



INVESTIGATING LANGUAGE CORPORA AS A GRAMMAR DEVELOPMENT RESOURCE

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ABSTRACT

The digital era has brought new concepts and transformations into language development and has given rise to technology-based approaches to learner autonomy. It has shifted the focus from deductive to inductive learning, where the concept of ‘noticing’ (Schmidt, 1990) language forms is promoted. Literature suggests that this type of student-centered self-discovery of lexico-grammatical patterns can be greatly aided by corpus linguistics methods, specifically ‘Data-Driven Learning’ (DDL) (Johns, 1986; Braun, 2005; O’Keeffe et al, 2007). It reports on the valuable potential of DDL for developing learners’ multi-literacies and cognitive strategies, particularly raising their awareness of lexico-grammatical patterning (O’Keeffe and Farr, 2003). However, insights from corpus-based studies have not been widely applied in teaching practices (Reppen, 2022; Zareva, 2017). It has also been proposed that DDL enhances accurate representation of language, raises cultural understanding, provides learners with the freedom to explore and discover the language, and fosters learner autonomy, thus making them more effective language learners (Flowerdew, 2015).

This affordance led to the design of a longitudinal experimental study which aimed to provide useful skills and processes in the use of language corpora as a grammar development resource in the pre-intermediate EFL classroom in an Armenian context outside of higher education. The evaluation data included pre-, post-, progress-, delayed post-test data, and Learner Autonomy Profile (LAP) form, the statistical analysis of which revealed the beneficial impact of the computer-based inductive approach of DDL on the learners’ grammar competency, independent learning skills, as well as the contribution of cognitive strategies to proceduralization of knowledge. It also included semi-structured interview data, which uncovered the learners’ increased engagement in the learning process, the positive change in their attitudes towards their own learning, and the ways of demonstrating autonomous abilities in working with concordances. These data also brought to light some of the fears and challenges of using DDL, as well as discussing its theoretical and pedagogical underpinnings aligned with psychological processes of learning.

The findings will serve all the participants of this hugely important ELT sector - researchers, language educators and learners. They will gain insights as to what is necessary to tap learners’ implicit long-term knowledge, to prepare them both psychologically and practically for independence so that they can be armed with confidence, interest in discovering the language, knowledge about their own learning, and understanding of how to make use of their learning styles and strategies.

Keywords: conventional/technology-enhanced EFL classroom, corpus linguistics, data-driven learning (DDL), inductive/deductive grammar learning, direct/indirect written feedback, explicit/implicit knowledge, language awareness, learner autonomy.

DECLARATION OF ORIGINALITY

I hereby declare that this thesis is the result of my own original research and has not been submitted for any other awards at this or at any other academic establishment. All sources that have been consulted have been identified and acknowledged in the appropriate way.

Signature of Candidate: _____

Lilit Avetisyan

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LIST OF ABBREVIATIONS

- BNC – British National Corpus
CEFR – Common European Framework of Reference for Languages
CALL – Computer-Assisted Language Learning
CL – Corpus Linguistics
CLT – Communicative Language Teaching
COCA – Corpus of Contemporary American English
DDL – Data-Driven Learning
EFL – English as a Foreign Language
ELT – English Language Teaching
ESL – English as a Second Language
ICE – International Corpus of English
KWIC – Key Word in Context
LA – Language Awareness
LAP – Learner Autonomy Profile
MIREC – Mary Immaculate Research Ethics Committee
NSC – Native Speaker Corpus
POS – Part of Speech
SCT – Socio-Cultural Theory
SLA – Second Language Acquisition
SPSS – Statistical Packages for Social Science
SD – Standard Deviation
TLA – Teacher’s Language Awareness
UB – Usage-Based
UG – Universal Grammar
ZPD – Zone of Proximal Development

*“Learning becomes accidental when there is
no self-control of learning processes.”*

CHAPTER ONE

INTRODUCTION

1.1 Data-Driven Learning: A Brief History

The focus of this study is grammar teaching and learning and, more specifically, the development of grammar at lower levels of language proficiency through data-driven learning (DDL), as well as the contribution of DDL to the acquisition of independent language learning skills, as understudied affordances of DDL, identified in literature. The study also aims to gain insights into the benefits, fears and challenges of the operationalization of DDL outside the academic setting and in an Armenian EFL context.

In the 20th century, corpus linguistics marked a major innovation in linguistic research as it allowed for the analysis of large collections of naturally occurring discourse, both written and spoken. The findings of much of this research, however, did not receive rapid uptake in language teaching and learning. It was a slow process and analogies in the literature include ‘percolation’ (McEnery and Wilson, 1997) or ‘trickle down’ (Leech, 1997). This type of shift was firstly necessitated by the emergence of the communicative approach, which prioritized the use of authentic data (even though for decades invented examples tended to be used and are still used). Moreover, as revealed by McCarthy (1998), Gilmore (2004) and others, there was significant difference between the language of coursebooks and actual language use. This fact led to the development of corpus-based dictionaries, grammars, and coursebooks, which made learners’ access to actual language use possible. Furthermore, in order to provide active learner participation, a need for interaction with the corpus itself arose (Chambers, 2022).

Thus, DDL came to take these developments a step further by providing learners with access to the corpus itself. By definition, a corpus is a large, principled collection of naturally occurring texts, stored electronically (Reppen, 2022), “records of language behavior” (Cook, 1998, p. 58), representing a wealth of knowledge about “linguistic and co-occurrence patterns”, which would be difficult to otherwise identify (Reppen, 2022, p. 16). Corpora provide information on usage in the form of concordances with a key word highlighted in context (KWIC), on frequency, distribution, collocation, etc. The multiple affordances of corpora for language teaching were not immediately evident to

the pioneering corpus compilers, including Randolph Quirk (1960) or Henry Kucera and W. Nelson Francis (1967), who created the first one-million-word corpora of British and American English respectively. In relation to the notion of affordances, Douglas Arthur (1994), a cognitive scientist, observes that “the value of a well-designed object is when it has such a rich set of affordances that the people who use it can do things with it that the designer never imagined” (p. 28). While more research was carried out aiming at improved corpus-based linguistic description (e.g. John Sinclair, who directed the COBUILD project), the pedagogical implications started to appear at the turn of the millennium.

It was not until the early 1990s that DDL was brought to applied linguists’ attention due to Johns’ (1991) first publications on the pedagogical use of corpora and to language teachers’ attention due to the work of Tribble and Jones (1990), guiding teachers in putting DDL into practice. Interestingly, the first attested uses of concordances were credited to Antoinette Renouf and Ahmed, Corbett, Rogers, and Sussex in Johns (1986), as well as to Peter Roe in Aston University, Birmingham in McEnery and Wilson (1997), and even to librarians and social scientists. However, it was due to Johns’ early experimentation and publication on the use of corpus data with language learners that DDL was introduced to the discourse community in applied linguistics and developed particularly in the context of higher education (Chambers, 2022). Johns initially used the concordancing software *MicroConcord* as a research tool for learners emphasizing their active role in language learning. His first work on concordancing was situated in the context of teaching English for Specific Purposes to non-native speakers of English. He also recognized the importance of a corpus as a research tool for teachers, as well as for himself, in the role of a teacher.

During this period, Geoffrey Leech (1997) proposed a distinction between direct and indirect uses of corpora in language pedagogy. The indirect approach involves situations when learners come into contact with corpus results through teaching materials or reference works. The direct use of corpora allows learners to get hands-on experience in exploiting corpus data to perform linguistic analysis and learn the language (Boulton and Cobb, 2017) (see Section 2.6 for more details). Tim Johns (1991), who pioneered this approach, advocated “cutting out the middleman as far as possible and giving the learner direct access to the data” (p. 30). He called this activity classroom concordancing and coined the term ‘data-driven learning’ (DDL), where “Every student (is) a Sherlock Holmes” (1997, p. 101). Leech (1997) promoted the idea

that corpora should be applied in language education, as a data-driven approach to learning, since language and language learning a fortiori are usage-based.

The developments in DDL research from the 1990s onwards were also largely conditioned by the developments in technology. More advanced concordancing software, such as *Wordsmith Tools* (Scott, 2020) and *AntConc* (Anthony, 2019), became available at a modest cost and freely respectively. Another noteworthy resource, *Lextutor*, was created on the basis of Johns' work. It involves corpora in English, French, German, and Spanish, to which teachers and learners can get easy access without any training (Chambers, 2022). Several general corpora are readily available, including Brown; Lancaster, Oslo, Bergen corpus (LOB); British National Corpus (BNC); the corpus of Contemporary American English (COCA), the International Corpus of English (ICE), and provide valuable resources for information on how spoken and written language are used in a range of settings (Reppen, 2022). In the last decade alone, corpus interfaces, such as *Sketch Engine* (Kilgarriff et al., 2014) and the *English-Corpora.org* (formerly known as *BYU Corpora*, curated by Mark Davies) store multi-billion-word corpora. For instance, *Sketch Engine* contains 500 corpora across 95 languages (Kilgarriff et al., 2014). The *English-Corpora.org* interface, used in this study, contains multi-million and multi-billion-word corpora of contemporary and historical English, as well as specialized collections such as *The TV Corpus* (325 million words). As O'Keeffe and McCarthy (2022) point out, in the last decade, the limitations on corpus size is no longer a limitation because of the ability to store vast amounts of data in the Cloud. Small corpora, also called pedagogic corpora, are created by researchers to meet learners' specific needs in language learning.

With the advances in educational technologies, DDL started to attract more advocates. The number of publications on the use of corpus data with language learners started to increase, along with the increase in diversification of DDL practices (Gilquin and Granger, 2022) (see also Chapter Two where work on DDL is reviewed). As mentioned, first publications and practices are credited to Tim Johns (1986), who brought DDL to researchers' attention in Applied Linguistics. He initially used corpus data as a tool for language learners (meanwhile recognizing its usefulness for language teachers) and contributed a lot of corpus-based teaching materials. DDL was defined as "the use in the classroom of computer-generated concordances to get students to explore regularities of patterning in the target language, and the development of activities and exercises based on concordance output" (Johns and King, 1991). From the 1980s

onwards, DDL research and practices became more widespread due to this early experimentation by Johns. While DDL was initially confined to writing, practices involving spoken corpora are growing (e.g. Hirata, 2020, Meunier, 2020); while DDL was more used in higher education, it has become more widespread in secondary education (e.g. Breyer, 2009; Crosthwaite, 2020; Lee, 2011); while it was only used in English language teaching initially, this approach has begun to spread to teaching other languages as well (e.g. Kennedy and Miceli, 2017; Yao, 2019).

Over the last twenty years, academic discussion has been elaborated through a number of books, articles, and conference presentations, focusing on corpus affordances in education ranging from descriptive corpus-based insights into the target and learner language to the development of new corpus resources and tools for language teaching and learning (e.g. Ajmer, 2009; Boulton et al., 2012; Braun et al., 2004; O’Keeffe, 2021; Sinclair, 2004). This was accompanied by real-life corpus-based pedagogical endeavors – production of reference grammars (e.g. the Cambridge Grammar of English – Carter and McCarthy, 2006), learner dictionaries (e.g. the Macmillan English Dictionary for Advanced learners – Rundell, 2007), course books (e.g. the Touchstone series – McCarthy et al., 2005), as well as the design of courses (e.g. Lee and Swales, 2006), and supplementary teaching materials (e.g. Real Grammar; A Corpus-based Approach to English – Conrad and Biber, 2009).

Important developments have been documented in research on DDL with the publication of meta-analyses (Boulton and Cobb, 2017; Cobb and Boulton, 2015; Lee et al., 2019; Perez-Paredes, 2019), analyses of empirical studies from pedagogical and theoretical perspectives (Boulton, 2010), language learning theories (Flowerdew, 2015), DDL practices for teachers and learners (Friginal, 2018; Poole, 2018; Tribble and Jones, 1990). However, as researchers state (e.g. Perez-Paredes, 2019; Romer, 2006), a lot still needs to be done before corpora can actually move to language pedagogy. The fact remains that language corpora have not been integrated into mainstream teaching practices (or ‘normalized’ as a method), and the question remains as to whether DDL has successfully crossed the research-practice gap (Chambers, 2019; Perez-Paredes, 2020).

Studies on DDL report largely positive feedback on the outcomes of corpus consultation (Boulton and Cobb, 2017; Cobb and Boulton, 2015; Lee et al., 2019; Perez-Paredes, 2019). Learners appreciate being exposed to genuine examples of language use (Chambers, 2005; Hirata and Hirata, 2019). DDL brings authenticity into

the classroom and multiple authentic samples of a particular language feature, as one of the advantages of DDL. This equips learners with confidence that they are learning the language they will encounter outside the classroom and in the world of real language use (Reppen, 2022). Moreover, this ‘condensed exposure’ can potentially expand vocabulary and raise awareness of linguistic patterns (Gabrielatos, 2005, p.10). Evidence also suggests that corpus consultation has a beneficial effect in improving vocabulary, grammar, and writing (Ackerley, 2017; Cobb, 1997; Gaskel and Cobb, 2004; Stevens, 1991). This underlines another advantage of DDL – its corrective function, when learners compare their utterances against the corpus data, correct their interlanguage errors, and improve their own writing (Gilquin and Granger, 2022). Still another advantage of DDL, highlighted by research, is the element of discovery, which makes learning more motivating, more active and fosters autonomy.

Admittedly, certain reservations have been expressed towards the use of DDL. Referring to corpus insights, Widdowson (1991) claimed that “such analysis provides us with facts, hitherto unknown, or ignored, but they do not themselves carry any guarantee of pedagogic relevance” (p. 20). A caution expressed by Leech (1997) was while research work enhances the skills of generalizing and hypothesis testing, “it does not itself initiate or direct the path of learning” (p. 5). Moreover, not every learner can resist independent process-oriented learning (Kirschen, Sweller, and Clark, 2006; McGroarty, 1998), as it demands a lot of cognitive work and, therefore, gives rise to the need for more scaffolding on the part of the teacher (Cobb and Boulton, 2015). Researchers, such as Romer (2006), Tribble (2008), Perez-Paredes (2010), and O’Keeffe, (2019) have pointed to the need to shift the use of DDL from research-oriented process to a more pedagogically underpinned one. However, it is still far from ‘normalization’ (a point where a particular technology reaches its fullest possible effectiveness and becomes a “valuable element in the language learning process” (Bax, 2011, p. 1, cited in Perez-Paredes, 2019).

DDL researchers and specialists point to various affordances of DDL that language learners can avail of (Boulton, 2015). Through direct uses of corpora, learners can get exposed to authentic language and a richer account of language data than offered by any teaching materials. They can formulate queries in various ways, receive information they are interested in at a particular moment and make sense of the results by themselves. This type of affordance not only raises their linguistic awareness by refining their understanding of how real language functions, but also contributes to the

development of general learning skills and autonomy, which are prioritized in the contemporary education (Lamb and Reinders, 2005). However, despite the enthusiasm of a number of DDL researchers and specialists, DDL has not been integrated into regular teaching procedures, as observed by a number of researchers (Chambers, 2019; Mukherjee, 2006; Perez-Paredes, 2020; Romer, 2019; Tribble, 2008).

To understand more clearly the context of the use of DDL and whether or not corpus work lives up to expectations, with benefits sufficient to justify the investment, there is a need to look at research to date, which is the focus of Chapter Two.

1.2 Grammar Teaching and DDL

Throughout the history of second or foreign language teaching, over 60 theories, models, hypotheses, and perspectives have been proposed (Atkinson, 2011; Mitchell, et al., 2013; VanPatten et al., 2020). There is now more disagreement about the facts of L2 acquisition, which is due to the crisis resulting from the gap between theory and practice (Ellis, R., 2008). In general terms, there are concerns related to the maturity of research sufficient to bridge the gap and to the accumulated knowledge in SLA necessary to inform language teaching (Gass and Mackey, 2007). In this regard, Ellis, R. (2020) draws a conclusion that SLA has come a long way but it is still at the early stage of becoming a discipline.

For grammar teaching to be effective, it needs to consider the development of learners' interlanguage system and to facilitate the natural acquisition of L2 competence (Larsen-Freeman, 2015). The traditional definition of grammar teaching is the presentation and the practice of discrete grammatical structures (Hedge, 2000; Ur, 1996). However, teaching grammar is not limited to the presentation and the practice of grammatical items. They can also be taught by providing learners with an opportunity to discover grammar rules, by multiple exposures to these rules, or by means of corrective feedback on learner errors that can arise when performing communicative tasks (Ellis, R., 2006). Thus, broadly defined, grammar teaching involves any technique that can help the learner internalize the grammatical form either by developing metalinguistic knowledge or by processing it in comprehension and/or production (Ellis, R., 2006). There is consensus with the field of Second Language Acquisition (SLA) that implicit knowledge or automaticity is the prerequisite of acquiring second language (L2) competence (Doughty, 2003). Drawing on different theories of L2 acquisition, a number

of studies have been conducted to measure the impact of various grammar teaching approaches on conscious (explicit) and sub-conscious (implicit) learning outcomes. However, there is no consensus regarding the effectiveness of a particular grammar teaching approach in facilitating the automatization of taught knowledge leading to an ongoing debate around the interface hypotheses (Han and Finneran, 2014; O’Keeffe, 2019).

DDL, which uses the tools and techniques of corpus linguistics, as one explicit, technology-based approach to language instruction, is said to provide an environment for the development of students’ cognitive strategies and multi-literacies. In addition, the emphasis has shifted from deductive to inductive learning, and ‘noticing’ (Schmidt, 1990) of corpus data is promoted in the form of concordance citations as language input and self-discovery of lexico-grammatical patterns (Bernardini, 2004; Braun, 2005; Gabrielatos, 2005; Hunston, 2002; Mukherjee, 2006; O’Keeffe et al, 2007; Romer, 2006). The essence of DDL is the process of inductive learning, where the learner takes on an active role. In this respect, the pedagogical context of DDL resonates with the current thinking in the theory of education in general and in second language acquisition in particular - constructivist and usage-based paradigms - and the developments in the area of learner autonomy (Chambers, 2022) (see Chapter Two).

The corpus-informed language pedagogy requires careful selection of a corpus, awareness of corpora design, and skills and knowledge of its correct use. Within the pedagogical context of corpus use, learners can engage in hands-on experience with language through guided activities or through corpus-based handouts with concordance lines. This experience relies on inductive or deductive approach, which, respectively, enable learners to see the linguistic patterns of the target item and form generalizations (Johns, 1991a), or check the validity of rules from their grammars or textbooks (Gilquin and Granger, 2022). Johns (2002), who coined this term ‘data-driven learning’ (DDL), saw it as an approach that “confronts the learner as directly as possible with the data to make him/her a linguistic researcher” (p. 108).

The role of DDL in grammar teaching and learning and its place in the interface debate can be evaluated from the position of the usage-model of language learning. Language corpora provide descriptive insights into both spoken and written grammar, which, pre-corpora, was based on intuition and qualitative analysis. Schmitt (2005) mentions that the systematicity of language should be explained not only by grammar rules, but also by patterning. “The more we look at corpus evidence, the more patterning

we find. We may discover in the end that patterning actually makes up the majority of the systematicity of language, with rules only coming into play when there is insufficient patterning available” (Schmitt, 2005, p. 22). Within a usage-based perspective, L2 constructions are abstracted and are learnt as a result of individual statistical processes of dynamic interplay between exposure to input and mental processing tools (Perez-Paredes et al., 2020).

There is widespread consensus that the core pedagogical contribution of DDL is its potential to encourage learners to construct their L2 grammar knowledge independently by getting multiple exposures to language data through concordancing (Flowerdew, 2015; Johns, 1994; Lee et al., 2019). From an SLA perspective, multiple instances create what Ellis, N. refers to as the ‘frequency effect’, which may accelerate the intuition of the pattern at a sub-conscious level (Ellis, N., 2002; Tomasello, 2003). Moreover, the target item is made salient in the concordance line within KWIC format, it promotes the operation of ‘input enhancement’ (Chappelle, 2003; Wong, 2005). In addition, by providing learners with opportunity to meaningfully engage with language through inductive learning, which enhances learner involvement, known as ‘involvement load hypothesis’ (Laufer and Hulstijn, 2001), acquisition of the target item becomes easier (Lee et al., 2019). In summary, and as shall be discussed further in this research, while DDL is supported by language acquisition theories of Noticing Hypothesis (Lai and Zhao, 2005; Schmidt, 2001); input enhancement (Chappelle, 2003; Wong, 2005); involvement load hypothesis (Hulstijn and Laufer, 2001); as well as usage-based model (Ellis, N., 2002; Tomassello, 2003), there is a dearth of empirical evidence for an actual link (O’Keeffe, 2019). It is within this frame of practices that the rationale for this study can best be elaborated.

1.3 Rationale for the Study

The historical account above briefly presented the developments of research in the area of DDL, which brings together theories of constructivism, usage-based model and advances in the field of autonomy (Vickers and Ene, 2006). It is based on the key concepts of authentic data, learner control, discovery learning, autonomy, and revolutionaries (Boulton, 2009). Many corpus-based studies have been carried out in language learning (see Chapter Two), but, as mentioned, language corpora have not been integrated into mainstream teaching practices. One reason is that many teachers

lack the training and resources to accomplish this task. Teachers who would like to incorporate language corpora into their instruction are often overwhelmed by the task of locating appropriate corpora or designing activities for their students (Reppen, 2022; Zareva, 2017). Moreover, the studies exploring corpus-driven language learning are mostly targeted at tertiary-level students (Boulton, 2008; Cheng et al, 2003; Koosha and Jafarpour, 2006; Passapong, 2002; Todd, 2001; Vannestal and Lindquist, 2007), while studies investigating the impact of DDL on learner performance and learner autonomy at lower levels of studying the language still need to be conducted (Braun, 2007; Sun and Wang, 2003). As my teaching context includes lower-level English language students who are not exclusively in university settings, a strong rationale for this study was to look at a typical group of learners in my pedagogical setting, which, compared to the DDL literature, are atypical because they are at a pre-intermediate level, taking an English course in their workplace, the Armenian Nuclear Power Plant. Essentially, I wanted to test whether DDL was beneficial in my pedagogical context.

Boulton and Cobb's (2017) meta-analysis of 64 experimental studies pointed to the research of DDL at lower levels of language learning, longitudinal investigation, and delayed post-testing that need further investigation. According to this substantial meta-analysis, most studies measure the learners' grammar knowledge immediately after the DDL intervention, which cannot provide understanding about the automatization of taught knowledge (Han and Finneran, 2014). Han and Finneran (2014) note that if we are to measure implicit knowledge, we need to conduct a delayed post-test, as they allow us to gain insights into the contribution of cognitive strategies to internalization and retention of a teaching point at empirical level. Therefore, one of the rationales for the design of this study was to take a longer-term view on post-testing (as discussed in Chapter Three)

Another rationale for this study was my interest in the concept of learner autonomy. As a learner of English myself, it was clear to me that the knowledge and skills about how to make use of one's own learning styles and strategies, whenever the need arises, can be a predictor for effective learning. The promotion of autonomy is one of the literacies of the digital era and this can be greatly supported by technology, whose appropriate use can extend the possibilities of conventional teaching techniques and offer new possibilities. Pedagogically core to DDL is the aim of fostering independent acquisition of language knowledge (O'Keeffe, 2021). Literature points to DDL as one technology-based approach to learning that can bring the real language use into the

classroom, offer new tools and support learning, and expand opportunities for self-directed learning; however, this potential of fostering learner autonomy has not been properly investigated in DDL context. Thus, the attraction of undertaking an intervention study involving DDL was underscored by its ethos of promoting learner autonomy.

Literature on DDL strongly suggested that the integration of language corpora into English language learning might have a positive impact on language acquisition, and on that basis, the present study was designed so as to test it in my context in Armenia. In a broad sense, the aim is to add to the body of empirical studies to complement the theoretical arguments and qualitative data that currently dominate the discussions of DDL, which will be outlined in Chapter 2. The effectiveness of any teaching approach is justified by its potential to enhance and ideally accelerate the acquisition of knowledge and its long-term retention. In particular, the current study, therefore, conducts comparative evaluation of this potential between conventional grammar teaching and data-driven instruction at low levels of language proficiency measuring the extent to which the taught grammar knowledge could be developed and retained in a long-term. Another focus of the study will be the evaluation of the potential of DDL instruction in promoting learner autonomy – an imperative of the digital era and an under-researched aspect in the DDL context and influenced by the new pedagogical data-driven treatment. The assessment, which will cover the main constructs of autonomy, will reveal the contribution of technology to self-directed learning in the context of DDL. Furthermore, to understand the fears and challenges of utilizing data-driven procedures, which will be another area for investigation in this thesis, will hopefully enhance the perception of the effective use of DDL and expand opportunities to make it more mainstream.

1.4 Significance of the Study

The findings of the study can be replicable and it can provide useful information for language educators as to how they could compensate for the deficiencies of a conventional EFL classroom (authenticity of language data, identification of frequencies, pervasiveness of constructions, salience of input, contingency of form-function mappings, shift in attentional biases, enhanced conditions for meaningful form-use-function mappings, independent acquisition of knowledge) with the help of corpus-

driven learning to address the challenges of enhancing the learnability of language constructions. Engaging with such critical concepts as inductive approach and noticing hypothesis and observing the long-term changes in thought and action, this research will reveal the contribution of the cognitive strategies of DDL to proceduralization and long-term retention of learners' grammar knowledge and identify the grammar aspects that are more amenable to corpus consultation to enhance the language learning process. The findings will also show what is necessary to prepare students both psychologically and practically for independence so that they can be armed with confidence, knowledge about their own learning, and understanding of how to make use of their learning styles and strategies.

This study will add to the growing evidence base which shows that learning how to use a language corpus as a data-driven resource for learning can enhance the language learning process, build learner confidence, create interest in discovering language patterns, and enhance learner independence. Thus, the findings can serve all the participants of this hugely important ELT sector - researchers, language educators and learners. Because the research can be transferrable to learning other languages as well, it can serve as reference material on the application of corpora, as a novel mediation, in foreign language teaching in general.

The study will also be significant because it will offer results on the use of DDL in an Armenian context and at lower levels. As mentioned, it will add to the existing literature also because it focuses on lower level students outside of a university setting.

1.5 Research Questions and Thesis Structure

The research questions under investigation are:

1. To what extent can DDL in an Armenian context improve pre-intermediate learners' knowledge of English written grammar items?
2. To what extent can DDL foster learner autonomy in discovering grammar knowledge through corpus consultation?
3. What are the learners' attitudes towards working with corpora to discover the grammar points, as well as improve their own writing?

This is a mixed-method study, which will obtain its evaluation quantitative data from pre-, progress, post-, delayed post- tests and Learner-Autonomy-Profile (LAP)

Form, and the qualitative data from semi-structured student interviews. The progress and post-tests will measure the learners' immediate grammatical performance through grammar tasks testing the grammar items discretely, through error correction and free writing tasks, thus answering research question 1. This will be supplemented with an analysis of the delayed post-test results to examine the rates of changes, gains, and losses between the three tests, thus measuring the contribution (or not) of cognitive strategies to long-term retention of knowledge and providing insights into which language items could benefit more from the DDL instruction. Semi-structured student interviews will be conducted to address research question 2, which aims at exploring the learners' engagement in the learning process, the change in their attitudes towards their own learning, the development of their language learning skills, and the ways of demonstrating autonomous abilities in working with concordances. Finally, to address research question 3, which is concerned with understanding of how learner autonomy can be fostered through language corpora, the LAP form, profiling the four key constructs of learner autonomy, will be administered at the end of the investigation. The remainder of the thesis is structured in the following way.

Chapter Two presents a review of the literature that served a foundation for this investigation. The second section provides an account of the current pedagogical context of DDL and identifies the gaps. The following two sections focus on certain learning theories and SLA models to allow for opening up a theoretically and pedagogically aware discussion in further chapters. In the fifth section, grammar teaching and DDL, which is the central focus of this study, as well as the related dichotomous constructs, including the unresolved debate in SLA, known as the interface debate, are dealt with. The following section centers on learner autonomy, as another major and related theory that interlinks with DDL and another issue under the current investigation. The last two sections close the chapter by reviewing the operationalization of DDL and setting the scene for the empirical phase of the study.

Chapter Three introduces the methodology of the project. It opens with a small-scale action research pilot study aimed to provide insights into how to design the main experiment in a most informed way to gain most comprehensive answers to the research questions. More specifically, the study seeks to experiment with computer-based hands-on and paper-based hand-out approaches of DDL and find out the difference in learning outcomes between these approaches and between different levels of language proficiency, as a response to operational uncertainties reported in relation to the use of

DDL with low level learners. The aim is to inform a selection of an appropriate teaching approach and development of teaching materials for the main study, as well as to bring to light some of the fears, challenges, and benefits of using these approaches in grammar instruction at low levels of language proficiency, which will help to mitigate the potential risks and maximize the possible gains from DDL at a larger scale. The sections in this chapter present the methodology, the results, and the findings of the pilot research and provide feedback to inform the actual experiment.

The main experiment, informed by the pilot study, has a multidimensional design, which is described in the following main section. It is a mixed-method longitudinal study which aims to conduct a comparative evaluation between conventional and DDL grammar instruction and reveal the contribution of DDL to learner immediate performance, proceduralization of taught knowledge, independent learning skills and learner motivation. To achieve this end, corresponding methodology, research design, sampling procedures, instrumentation, data collection and data analysis procedures were selected, which are detailed in separate sections of this chapter.

The results of the evaluation data collected from pre-, post-, progress, and delayed post-tests, the LAP Form, and semi-structured student interviews are the foci of Chapter Four consisting of nine sections. The first six sections present a comparative evaluation of conventional and corpus-based instruction and the impact of DDL on learner performance in grammar through statistical analysis of test results. The seventh section reveals the contribution of DDL to learner autonomy. Finally, the qualitative data obtained from semi-structured student interviews is introduced according to certain themes.

The discussion of the empirical findings is conducted in Chapter Five comprised of five sections in explicit reference to the paradigmatic stance undertaken by the study. The first and second sections engage with the pre-, post-, and progress test results, which demonstrated the extent to which the learners were able to improve their declarative grammar knowledge immediately after the introduction of each grammar point and immediately after the corpus-based treatment, thus answering the first research question. The following part in this section is devoted to the delayed post-test results and contributes to the first research question. It discusses the impact of inductive data-driven learning on the long-term retention of knowledge, reveals the areas where certain losses, gains, and retention rates were detected after a three-week delay, and identifies the language areas that could benefit more from DDL. The third section

provides a discussion of the quantitative data on learner autonomy and answers the second research question. In the fourth section, the qualitative findings of the student interviews are discussed, which provide answers to the third research question. The final section closes the chapter by summarizing the main findings of the study.

Chapter Six is the final concluding chapter where the implications for pedagogy are addressed in light of the discussion and synthesis of the findings in the discussion chapter. The chapter also presents the limitations, delimitations of the study and suggestions for further research, and closes with concluding remarks.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The brief overview of the history of DDL in L2 language teaching and learning in general and in grammar instruction in particular in Chapter One shed light on DDL, as one potential contemporary response given to concerns related to instructed second language acquisition, and prompted the need to investigate DDL as a resource for developing grammar and fostering autonomy. The aim of Chapter Two, therefore, is to survey the literature that investigates the pedagogical contribution of DDL specifically to learner performance in grammar and long-term retention of knowledge and the development of autonomous learning skills, complemented by theoretical underpinnings of DDL. This is a review of the literature that serves as pillars for the constructs upon which this investigation is founded, thus establishing an epistemological stance for further discussion of findings. Thus, the second section presents an account of the current pedagogical context of DDL and identifies the gaps. The third section focuses on the theories of learning, namely constructivist and socio-cultural paradigms, which have greatly influenced SLA and can provide theoretical support for DDL. The fourth section illustrates the links between DDL and certain models from SLA methodological repertoire, such as noticing, discovery, usage-based model, which often get a mention in DDL research. This is done to open up an opportunity for a more pedagogically aware and SLA-focused discussion throughout the thesis. In the fifth section, the survey is narrowed down to grammar teaching and DDL, which is the central focus of this research. It discusses such dichotomous concepts as inductive/deductive learning, explicit/implicit knowledge, which are part of the grammar treatment in this study, and are related to a long-running SLA debate, known as the Interface Debate. This is followed by the exploration of the potential of DDL in fostering learner autonomy, which is another focus of this study, as an under-researched area in DDL and interlinking with SLA. The sixth section deals with the operationalization of DDL featuring the direct and indirect uses of DDL, as well as training, treatment, and teaching materials in DDL. This theoretical review is concluded in the final section, thus setting the scene for the empirical phase of this study.

2.2 An Overview of DDL

2.2.1 The Context of Studies in DDL

The developments in DDL, as described in the previous chapter, came to play a central role in linguistic research in the 20th century, whereas the classroom application of this research was slow (Chambers, 2022). In order to gain a better picture of the context where DDL has been put into practice, this section provides an overview of the research through the recent important meta-analyses of DDL studies.

Cobb and Boulton's (2015) meta-analysis is based on 116 publications of classroom applications of DDL. The aim is to reduce the subjective evaluation of the effects of corpus use inherent in the traditional narrative review and provide more rigor and objectivity in making generalizations about outcomes through statistical quantitative analyses of the empirical findings. According to the factual description of their work, the studies spread from 1989 to 2012, half of which were published in the last five years. About half of the studies were conducted in Europe and one-third in Asia. Over 100 studies, involving advanced or upper-intermediate students, are situated in higher education setting and only a handful of other contexts, such as secondary education. The learning objectives generally target vocabulary and, occasionally, grammar and syntax. Almost a third of studies use BNC or COCA, half use locally-built corpora, and a small number use *WordSmith Tools*, *AntConc*, and *LexTutor*. The DDL treatment ranges from just a few minutes to a semester (only in 5 cases), while the majority last a few hours over a few weeks. The average number of participants is 40, ranging from one in case studies to over 100. As the authors mention, this wide range of variables leads to substantial methodological heterogeneity, with statistical analysis of quantitative results in 49 studies, raw figures and percentages in 41, and qualitative discussion in 26 studies.

The evaluation of the studies in Cobb and Boulton's (2015) meta-analysis was carried out both within groups and between groups. The results of the within-groups analysis reveal demonstrable effect after the treatment, suggesting that corpora can be effective. The results of the between-groups analysis show that corpus-based learning is more efficient than conventional transmission-based teaching. Evidence suggests that corpora can be beneficial for various purposes, including learning of lexis and grammar, reading and writing or translation, and this has been the case for both paper-based and

computer-based concordancing. Evidence also suggests that DDL is now ready to expand beyond higher education setting into mainstream foreign language learning. The study concludes by pointing to avenues for future work that would complement the dominance of studies on lexis and specific grammar points, show the ways that corpora are integrated and how they relate to learner profiles. A point of relevance to the design of this study is that Cobb and Boulton (2015) express hope for more longitudinal studies with delayed post-tests to balance the short-term focus of existing studies and observe such long-term benefits as awareness, noticing, autonomy, motivation, and other cognitive and metacognitive skills, which are perhaps most strikingly in need of study.

Another significant study was Boulton and Cobb's (2017) meta-analysis of 64 experimental and quasi-experimental studies. Applying systemic meta-analytic procedures, it aimed to summarize findings from the investigations into the effectiveness of DDL tools and techniques in second language acquisition. The motivation for this effects-oriented meta-analysis was the treatment of DDL as an empirical matter alternative to the irresolvable in-principle case for or against DDL. Guided by a broader definition rather than the narrow view of DDL as entirely autonomous, serendipitous browsing, the study set a goal "to make generalizations ... across a range of populations and scenarios" (Plonsky and Ziegler, 2016, p. 19). A broader domain can better reflect the diversity of practices and make research results more generalizable, and a larger dataset can increase power and accuracy (Plonsky and Brown, 2014). To minimize the possibility of comparing apples and oranges, the research was based on studies that were "similar enough" (Norris and Ortega, 2006, p. 216), which were later diversified by variation in effect sizes due to moderator variables (Cumming, 2012), such as study designs, populations, language focus, implementation, and others.

The analysis of the results indicate that DDL approaches result in large overall effect for both pre/posttest designs ($d = 1.50$) and control/experimental group comparisons ($d = 0.95$) (Boulton and Cobb, 2017). Further analysis of moderator variables revealed a number of significant points. Small effect sizes were attributed to small sample sizes. Studies that were longitudinal with intermediary tests were few. Most studies used comparison groups that received a different treatment, while only one study used an obviously true control group. One difficulty was related to the assessment of learners' language proficiency, as the perceptions and descriptions were culturally bound. The analysis noted that (hands-on) computer-based work showed larger effect

sizes than concordance printouts. DDL was found to be a strong methodology in lexicogrammar, in particular, and in language learning, in general; hence, offering a flourishing field for research and having a bright future. The most robust results showed that

DDL is perhaps most appropriate in foreign language contexts for undergraduates as much as for graduates, for intermediate levels as much as for advanced, for general as much as for specific/academic purposes, for local as much as large corpora, for hands-on concordancing as much as for paper-based exploration, for learning as much as for reference, and particularly for vocabulary and lexicogrammar.

(Boulton and Cobb, 2017, p. 39).

However, and of relevance to the present study, the acute requirements that the meta-analysis pinpointed for further investigation are the theoretical underpinnings of DDL that lead to these results, low levels of language proficiency, experimental design, more longitudinal treatment, and delayed posttesting.

The effects of corpus use on vocabulary learning have received particular focus in research studies since the 1990s. Thus, Lee et al.'s (2019) meta-analysis focuses on this potential and conducts a multi-level evaluation of the treatment effects of corpus use between studies, as well as across moderating variables within studies. Based on the three pre-established criteria (homogeneity between treatment and control groups, descriptive and/or inferential statistics of post-test scores, conventional instruction control group), perhaps worryingly, only 29 studies fully match the three criteria and were thus selected for the analyses. The studies included began in the 1990s and a larger number, 60%, emerged in the 2010s. They were carried out in a wide range of pedagogical context. The calculations revealed a medium-size effect of the corpus use on L2 vocabulary learning both for the post-tests and follow-up-tests. Since the positive medium-sized effect was long-term, it was suggested that corpus consultation contributes to long-term retention of L2 vocabulary.

Lee et al.'s (2019) meta-study also revealed through multiple regression analysis for both the short and the long terms, how the magnitude of the effectiveness of corpus use can be influenced by each value of moderator variables, including publication type, region, L2 proficiency level, and specialty. It was found out that publication types have statistically insignificant differences for the post-test effect sizes, but significant difference for the follow-up effect sizes between PhD dissertations and journal articles. This was possible due to the submission and acceptance biases, as indicated by Lee et

al. (2019). With regard to the region, L2 learners from the Middle East had higher mean effect sizes than the learners from Asia, Europe, and the USA, which seemed counterintuitive given the similar deductive-oriented L2 learning cultures both in the Middle East and Asia. The analysis of the third variable, L2 proficiency level, showed a small effect of corpus use for low proficiency levels, which became negligible in the long term, and medium or large effects for intermediate and high levels, which remained in the follow-up tests. Lee et al. (2019) suggest that intermediate and high proficiency level students could avail of corpus use more than low proficiency learners. It was also found that the specialty variable did not have a large effect on L2 vocabulary learning through corpus use. Regarding the variables for the treatment data, the effect sizes difference between the paper-based and corpus-based approaches was not significant, although the results favored the paper-based type. Moreover, superior results were observed for the interaction of these approaches in the long-term. Careful selection of concordance lines had a large impact on L2 vocabulary learning, while public or local corpora had a medium effect size, and both of these positive effects remained long term. A unique contribution of this study, Lee et al. (2019) themselves note, is the finding that the corpus use had a large effect on improving in-depth knowledge, but a small effect for precise and productive lexical knowledge. The analysis also shows, even when controlling for other treatment-related variables, that the learners performed equally well with or without corpus training, and there was no statistically significant difference across the different lengths of intervention.

A recent meta-analysis of 32 full original research papers, conducted by Perez-Paredes (2019) provides significant insights into the context of DDL use between 2011 and 2015 and identifies the factors that facilitate or impede normalization of DDL. It should be highlighted that only 32 papers (4.2%) of the published research in five CALL journals during these five years dealt with the use of DDL for language learning. The analysis was conducted within the framework of the factors of normalization, as conceptualized by Chambers and Bax (2006), focusing on logistics, stakeholders' conceptions, syllabus integration, and training. The multiword keyword analysis (Kilgariff, 2012; Perez-Paredes, 2017) indicated a dominant focus on writing, collocations, rather than on the challenges of using corpora. The studies used different types of corpora, including BNC, COCA, BAWE, self-compiled corpora, among others. Thus, logistics, referring to resource location and access, did not seem to play a crucial role – either impeding or promoting – in the use of DDL and corpora as a language learning tool. As regards the conceptions, the idea of 'usefulness' appeared to be

central. Even so, the obtained generally positive results were reported with caution given the biases and limitations of the questionnaires and interviews. Moreover, the keyword analysis revealed that the skill-based knowledge, needed by teachers and learners to work with corpora, was related to online consultation, making generalizations, correcting learner errors, and using collocations. This allowed the study to suggest that most of the DDL research (94% in higher education and only two papers in secondary education) focused on writing through error correction and collocation exploration, with few papers studying specific grammatical constructions and no paper engaging with cognitive skills (only discussed in the literature review). One important factor facilitating normalization of an approach is its integration into the syllabus, as suggested by Chambers and Bax (2006). Related to this, only five studies addressed the integration of DDL across syllabi.

While this section presented the findings of the meta-analyses to illustrate the pedagogical context of the developments of DDL, the following section brings them together and identifies the gaps.

2.2.2 Bringing the Studies Together and Identifying the Gaps

The recent meta-analyses, discussed in the previous section, provide important insights into the context of the use of DDL and the extent to which DDL is far or close to normalization, even though certain papers were excluded from the final pool, being unrelated to the aims of the reviews. It became clear that the number of publications on DDL began to rise at the turn of the 21st century, which is likely to be associated with the spread of technologies in language teaching (Gilquin and Granger, 2022). Large and small corpora became increasingly available to teachers and learners, and researchers started to experiment with ways to make DDL a reality for language learners. As the meta-analyses shows, DDL has become more widespread in the European Union, the USA, the Middle East, and Asia.

For the evaluation of a pedagogical approach, in this case DDL, Boulton (2008b) suggests evaluating attitudes, practices, and efficiency of DDL. Thus, based on the results of the meta-analyses and the discussion in literature, learners generally expressed positive feelings towards concordancing, in terms of its usefulness and enhancing motivation (Boulton and Cobb, 2017), but some negative attitude in terms of time and effort (e.g. Hadley and Charles, 2017; Kennedy and Miceli, 2001; Quan, 2016). They

appreciate having access to multiple genuine examples of the language item under study, as well as the exploratory nature of DDL experience (Chambers, 2005; Hirata and Hirata 2019). As regards practices, it can be observed that most of the studies are situated in higher education and carried out with intermediate or high levels of language proficiency. Learning objectives generally target learning vocabulary, improving writing, correcting errors, collocations, and specific grammar points. The results are heterogeneous in relation to the number of participants and the types of corpora used for the treatment. The impact of direct and indirect uses of DDL seems to have mixed results. While it has often been claimed that printed materials are more effective (e.g. Lee et al., 2019), Boulton and Cobb's (2017) meta-analysis shows results that favor hands-on experience, Vyatkina (2016) finds both approaches equally effective, and sometimes the interaction of both leads to superior results (Lee et al., 2019). Efficiency, which can be determining in the future of DDL, has been associated with medium and high effect sizes; however, it has also been recognized that a number of moderator variables can affect the results.

Considerable progress in DDL research and practice has been documented in literature; yet, certain limitations have persisted on the way to normalizations of DDL. While the focus has tended to be on English, there are only a few DDL studies involving other languages. While publications on DDL almost exclusively report on experimentation in higher education context, very few researchers focus on secondary education (Braun, 2005, 2007; Breyer, 2009; Crosthwaite, 2020; Lee, 2011) According to Boulton (2020), only 19 out of 378 empirical studies of DDL relate to secondary education and none to primary level. Moreover, the majority of studies are conducted with intermediate or high levels of English proficiency, while studies with low-level participants are rare. Thus, more investigation is needed at lower levels and outside the academic context (Chen and Flowerdew, 2018; Meunier, 2020). While the overwhelming focus in research is on the role of DDL in the acquisition of lexis or a particular grammar item, a need arises for research into a wider range of grammatical points and identification of language areas that are more amenable to DDL. Seldom has the link between DDL and cognitive strategies been tested, which opens up a possibility of logical delusion regarding the role of DDL (Flowerdew, 2015). Similarly, learner autonomy, as one central affordance of DDL, has been often emphasized but rarely tested in the context of DDL (Boulton and Cobb, 2017). Furthermore, most studies conduct post-test immediately after the intervention of DDL, but for gaining insights into implicit knowledge, delayed post-testing needs to be administered (Han and

Finneran, 2014). While logistics has often been cited as one of the biggest problems of DDL, this is no longer a major issue, thanks to the widespread use of laptops by learners and the development of DDL on mobile devices (e.g. Quan, 2016; Perez-Paredes, 2019). What is still largely missing is the ready-made DDL materials for teachers, which would save their time, and guides to using corpora specifically designed for teachers (e.g. Friginal, 2018). Moreover, there is a need for better integration of DDL into teacher training programs (Hirata, 2020). Equally time-consuming is the engagement with DDL on the part of the learner, and, therefore, they might need to acquire some basic skills or, what Mukherjee (2002, p. 179) calls, ‘corpus literacy’.

As this review thus far shows, research into DDL reveals over focus over certain language areas, while in other areas, DDL is still far from normalization (Perez-Paredes, 2019). There is little evidence that DDL has successfully crossed the research-practice gap and it has yet to become more mainstream (Chambers, 2021). Researchers (e.g. Boulton and Cobb, 2017) call for deeper investigation of theoretical underpinnings of DDL, experimental design, more longitudinal treatment, and delayed post-testing. If the rationale behind DDL is to achieve long-term changes in thought and action, including autonomy, consciousness raising, implicit knowledge, and others, then strong evidence should be gained through delayed posttests (Boulton and Cobb, 2017). As Gilquin and Granger (2022) conclude, since many results are still inconclusive, even contradictory, and dependent on many different variables, more replicable studies should be encouraged.

As seen in this section, while the value of DDL has been shown through empirical DDL research, reference materials, and meta-studies, it is also necessary to understand where DDL can be theoretically situated in the current thinking of learning, which the following section will turn to.

2.3 DDL and Theories of Learning

Literature reports that DDL relates closely to current thinking in theories of learning in general and in language pedagogy in particular (Chambers, 2022). In terms of theories of learning, O’Keeffe (2020) identifies two motifs in DDL research taking constructivist and socio-cultural perspectives. The following section will show the ways how DDL can interlink with each perspective.

2.3.1 Constructivism and DDL

Cognitive constructivism, originating from Piaget, and its theory of learning seem to be most associated with data-driven learning.

Fifty years of experience have taught us that knowledge does not result from a mere recording of observations without a structuring activity on the part of the subject. Nor do any a priori or innate cognitive structures exist in man; the functioning of intelligence alone is hereditary and creates structures only through an organization of successive actions performed on objects. Consequently, an epistemology conforming to the data of psychogenesis could be neither empiricist nor preformationist, but could consist only of a constructivism, with a continual elaboration of new operations and structures.

(Piaget 1980, p. 23).

The shared epistemological ground for DDL and constructivism is interpretativism, which holds that knowledge acquisition cannot be imitative and repetitive but interpretative through engagement with content (Kroll and LaBoskey, 1996). DDL was originally based on a constructivist view, where learners engage in cognitive processes when grappling with raw data (Boulton, 2010; Cobb, 2005; Johns, 1994; O’Sullivan, 2007; O’Keeffe, 2020). Ideally, as Boulton (2010) states, DDL fits well with constructivism, since learners engage in adaptive behavior when detecting patterns that are meaningful to them, rather than in artificial intellectual activity involving memorization and application of transferred rules.

Constructivism holds the idea that knowledge cannot be received passively. Instead, the learner needs to construct his or her own internal knowledge based on his or her own experience and provided input. In Phillip’s (2007, p. 7) words, “Knowledge is not a mere copy of the external world, nor is knowledge acquired by passive absorption or by simple transference from one person to another”. This suggests that the images of reality created by each individual slightly differ from each other. While this is also true about language learning, DDL has apparently taken this into account, providing opportunities for learners to arrive at a rule through their own observations and generalizations of numerous instances of language use in the form of concordances. This to some extent replicates the natural acquisition process, though in a condensed and accelerated manner (Lewandowska, 2013).

Besides the interpretativeness in knowledge acquisition, constructivism also stresses such concepts as learner-centeredness, discovery, and cognitive skills. By definition, constructivism is “a learning approach that holds that people actively

construct their own knowledge and that reality is determined by the experiences of the learner” (Elliot et al., 2000, p. 256). DDL, as a pedagogical approach, promotes all these ideals above and, therefore, can be theoretically supported by constructivism (Cobb, 1999). As was initially proposed by Johns (1994), the middleman should be cut out as far as possible to allow learners to have direct access to corpus data and build their own knowledge of language use. Learners take an active role in their own language learning, which is of crucial importance both in constructivism and in DDL (Chambers, 2022). In his *Individual Cognitive Constructivism*, Piaget (1977) argues that learning takes place through active construction of meaning, which cannot be passive. Internal processes of the individual, particularly, discovery learning, form the fundamental basis for the individual’s development. To understand means to discover or reconstruct by means of rediscovery. New situations, which challenge our thinking, create a state of disequilibrium. In order to restore balance, that is to make sense of the new information, we restructure our current thinking by trying to assimilate it to the previous knowledge, or bring it to a higher order of thinking through accommodation. In its purest form, as O’Keeffe (2021) puts it, DDL is viewed as an open discovery rather than teacher-mediated focus on language input.

Constructivism triggers learners’ curiosity about the world and how it works, enhances their engagement in knowledge construction by allowing them to apply their real-world experiences, hypothesize and test their own theories, and draw conclusion or generalizations out of their findings (Jonassen, 1994). Similarly, DDL potentially encourages learners to construct their L2 knowledge independently by exploring language data from corpus input (Cobb, 1999; Flowerdew, 2015; Johns, 1994; Lee et al., 2019). Learners get multiple exposures to a particular language item made salient in the corpus input, which increases the likelihood of the item being noticed by the learners and their engaging in knowledge construction (Cobb, 1997; Collentine, 2000; Flowerdew, 2015). In relation to this, Leech (1997, p. 10) claims that DDL “invites the student to obtain, organize, and study real-language data and gives the student the realistic expectation of breaking new ground as a researcher”. Knowledge construction is a process-oriented activity, which draws on cognitive skills associated with inductive learning (O’Keeffe, 2021). By Johns and King’s definition (1991, p. 3), “DDL is the use in the classroom of computer-generated concordances to get students to explore the regularities of patterning in the target language, and the development of activities and exercises based on concordance input”. As suggested by this definition, DDL shifts emphasis from deductive to inductive learning and promotes noticing of corpus data in

the form of concordance citations as language input and self-discovery of lexico-grammatical patterns. This process involves and refines a number of cognitive skills, as listed by O’Sullivan (2007, p. 277): “predicting, observing, noticing, thinking, reasoning, analyzing, interpreting, reflecting, exploring , making inferences, guessing, comparing, differentiating, theorizing, hypothesizing, and verifying”.

Studies that make explicit reference to language learning theories, such as constructivism, underpinning DDL are very few (Flowerdew, 2015; O’Keeffe, 2019). An exception is Papp (2007), who discusses the psycholinguistic processes related to noticing. Chang (2012) also attempted to find out the types of cognitive skills deployed by DDL in a constructivist environment. It was suggested that in their learning process learners relied on lower-level cognitive skills, such as exploring and making sense, rather than higher-order thinking skills, such as inference. Similar studies, conducted by Todd (2001) and Gabel (2001), aimed to explore and measure learners’ ability to induce rules and self-correct. While both studies report positive results, Papp (2007) notes that neither of them really captured the cognitive skills deployed in the learning process. In this regard, Lee et al. (2019, p. 26) stress the value of corpus-driven approaches and call for more qualitative studies where “how learners construct their knowledge deserves core attention”.

The significance of discovery, as a key concept in constructivism, is also in fostering autonomous behavior. With regard to discovery in DDL, Bernardini (2004) states that it enhances learners’ competencies in making better focused searches, interpreting the results more accurately, better understanding corpus use, and sharpening their language awareness. Soon, this becomes liberating for both teachers, who stop acting as a source of knowledge, and learners, who start acting more independently in their language learning process. In DDL, learners act ‘as the producer of research, rather than its passive receptacle’, and the result is the knowledge gained independently through reliance on one’s own intelligence and judgment and not on the computer (McEnery and Wilson, 1997, p. 6). There has been the belief that by transferring linguist’s analytical procedures into the language classroom, learners will be able to raise awareness of language patterns, enhance language learning strategies (Perez-Paredes, 2010), and refine more complex cognitive processes (O’Sullivan, 2007; Lee et al., 2019). Thus, the pedagogically core aim of DDL is to foster independent acquisition of language knowledge (O’Keeffe, 2021).

Discovery, as already mentioned, is at the core of the constructivist paradigm. Within the ethos of DDL, learners are encouraged to arrive at a feasible interpretation by exploring the raw data and construct their own cognitive structure that would incorporate the newly obtained information. This is especially true in the case of hands-on concordancing when learners have direct access to corpora and more independence to investigate language data. Still, in the case of handouts, learners engage in research work observing the regularities in the language input and arriving at a self-constructed knowledge. Gabrielatos (2005) presents a continuum of possible dimensions of DDL with varying degrees of learner- and teacher- controlledness. This type of experience can potentially give learners a stronger feeling of control and autonomy and involve their attention more effectively than conventional transmissionist teaching. While many studies explore the efficiency of direct and indirect uses of DDL, which will be detailed in Section 2.6, they provide net results obtained through pre- and post- tests rather than delve into processes that describe the nature of learning affected by the variables on this continuum (O’Keeffe, 2021).

Since self-regulation on the continuum of DDL is also mediated by the degrees of scaffolding, a need arises to also explore the ways DDL converges with socio-cultural theory. This will be the focus of the following section.

2.3.2 Socio-Cultural Theory and DDL

Independent discovery, being a central constructivist approach in DDL, as presented previously, has been treated with certain reservations. For instance, Cook (1998), Widdowson (2000), and Kilgariff et al. (2008) have noted that independent corpus work can be a big challenge for many learners, as reading concordances requires an advanced process-oriented learning (Kirschen et al., 2006). O’Keeffe (2021, p. 264) notices the risk of no learning or the risk of ‘fake discovery’ in the free discovery approach. Still another caution, made by Cobb and Boulton (2015), is the high amount of cognitive work on the part of the learner, which, therefore, raises the need for more scaffolding on the part of the teacher.

Scaffolding is a term within the Socio-Cultural Theory (SCT) paradigm, coined by psychologist Jerome Bruner (1966): it refers to the use of some kind of supporting mediation in the learning process. It can include strategic questioning by a teacher, structured collaboration, and dialogues within and between groups, and lead to learner

self-regulation – a SCT concept viewed as a boon of DDL for learners (Cobb and Boulton, 2015; Flowerdew, 2015; O’Keeffe et al., 2007). Self-regulation or learner agency, although not empirically researched, has been cited by O’Keeffe et al. (2007) as one of the benefits of DDL, when learners are empowered to take control over their own learning rather than passively receive information on one-way transmissive relationship with the teacher. Through mediation or scaffolding, the learner can gain skills and strategies to operate independently and “surpass instructional intervention and become a better self-regulated learner” (O’Keeffe et al., 2007, p. 55). Boulton’s (2010, p. 535) reference to the concept of self-regulation, as mentioned earlier, is in the adaptive behavior of the learner, who engages with the meaningful activity of detecting regular patterns for knowledge construction instead of the artificial intellectual activity of applying given rules.

It is the consideration of the SCT-related concepts of DDL, such as self-regulation, teacher mediation and scaffolding, that raises the need to explore the convergences between DDL and SCT (Huang, 2011; O’Keeffe et al., 2007; O’Keeffe, 2020). While Piaget (1977) believed in independent cognitive constructivism, Vygotsky (1986) emphasized the social dimension in the development of language and thought. He argued that learning should be based on acquisition and participation in meaningful interaction with other students, teachers, and the world-at-large. Within SCT, learning is a social process and, therefore, the development of learners’ cognition takes place through social interaction. He identifies two levels at which learning happens: inter-psychological (between people) and intra-psychological (in the individual’s mind). “This applies equally to voluntary attention, to logical memory, and the formation of concepts. All the higher functions originate as actual relationship between individuals” (Vygotsky, 1999, p. 86). Central to the notion of Vygotskian SCT is the idea that individual’s cognitive processes are mediated psychologically, and language is one such influential psychological tool for individual’s development (Swain, 2006). As Flowerdew (2015) puts it, speech allows learners to interact for meaning, thus helping them to shape and reshape their cognition. This type of interactionist model is also known as Vygotsky’s Zone of Proximal Development (ZPD), where the learner’s current state of cognitive capacity is related to what he or she can manage independently compared with the level of his or her potential development, which is managed with support from others (Suharno, 2010). Thus, ZPD captures learner’s cognitive skills, and its upper limits can be reached through scaffolding – the guidance of a more skilled

person. Learning takes place through guided participation and collaboration when knowledge is not simply constructed but co-constructed (Vygotsky, 1986).

Pedagogical approaches have been informed by SCT framework where the benefits of interpersonal collaboration for language learning are capitalized. SCT-informed pedagogical interventions aim to convey specific social actions and social mediation in the zone of proximal development (Belz and Vyatkina, 2008; Darhower, 2014). DDL is one such approach where language learning is conceived of as a goal-oriented activity mediated by corpus consultation as a means to foster collaboration for meaning. By applying the key tenets of SCT, DDL presumably encourages learners to move beyond the intuitive level to an objective understanding of their own possibilities and to the construction of genuine knowledge. A teacher or more efficient peer can provide the learner with ‘scaffolding’ to support his or her evolving understanding of knowledge and the development of higher-order cognitive skills (Hadley, 2002). Flowerdew (2012), for example, reports on a writing module in DDL where knowledge is constructed in the spirit of sociocultural approach. Essentially, weak learners are grouped with more efficient ones to foster social dialogue through ‘assisted performance’ with the aim to formulate corpus consultation, discuss the corpus output, and arrive at genuine knowledge. Thus, DDL practitioners, working within socio-cultural framework of SLA, provide a social environment which becomes the source of, rather than the context for, mental development.

The degree of mediation co- or inter- relates with the degree of autonomy and self-regulation (O’Keeffe, 2021). Mukherjee (2006) effectively describes the range of DDL activities, starting from teacher-led controlled tasks to entirely learner-led projects promoting “serendipitous corpus browsing” (Bernardini, 2004, p. 22). This cline shows that DDL activities can have varying degrees of mediation, hence varying degrees of learner agency, and the theoretical underpinnings of DDL can range from constructivist to socio-cultural paradigms (O’Keeffe, 2021). A few small-scale studies have explored learner agency. For example, Cobb’s (1999) and Chau’s (2003) studies, which, even though were not designed to measure this aspect experimentally, reported positive results in relation to learner agency, based on the findings from the delayed post-testing. Another study, carried out by Huang (2011), investigated the relationship between learner performance in grammar acquisition and peer-to-peer collaboration as a type of mediation in the learning process. The results pointed to a positive relationship, where the learners’ negotiation in pairs about the use of a grammatical item helped them to

arrive at a correct understanding. While a broader research gaze would increase the possibilities for DDL research in relation to SCT, studies that robustly investigate the role and nature of mediation in relation to DDL have not been conducted (O’Keeffe, 2021).

SCT concepts, such as mediation, scaffolding, and self-regulation, described above, have been less overtly addressed in the discussions on DDL, though they intersect with DDL (e.g. Kennedy and Miceli, 2001, 2017). It can be noted that while the SCT view of DDL diminishes the role of the notion of independent grappling with data (Cobb, 2005) by offering learning opportunities enhanced through social mediation, there can be observed converging points between constructivist and SCT tenets. This will be the focus of the following section, through which the ontological stance taken by this study in relation to DDL will be made clear.

2.3.3 In Search of Intersections in Theory

Theoretical underpinnings of DDL, as shown by the previous sections, range from constructivist to sociocultural. O’Keeffe’s (2021) presentation of the DDL cline from constructivist to socio-cultural stances on learning effectively illustrates both ends of the cline. By mapping out the impact of each theoretical position on learning, learner, data type, treatment, degree of mediation, and learning outcome, one end of the cline focuses on constructivist discovery learning. Here the degree of learner self-regulation or learner-controlledness is not mediated, thus leaving learning more open and more to chance, which as previously mentioned, can have the risk of fake discovery (O’Keeffe, 2021). The other end of the cline is socio-culturally focused with higher degrees of teacher-controlledness and mediation influencing the above listed variables. While DDL can be differently positioned theoretically, O’Keeffe (2020) stresses the importance of clear articulation of the ontological stance a classroom-based study undertakes. This clarity will help to gain better insights into how pedagogical stance can influence teaching and learning processes, as well as outcomes, and engage with key concepts within instructed SLA.

The position that the current study undertakes can be situated between the two ends of the cline above. The dynamic conditions of modernity generate the necessity of prospective education, which can be supported by constructivism. The latter, as presented already, implies that students should be creative and capable of approaching

problems that do not exist at the moment of their learning (Halliwell, 1993; Kozulin, 1998). This kind of instruction emphasizes continuous and future development of cognitive strategies, and the learner takes an active role that is based on two important hypotheses (Kozulin, 1998). The first is related to Piaget's assumption that a learner needs a motivating and problem-solving environment where he or she can optimize natural curiosity and ability to discover. DDL, as shown above, can be anchored in cognitivist and constructivist theories through its usage-based approaches to noticing, discovery, and experiential learning (Flowerdew, 2015). Another anchor is the "grappling with raw data", as Cobb (2005) explains in his discussion of constructivism. Learners construct knowledge by grappling with raw data, which unlike knowledge resulting from someone else's grappling, is expected to empower learners to retain more information, transfer their skills to novel situations, and potentially prepare them for independent learning. This also includes the methodology of how to grapple with raw data, namely tools that experts have developed to assist them in their own grappling and overcome the challenges with unencoded data.

The second assumption derives from Vygotsky's assertions that a human as an independent learner is the outcome and not the starting point of the education process (Kozulin, 1998; Nykos and Hashimoto, 1997). The learner's responsibility is to co-construct knowledge in a stimulating, interesting, and interpersonal environment. This process is supported by the teacher and has been termed as guided construction of knowledge (Mercer, 1995). In this regard, DDL intersects with Vygotskian socio-cultural constructivism, when DDL learning is supported by means of the concepts of scaffolding, cooperation, and cognitive apprenticeship between teachers and learners. The teacher creates situations where learners have opportunity to question their own and each other's assumptions.

At the constructivist level of knowing and thinking, we always reevaluate our assumptions about knowledge; our attitude towards "the expert" is transformed; we do not have any problem by ambiguity but are enticed by complexity; and we take on a never-ending quest for truth and learning where truth is seen as a process of construction in which the knower participates.

(Belenky, Clinchy, Goldberger, and Tarule, 1986, p.26)

By rejecting the passive assimilation of knowledge and proposing the dynamic process of knowledge construction, DDL fosters the cognitive processes involved in knowledge construction. The latter, as Piaget (1985) theorized, is a successive process of adaptation to reality, which involves learners creating and testing their own theories.

The stages of this dynamic cognitive process refer to assimilation and accommodation that create the state of equilibration. At the stage of assimilation, the new information is shaped to fit the existing schema. However, this process is very often accompanied by anomalies of experience, which results in disequilibrium. To overcome this state, the mind adopts a more adaptive, sophisticated mode of thought to account for the new experience, and this is termed as accommodation. Similarly, Vygotsky (1934/1987) suggested that learning occurs not through a mere attention to facts but through meaning and significance in mind. In this regard, he states, “I do not see the world simply in color and shape but also as a world with sense and meaning. I do not merely see something round and black with two hands; I see a clock...” (p. 39).

Another aspect of constructivism relevant to this study is the clearly defined, positive stance that constructivism maintains towards learner errors. They are seen as useful and necessary part of the process of adaptation in learning:

Mistakes inform the learning process enormously and enable a better understanding of the domain or concepts worked on – in other words, mistakes illuminate the learner and help him or her to learn and become more adapted to the experience or situation lived. (...) Mistakes are sources of learning and adaptation, and because of that, they should not be perceived negatively.

(Proulx 2006).

This does not suggest, however, that errors should be encouraged or ignored. This means that by evoking the state of disequilibrium, the learner is able to see the controversies between his or her own cognitive structures and the language input, which leads to the state of equilibrium. The effects of such cognitive dissonance have been confirmed to be motivating for learners in the studies conducted by Elliot and Devine (1994). To achieve this state, an open mind and readiness to utilize errors in the construction of new knowledge are required on the part of both the teacher and the learner.

Informed by the literature discussed above, the theoretical stance undertaken by this study, as discussed above, will be summarized in the following table. It shows the transition from instructivist to constructivist instruction, as well as the key converging points between DDL and cognitive and socio-cultural constructivism.

Table 2.1

Summary of Key Principles of Instructivist, Constructivist, and DDL Classrooms

Instructivist Classroom	Constructivist Classroom	DDL Classroom
The focus is on the external – the behavior of the learner.	The focus is on the internal processes of the learner, which are managed by the learner’s short- and long-term memories.	DDL encourages learners to build new cognitive structures or reorganize those developed earlier.
Retrospective education, when the teacher teaches students how to reproduce already known answers to previously posed questions.	Prospective education, when the teacher helps students become capable of approaching problems that do not exist at the moment of their learning.	DDL equips learners with knowledge and skills in corpus use and in discovering language whenever the need arises.
Learning begins with the parts of the whole and does not go beyond the basic skills of listening, reading, and taking notes.	Learning begins with big concepts and expands to include parts, going from the simple to complex and developing multi-literacies.	Learners mobilize higher-level top-down processing skills, instead of rehearsing arbitrary form-function connections; observe language, seek regularities, abstract patterns, and hypothesize unifying concepts of language use.
Strict adherence to the fixed curriculum.	Mediation by the teacher to recontextualize teaching/learning according to learners’ needs.	DDL provides corpus-based handouts with contextualized input in the form of concordance lines or hands-on direct experience with guided activities.
Materials are primarily textbooks, made-up resources.	Materials include authentic or natural resources and allow manipulation of the language.	Learners get access to raw authentic language data through corpus consultation.

Learning is repetitive and rote memorization.	Learning is construction of knowledge based on what already has been learnt.	DDL promotes construction of knowledge based on individual experience and social dialogue.
Knowledge is received, accumulated, memorized, and repeated back.	Knowledge is constructed, thought, analyzed, understood, and applied.	Knowledge is constructed through dynamic cognitive processes of noticing, discovery, hypothesizing, and generalization.
Teacher dominance – subordinate relationship between the teacher and learners. The teacher’s role is directive, rooted in authority.	Authority is shared between the teacher and learners and learner autonomy is valued. The teacher’s role is interactive, rooted in negotiation.	Authority is redefined – learners take control over their own learning, and the teacher supports them with his/her expertise, where knowledge construction becomes an endeavor of intense cognitive stimulation and genuine interaction.
One-way channel of instruction, where the teacher is the transmitter of knowledge.	Multi-channel instruction, where the teacher acts as a facilitator, guide, and mediator.	Learning takes place in the interaction between learners’ competencies, learning environment, and interpersonal support.
Learners are reactive beings, either accepting or not accepting the material offered by the teacher. Passive learners, who are recipients of knowledge.	Active learners, who construct their own knowledge through individual discovery or dialogue with others.	Learners play a more responsible role, which turns them to active creators, rather than consumers, of knowledge. They learn to analyze language and raise awareness of the language learning process, which can be transferred to new situations for solving problems, thus becoming more autonomous.

The above account of the theoretical considerations underpinning DDL was important to provide insight into the ontological stance of the current study. It is equally necessary to discuss the pedagogical underpinnings of DDL, which will allow us to engage with the current issues in instructed SLA and understand the extent to which DDL-related teaching and learning processes can inform these concerns. This will be discussed now.

2.4 Second Language Acquisition Models and DDL

In literature on DDL, some of the Second Language Acquisition (SLA) concepts, such as noticing (Schmidt, 2001), discovery, input enhancement (Chapelle, 2003; Wong, 2005), usage-based model (Ellis, 2002; Tomasello, 2003), have often been mentioned as supporting DDL. During the last three decades, a large number of DDL and SLA studies have been carried out; however, the research paths of DDL and SLA have generally not intersected (Flowerdew, 2015; O’Keeffe, 2020; O’Keeffe, 2021). The references to the above concepts have been either part of the rationale for DDL studies or add-ons in the discussion of findings (O’Keeffe, 2021). Very few researchers (e.g. Flowerdew, 2015; Perez-Paredes, 2019) have called for investigation of this intersection. Papp (2007) is another exception, who provides psycholinguistic analysis of language learning processes related to noticing. This section offers an account of some important links between DDL and SLA.

2.4.1 Noticing, Attention, and Awareness

Studies on DDL (e.g. Lee et al., 2019; Boulton and Cobb, 2017) frequently cite Schmidt’s Noticing Hypothesis (1990, 2001) as a boon of the DDL research. According to this hypothesis, noticing the target forms in the input intentionally or unintentionally is necessary for the input to become intake, where input is defined as samples of the target language and intake is assimilated language from the input. Thus, noticing is a necessary, although not sufficient, condition for the emergence of new forms in production. It requires observation and comparison of the input based on the existing interlanguage system, which allows learners to notice the gap. The two cognitive processes that define the level of noticing and mediate input and L2 development are attention and awareness. These processes include reflection, endeavor to understand, and insight, thus “allowing learners to notice the gap between what they produce/know

and what is produced by the speakers of L2. The perception of a gap or mismatch may lead to knowledge restructuring.” (Gass and Varonis, 1994, p. 299).

DDL reflects the current psycholinguistic theory, which emphasizes the significance of noticing (Boulton and Cobb, 2017). DDL promotes noticing of corpus data in the form of concordance citations as language input and self-discovery of lexico-grammatical patterns (Bernardini, 2004). It requires conscious attention, which is necessary for language learning to take place. In contrast to “artificial” intellectual activity of trying to learn and use the rules, DDL allows learners to detect through their adaptive behavior language patterns that are meaningful to them, thus making learning more “natural” (Gaskell and Cobb, 2004, p. 304). Being a natural process, pattern induction minimizes the load of cognitive processing (Sweller et al., 2011) on the one hand, and still requires cognitive effort for constructing meaning, on the other. This effort, which is a reliable factor for retention (Halstijn and Laufer, 2001), is absent in rule-based instruction and is required by DDL, when learners are exposed to multiple patterned examples made salient in authentic input necessary for noticing (Boulton and Cobb, 2017).

Noticing and attention are linked with salience of input for learners (O’Keeffe, 2021), when the target language items are made prominent to catch learners’ attention (VanPatten and Benati, 2016). DDL is one explicit instruction that can enhance learners’ attention by increasing the salience of language input through corpus-based solutions. Studies in SLA have been interested in finding out the degree of frequency of learner exposure to a new language form for acquiring the item (e.g. Bybee, 2008; Ellis, 2018; Gass et al., 2018). The impact of different variables have been explored, since for gaining insight into how grammar is acquired, it is essential to consider both the quantity and quality of exposure to constructions (Indrarathne et al., 2018). However, studies in DDL have rarely looked into this matter. One such study that offers interesting insights is the study by Perez-Paredes et al. (2012), which investigates the processes involved in learners’ grappling with language using a computer. In this respect, O’Keeffe (2021) notes the increased opportunities for DDL to address and inform this aspect of SLA research, given the direct interface between the learner, the language input made salient through the corpus, and the facilities for voice-capturing and eye-tracking. Moreover, the exploration of such key variables, as the degree of input enhancement (Smith, 1981; Chapelle, 2003; Wong, 2005) through the KWIC format of DDL, the level of learner involvement with concordances (Laufer and

Hulstijn, 2001; Lee et al., 2019) will contribute to understanding the relationship between noticing and acquisition, especially in relation to grammatical constructions and patterns (O’Keeffe, 2021).

Language awareness is another cognitive variable that mediates input and determines the degree of noticing (Gass and Varonis, 1994). Carter (2003, p. 64) defines language awareness as “the development in learners of an enhanced consciousness and sensitivity to the forms and functions of language.” In contrast to prescriptive approaches to language learning, which are based on more formalistic methodologies and characterized by atomistic language analysis, DDL offers a descriptive approach that deals with more holistic and discourse-level practices, thus contributing to language awareness (Carter, 2003). Moreover, due to the cognitive strategies involved in DDL, learners can avoid a rote-learned metalanguage which may result in pseudo-metacognition (James, 1996). While in the traditional classroom linguistic forms are taught by the teacher with direct explanations in the form of oversimplified and abstract generalizations, awareness-raising activities challenge learners cognitively to compare, analyze, and construct their own generalizations (Lightbown and Spada, 2013). This type of reflective learning, which DDL offers, enables learners to raise their language awareness of the relationship of the linguistic form with its meaning, function, and context of use (Chambers, 2022). To fully understand how language functions, learners should get multiple exposures to the linguistic item in different contexts (CDC, 2004). Corpus consultation instantly exposes learners to a large number of attested examples, which allow them to abstract patterns and make generalizations, thus developing both their knowledge of language and their knowledge about language.

Noticing, as can be seen from the above account is one cognitive process that can link DDL and SLA. However, it should also be noted that for noticing to happen, it has to be followed by another cognitive process, that is discovery, which is another converging point between DDL and SLA and will be discussed in the following section.

2.4.2 Discovery Learning

Within the field of Applied Linguistics and Second Language Acquisition, the emphasis has shifted from deductive to inductive learning, where the concepts of noticing and self-discovery of lexico-grammatical items are promoted (Bernardini, 2004; Braun, 2005; Gabrielatos, 2005; Hunston, 2002; Mukherjee, 2006; O’Keeffe et al,

2007; Romer, 2006). This type of SLA model of learning is the basis of the DDL approach, which makes it possible to draw lines between DDL and SLA. As Mukherjee (2006, p. 11) notes, Widdowson's (1991) "learning as discovery" came through in the vanguard of DDL, where learner-centered inductive learning was fostered (O'Keeffe, 2021). While discovery learning can be best located at one end of the Mukherjee's (2006) cline with the free-range view, which can also be found in Bernardini's (2004) notion of the serendipitous use of corpora, it can also be situated at the opposite end of the cline, which is anchored in nature by teacher control.

Concordance-based activities are viewed by many authors as a useful way to implement discovery learning. Leech (1994), for example, notes that the analysis of a language problem to discover a grammar rule from authentic data leads to better insights into how grammar functions in real communication than a detailed direct explanation of the item in a grammar book. Exposure to genuine language, as presented by the corpus input, can help learners discover the native speakers' production, as well as the contradictions between the latter and the 'official' prescriptive grammar rules. By seeing the human aspect of language, its unpredictability and flexibility, they can become more open-minded and involved in analyzing language. This type of experience is likely to decrease learners' dependence on the teacher and foster independent acquisition of language knowledge, which is pedagogically core to DDL (O'Keeffe, 2021).

An important aspect of discovery learning is its process-oriented perspective, which views understanding grammar as a process leading to procedural knowledge. This is in contrast to the structuralist approach, which perceives grammar learning as presentation of a static set of isolated forms governed by idealized grammatical rules. This distinction was proposed and developed by Batstone (1994), who recognizes the benefits and shortcomings of each perspective and posits that neither should be used exclusively or in its extreme version. DDL, as conceived by Hadley (2002), can offer a compromise between these two extremes: learners notice the language form in the corpus input explicitly and perform inductive analysis which results in the construction of knowledge through discovery learning. "DDL draws from process teaching in that it sees grammar as a flexible system of recurring and interrelated prototypes rather than a static set of rules" (Hadley, 2002, p. 107). In DDL, exposure to real-life data helps learners to avoid the oversimplification and excessive idealization of grammar rules, which is the danger of product teaching, and, through active engagement in the

discovery of regularities in language, develop a ‘feel’ for it, which is the benefit of process learning. The latter provides the opportunity to enhance research competence, learning skills, and evaluative strategies. Cognitive strategies, along with metacognitive and social/affective strategies, involve deliberate manipulation of language, which empowers the learner to learn more successfully (Suharno, 2010). This type of systematic and critical thinking leads to executive, high-level control – consciousness (Supratman, 2009).

If learning is an act of discovery per se, learning takes place in a problem-solving environment (Bruner, 1961), which requires learners to reason inductively – observe, classify, and generalize (Johns, 1991). As Pawlak (2006) suggests, “Corpus-based materials are one plausible way of enhancing the potential of inductive grammar teaching.” He stresses the authenticity of concordance-based input and the efficiency of identifying language patterns as major strengths of corpus-based activities. The inductive approach of DDL allows learners to not only observe the grammatical forms and the words they collocate with, but also identify patterns and abstract rules. With regard to pattern identification, Gabrielatos (2005) recommends several considerations for generalizations to be accurate. These refer to the medium of the input (through speech or writing or both), the context of use (topic, purpose of use, type of interaction), the co-text (linguistic neighborhood of the sample), the representativeness (samples as a microcosm of language under study), and the size (adequate presentation of the sample). Consideration of these variables, along with the intellectual effort invested into the analysis of regularities is believed to lead to more accurate generalizations, facilitate the retention of and further access to the language item, and, therefore, make the discovery more successful.

Empirical research (e.g. Bernardini, 2002; Mao et al., 2018; Ozbay and Ozer, 2017; Yanto and Nugraha, 2017; Zhang, 2018) generally reports positive learning outcomes as a result of discovery learning. For example, the study by Barabadi and Khajavi (2017) demonstrates better performance in favor of the group that took a more active role in the learning process in which discovery and inductive learning was promoted. Another study carried out by Fuentes (2017) reveals that the DDL group performed slightly better in the acquisition of grammatical points, which were discovered by them. Lee and Lin (2019) investigate the difference in contribution between inductive and deductive DDL and report that both were equally effective in the acquisition of the target lexis. They suggest that deductive DDL can complement

inductive DDL when the latter prevents learners from fully benefiting from its potential advantages. Still another study conducted by Perez-Paredes et al. (2019) involved the creation of a mobile language learning application for learners to examine and discover the samples of attested uses of language. The results suggest a generally positive evaluation of DDL's instant and personalized feedback and direct access to various tools.

Competencies involved in discovery learning are located under the umbrella "ability to learn" (*savoir-apprendre*), as labeled by the Common European Framework of Reference for languages (CEFR) (CEFR, 2001). The latter emphasizes the importance of such competencies that make learners independent in language learning and describes this as follows:

In its most general sense, *savoir-apprendre* is the ability to observe and participate in new experiences, to use new technologies, and to incorporate new knowledge into existing knowledge, modifying the latter where necessary. Language learning abilities are developed in the course of the experience of learning. They enable the learner to deal more effectively and independently with new language learning challenges, to see what options exist and to make better use of opportunities. Ability to learn has several components, such as language and communication awareness, general phonetic skills; study skills; and heuristic skills

(CEFR, 2001, p. 106).

DDL, as one technology-based approach to language learning, allows for learners to develop such heuristic skills, as the ability to observe and draw conclusions, the ability to analyze authentic language input and process new information, as well as the ability to use new technology, among others.

Discovery learning in DDL also ties in with another established concept in SLA – usage-based model of language learning, discussed in Section 2.4.3.

2.4.3 Usage-Based Perspective

Increasingly, researchers are pointing to the resonances between DDL and the usage-based theory of SLA in terms of the centrality of the role of frequently experienced syntactic regularities in learning and strongly argue for engagement with ongoing research in SLA, especially from a usage-based perspective (e.g. Meunier, 2020; O'Keeffe, 2020; O'Keeffe, 2021; Perez-Paredes, 2020; Romer, 2019).

Usage-based theories refer to second language learning approaches that have at least two assumptions in common: (1) The primary source for L2 learning is the linguistic input learners are exposed to; and (2) The mental processes involved in L2 learning are characteristic of any kind of learning (Wulff and Ellis, 2018). DDL is one approach that shares these characteristics, thus allowing us to be part of the inquiry processes that can mutually benefit DDL and SLA. From the usage-based perspective of language learning, the targets that language learners have to acquire are language constructions that have conventionally attributed form and function, which express meaning in communication (Wulff and Ellis, 2018). Lievan (2016) describes grammar learning as a continuous process of abstraction throughout which groupings of words, constructions, and more complex syntactical structures emerge. The range of constructions starts from the smallest units of language, such as morphemes, and continues through words, phrases and to syntactic frames (Goldberg, 2016; Trousdale and Hoffmann, 2013). However, these constructions are not just one form but can appear in multiple forms and, therefore, they are different in terms of the level of their form-function complexity and abstraction (Wulff and Ellis, 2018). In other words, the storage of the constructions as constituent parts of more complex constructions requires different levels of schematization. In this sense, language is a complex system functioning with various agents in different configurations at multiple systemic levels on many time scales, and language learning is rational, emergent, usage-based, custom-tailored, dynamic, and adaptive (Ellis, Romer and O'Donnell, 2016; MacWhinney and O'Grady, 2015).

In usage-based theories, learning largely hinges on the frequency of construction usage. Frequency, however, does not always result in acquisition, which means that different constructions have different degrees of learnability (Wulff and Ellis, 2018), and not all input becomes intake (Corder, 1967). SLA research is, therefore, concerned with understanding the reasons behind the challenges related to learning grammatical morphemes and closed-class constructions. In this respect, usage-based theories point to (1) salience, (2) contingency of form-function association, and (3) learned attention, which affect the learnability of a construction (Wulff and Ellis, 2018).

Salience is the property of standing out from the rest. There is a belief that the likelihood of being perceived and subjected to cognitive processing is higher for salient items, which as a result are more readily learned than less salient cues (Ellis, N., 2006c; Rescorla and Wagner, 1972). In this respect, the connection between usage-based

perspective and DDL is obvious. DDL offers language input made prominent through a “condensed exposure” (Gabrielatos, 2005, p. 10) to concordances, which raises learners’ lexical and pattern awareness. This intensifies and accelerates learners’ language experience through engagement with structural regularities in data (O’Keeffe, 2021). Saliency can be the product of both physical and psychological interpretation. In the history of learning theory, the most influential formula, which summarizes the 80 years of research in associative learning, appears to be the one that encapsulates psychophysical saliency, where some stimuli are more intensely experienced than others; psychological saliency, deriving from the significance we attach to environmental cues based on our priorities; and surprisal saliency, when expectations are violated (Wulff and Ellis, 2018). All these interactively affect our learning from our experiences (Wulff and Ellis, 2018), as well as language acquisition and language change (Ellis, N., 2019). The significance of saliency has been witnessed in morphology and syntax by a number of studies (Cameron-Faulkner, Lieven and Theakston, 2007; Theakston, Lieven, Pine, and Rowland, 2005; Whittle and Lyster, 2016). The conclusion was that saliency is one factor that contributes to the early adoption of a language item among others. An interesting concluding point was made by Goldscheider and DeKeyser (2001) stating that the importance of explicit learning increases with age, and so does the role of saliency, as the latter is more of a factor for explicit learning; hence the non-static role of saliency across ages. There was also an attempt to explore the relationship between textual enhancement and cognitive effort; however, it was only concluded that there is interaction, and the issue still requires investigation (Gass, Spinner, and Behney, 2018).

In terms of contingency of form-function association, some SLA researchers propose that the acquisition and processing of a form is determined by its reliability as a predictor of an interpretation (Gries and Ellis, 2015; Gries and Stefanowitsch, 2004; MacWhinney, 1987). The lower the associative reliability between the form and the function, the harder learning becomes (Ellis, N., 2006b; Shanks, 1995). Instances of cues with single interpretations are rare, while those with multiple interpretations are numerous and create ambiguity and, therefore, challenges in learning. Those form-function mappings whose contingency is high are considered reliable and readily processed. Wulff and Ellis (2018) contend that the contingency of cue-outcome associations and not the raw frequency of occurrence is more important in acquisition.

Learned attention has been mentioned as a third factor affecting L2 learning. Learners come with their knowledge of a prior language that is biased in terms of attention. These attentional biases or learned attention is believed to result in so termed “blocking” (Ellis, N., 2006a; Kruschke, 2006; Kruschke and Blair, 2000), when the learner’s attention to input is shifted due to prior experience (Shanks, 1995; Wills, 2005). A series of experimental investigations conducted by Ellis and Sagarra (2010, 2011) demonstrated the processing bias of learned attention resulting from prior L1 usage in learning L2 cues. They also demonstrated the influence of instructional manipulations that assisted in shifting attention to particular cues, when sensitivity to these cues was increased. Another extended replication of these studies revealed the overt impact of prior attentional biases on the participants’ choice of focus on language and its subsequent covert manifestation in processing language receptively and productively (Ellis et al., 2014). The learner’s schematized repertoire of L1 both converges with and diverges from the L1 environment (Perez-Paredes et al., 2020). Thus, attentional biases shade experiences in L2 both positively and negatively, by increasing sensitivity to language cues in one case and reducing it in another (Jarvis and Pavlenko, 2008). It has been argued that the existence of L1 transfer makes it in most cases impossible for a second language learner to be native-like, regardless of the ambient input, since the latter is filtered through an L1 lens with certain biases, and hence Corder’s (1967) distinction between input and intake. However, the conclusion that L1 learning is qualitatively different from L2 learning cannot be licensed as in both cases learners use the same learning mechanisms. Slobin (1996) argues that there are different ways of attending to language environments: while in L1 learning it is one particular way, in L2 learning attentional biases of successfully acquired L1 have to be adjusted.

Within a usage-based perspective, learning and language experience are positively correlated. This means that the acquisition of constructions is input-driven – exposure to frequently used form-function bindings result in a language system that “emerges from the statistical abstraction of patterns” (Ellis, N., 2012b); hence the more frequently the usage, the higher the degree of entrenchment of form-meaning pairings as grammatical knowledge (Ellis and Ferreira,-Junior, 2009). Being statistical, learners create in memory an isolated image of a construction with its properties during the first encounters, while subsequent encounters mobilize pattern-finding mechanisms and strengthen form-function mappings (Wulff and Ellis, 2018). Frequent exposures to a construction make memories stronger and facilitate the access to what Wulff and Ellis

(2018) refer to as the ‘construction warehouse’. The associations between form and meaning are in constant change and receive more strength every time the pairing is encountered. It is the strength of contingency of form-function mapping that affects learning. Due to their polysemic function, many grammatical morphemes form various constructions, and despite the high frequency of these morphemes, some of their pairings have low contingency. Thus, when the form-function contingency is weaker and, therefore, the association is less reliable, it appears to become more challenging for the learner to acquire this construction than open-class words (Wulff and Ellis, 2018).

In terms of the issue of the pervasiveness of target constructions in the teaching context compared with the L1 acquisition context: in L1 contexts, constructions emerge as a function of the interaction between early-developing perceptual biases and statistically frequent and variable structures in the input, whereas in the L2 classroom, the L2 input has limited frequency and variability (Tyler and Ortega, 2018). Native language knowledge is not declarative and it is acquired in its use in various contexts by mapping out the form-function constructions. By contrast, in L2 classrooms, there is a struggle to replicate the reality of language usage (Perez-Paredes et al., 2020). In relation to this, Perez-Paredes et al. (2020) stress the possibility of language corpora, which can bring the replications of the typicalities and possibilities of real language use into the classroom by exposing learners to language chunks (strings of words that perform a function in the context of interaction) in contexts, as language constructions. The frequency distribution demonstrates that it is due to the conspiracy between prototypicality of function and reliability of form-function mapping that language becomes learnable (Ellis, N., 2012b). The high frequency of chunks is driven by the need for careful interaction (Perez-Paredes et al., 2020). Corpus-based instruction is believed to offer a much greater chance of experiencing these high-frequency chunks. The classroom experience that mirrors a ‘microcosm of meaning’ from the real world can, ideally, optimize the potential for polysemic forms expanding the opportunity for experiencing them across a range of meanings and assist the learner to arrive at prototypicality due to the complete form-function mapping (Perez-Paredes et al., 2020).

In DDL, by drawing on semantic networks, learners will be able to mobilize higher level top-down processing skills, instead of rehearsing arbitrary form-function connections, which will assist them to abstract the unifying concept of all the manifestations of use – prototypicality. Once the prototype is abstracted for the most frequent occurring, all the other meanings experienced will map below this unifying

meaning. These cognitive processes promoted by DDL can create resonance with the usage-based perspective that hold that cognitive mechanisms are triggered through experiencing language patterns (Perez-Paredes et al., 2020). This implies that pedagogy should start from the idea of prototypical meaning (Tyler and Ortega, 2018). While learning takes place implicitly, it is also true that learning involves understanding and applying a set of rules, which suggests that language teaching should prioritize opportunities for learners to notice input through exposure and repetition (Perez-Paredes et al., 2020). For noticing to happen to facilitate learning, which is quite understudied, learners' attention needs to be curated by the teacher. In many cases, however, teachers avoid changes in their teaching practices; even being introduced to recent research findings, they continue practising traditional approaches of presenting rules and in limited contexts – 'a paradigm that largely ignores the intricacies and nuances of language acquisition' (Graus and Coppen, 2016, p. 572).

To conclude the arguments of usage-based and DDL researchers, it should be underscored that learning environments need to provide opportunities for inductive or deductive abstraction of constructions instead of the rehearsal of arbitrary connection between form and meaning (Tyler and Ortega, 2018). In this environment, the focus is not only on form-use-meaning mappings, but also on learning which is individual in terms of experience but all-human in terms of available similar cognitive mechanisms for any learning. In usage-based approaches, which hold a wider perspective on learning than traditional approaches, L2 constructions emerge and are learnt as a result of individual statistical processes of dynamic interplay between exposure to input and mental processing tools (Perez-Paredes et al., 2020). There is still a gap between usage-based theory and practice; the contribution of usage-based approaches to theorization on language learning is significant; however, at a practical level, there is a need to better understand its empirical contribution to language learning across different parameters. A better understanding of a usage-based model will help to investigate the interface between the enhanced input through DDL and the cognitive processes that might best facilitate language acquisition (O'Keeffe, 2021). There is a need to investigate the effects of such challenges, as the centredness on the learner, mobilization of cognitive resources, and exposure to enhanced L2 input. Among other challenges are: learning experiences that make most of the interaction between environment and the cognitive system, attentional biases that affect L2 learning, and the integration of frequency-related findings (Ellis, N., 2019). As Perez-Paredes et al. (2020) conclude, fortunately, there are corpus-based solutions to undertake these challenges, ranging from supporting

pervasiveness of constructions, enhancing their salience and identification of frequencies, stimulating teacher-curated attention to contingencies to prioritizing learning conditions for meaningful form-use-meaning mappings.

The concern related to the interface between the two key assumptions (enhanced input and cognition from the usage-based perspective) leads to a discussion on the differing positions in relation to second language acquisition, particularly in terms of grammar teaching. Differing views about how we process grammar in language learning has resulted in the long-running SLA debate known as the Interface Debate. As O’Keeffe (2020) argues DDL needs to take its place within this. This will be the focus of the following section.

2.5 DDL and Grammar Teaching

2.5.1 Interface Debate and DDL

The discussion on the usage-based model of language learning, which draws upon the construction of knowledge, necessitates discussion of automatization of knowledge, where the two key constructs are explicit knowledge and implicit knowledge. Since the introduction of Krashen’s (1977; 1981; 1982) hypothesis, according to which there are two independent ways for learners to learn a second language – subconscious acquisition and/or conscious learning, there have been controversies among researchers as to whether learners develop explicit and/or implicit knowledge and what is the interface between these two. Explicit knowledge is defined as conscious metalinguistic knowledge, which is subserved by declarative memory (Paradis, 2009), is normally accessed during controlled processing and is potentially verbalizable (Bowles, 2011; Ellis, R., 2005; Hulstijn, 2005). It is deliberate, intentional (Hulstijn, 2005), and variable (Paradis, 2009). Implicit knowledge is understood as intuitive knowledge, which is subserved by procedural memory (Paradis, 2009), is normally accessed automatically and cannot be verbalized (Bowles, 2009; Ellis, R., 2005). It is also effortless, unintentional (Hulstijn, 2005), and stable (Paradis, 2009). While researchers seem to agree that implicit knowledge is the key to acquiring a second language, they have not come to a consensus over the relationship between explicit and implicit knowledge (Han and Finneran, 2014). As mentioned above, this is known as the Interface Debate, and it essentially questions whether the learnt forms or patterns can become part of the user’s long-term memory and fluent sub-conscious

functionality. As regards the place of DDL in this debate, it can be said that this motif has not been found in the discourse on DDL and O’Keeffe (2021) argues that it is time to engage with it. She notes that is especially relevant given the centrality of noticing in DDL promoted by the salience of input within the usage-based model, and the assumption that noticing leads to some kind of learning. In this sense, O’Keeffe (2021) argues that DDL is perfectly positioned to address this debate.

The debate has given rise to three positions, namely non-interface, weak, and strong positions (Han and Finneran, 2014; Graus and Coppen, 2016), which, in turn, manifest into three teaching stances, which are Focus on Meaning (FonM), Focus on Form (FonF), and Focus on Forms (FonFs), respectively. As O’Keeffe (2021) demonstrates, each of these positions has certain implications for DDL teaching and learning, which will now be discussed.

The non-interface position, deriving from a Chomskyan view, rejects the possibility of interface between explicit and implicit types of knowledge because of their different processing mechanisms and claims that one cannot become the other type (e.g. Hulstijn, 2002; Krashen, 1981; Paradis, 1994). It holds that not everything is learnable, hence learning has limitations – not all unacquired rules can be learnt; language is too complex to be learned explicitly; and explicitly learnt knowledge cannot be applied spontaneously, as implicit knowledge, whose acquisition is possible through experience with comprehensible input of L2 (Krashen, 1982). In this view, competence and performance are separated rather than coalesced (i.e. there is no interface or connection between the two), where the former is facilitated by the interaction between Universal Grammar and natural target input, while the latter is assisted by controlled conditions of instruction which does not help spontaneous performance, as driven by implicit knowledge (Krashen, 1982). From this position, consciously learnt knowledge is explicit and can be explicitly assessed, but it cannot be transferred to a subconscious level or become implicit. This means that teaching should focus on meaning, where forms are learnt incidentally with no overt focus on form. The implication of this perspective for DDL is that the latter cannot have pedagogical value if it fails to solely focus on meaning, or the explicitly learnt knowledge will remain in the declarative memory and not become part of procedural or automatized fluency (O’Keeffe, 2021).

In stark contrast, the strong interface position, derived from cognitive psychology (Anderson, 1982), and exemplified in skills acquisition theory (DeKeyser, 2007), and instantiated by Noticing Hypothesis (Schmidt, 1990) (see Section 2.4.1),

underlines the strong relationship between explicit and implicit knowledge. It explains that language learning is a conscious process and starts from the development of cognitive skills, such as noticing. The only viable way of second language acquisition is conscious learning (Schmidt, 1990), where learners first acquire declarative or know-what knowledge, followed by procedural or know-how knowledge, which is finally internalized or automatized as spontaneous, effortless, and fluent knowledge (Han and Finneran, 2014). The pedagogical manifestation of this position is in its focus on forms format, where forms are presented and practiced according to a structured syllabus. From this stance, DDL would align well with the teacher-mediated manifestations on the DDL cline from discovery to higher degrees of mediation. Within this perspective, DDL learning starts with declarative knowledge when explicit noticing of form is promoted through repeated exposures to it, thus, ideally, leading to implicit learning (O’Keeffe, 2021).

The weak interface position maintains that there is overlap between explicit and implicit knowledge under certain conditions. The two most popular incarnations of this position, hypothesized by Ellis, R. and Ellis, N., ascribe different weights to consciousness in learning. Underscoring the contribution of consciousness, Ellis, R. (1994; 2005; 2006) claims that developmental items can interface from explicit to implicit knowledge if learning is at the right developmental stage. Assigning a lesser role to consciousness, Ellis, N. (2005; 2006; 2007), proponent of the usage-based model, as discussed in Section 2.4.3, holds that learning is mainly an implicit process - an associative and rational process where learners intuitively identify and organize constructions based on their probabilistic encounters with relevant exemplars in the communicative environment. In this process, which can be subjected to L1 interference, noticing of constructions and form-function mapping enable learners to reorganize the system of their linguistic knowledge subconsciously or implicitly (Han and Finneran, 2014). Thus, the interface between explicit and implicit knowledge is not in the transfer of one type to another, but in the possibility that explicit knowledge can assist in constructing implicit knowledge. As discussed, this is a core underpinning of a usage-based model of language acquisition (Ellis, 2015; Tyler and Ortega, 2018). In essence, although qualitatively different, these two approaches agree that explicit knowledge is learnable (Ellis, N. and Robinson, 2008). DDL becomes closer to this position if it is used in a discovery learning format, where learning takes place through explicit and implicit noticing of form, through multiple encounters, which, over time, can lead to implicit learning (O’Keeffe, 2021).

In SLA, contemporary prevailing thinking favors interface position (Long, 2015), assuming that everything is teachable and learnable. Literature on psychology and neuroscience report findings related to the development of two types of knowledge in language learners (e.g. Lebrun, 2002; Mathews, Buss, Chinn, and Stanley, 1989; Paradis, 2009; Reber, Kassin, Lewis, and Cantor, 1980). Furthermore, investigations on instructed SLA point to the possibility of the transfer from explicit to spontaneous language use or implicit knowledge (e.g. Ellis, R., 2002; Norris and Ortega, 2000; Russel and Spada, 2006), thus serving as argument for weak interface position and counter-argument for non-interface position (Ellis, N., 2008a).

The research on instructed SLA (ISLA), however, is not without limitations. First, most studies target simple and categorical rules (e.g. Bitchener and Knock, 2009), which feeds the belief that they can be learnt without instruction (Han and Finneran, 2014). Another issue is the short-term investigation of the studies, which cannot secure reliability in the contribution of instruction on acquisition. Moreover, the studies fail to report on integratability (e.g. McLaughlin, 1990), abstraction (e.g. Revesz, 2007), or long-term retention (e.g. Pienemann, 1989; Harley, 1989) of the instructed or learnt knowledge. The studies that involved multiple aspects of language, such as lexicon, phonology, and morphosyntax, produced unequal results related to learning through consciousness-raising activities. Lexical and phonological elements appeared to benefit from instruction more than morphosyntactic elements (e.g. Alanen, 1995; Kim and Han, 2007). In some studies, instruction was more advantageous for certain morphosyntactic items than for others (e.g. Ellis, R., 2007; Song, 2009). There are still other issues, and it becomes evident that the nature of second language acquisition is not simple and is characterized by more than a singular relation between implicit and explicit knowledge (Han and Finneran, 2014). With regard to the role of instruction, as well as of corrective feedback, DeKeyser (1998) notes that instruction is helpful 'to some extent, for some forms, for some students, at some point in the learning process' (p. 42). This does not completely ignore the non-interface position, but rather places the responsibility on each position in the interface debate to validate for which grammar aspects there can be a strong, weak, or no interface between explicit and implicit knowledge (Han and Finneran, 2014).

It has been noted that to be able to explain the contribution of interface position to language acquisition, it is essential to understand how working memory functions (Ellis, R., 2016; Wen, 2015). While researchers draw on different models of working

memory (see Wen, 2015), there is agreement that input and output are temporarily stored in working memory, which establishes links with long-term memory. Or in SLA terms, working memory helps the input to enter the learner's interlanguage system either as explicit knowledge in declarative memory or as implicit knowledge in procedural memory (Ellis, R., 2016). However, it becomes complex to understand whether focus on form brings about changes in declarative/explicit or procedural/implicit knowledge, and how working memory processes different types of focus-on-form interventions (Ellis, R., 2016). If the intervention is through text enhancement, learners are able to notice the target item but not always (Lee and Huang, 2008). Even if they do notice the target item, they might not acquire it, or in performing a comprehension task, they might rely on top-down processing and fail to notice the enhanced element. If learners are to attend to the target feature through corrective feedback, there is clear evidence that they notice the corrections, which facilitates acquisition, yet the evidence is little to illustrate the direct effect of such noticing on acquisition (Mackey, 2006). As noted by Aljaafreh and Lantolf (1994), perhaps it would be more accurate to state that the effectiveness of different corrective strategies, explicit or implicit, depends on different developmental levels of students. Another focus-on-form mediation is pre-task planning, which can be guided (teacher draws learners attention to specific language aspects) and unguided (learners decide on the aspects). Ellis', R. (2009) survey of planning studies reported that both had a positive effect on fluency, while accuracy is achieved through guided planning. He points to the need for more work on the impact of specific planning strategies on learner performance (Ellis, R., 2016). The results of the studies incorporating task-repetition, as one focus-on-form procedure, were found to be different in terms of the increase in complexity, fluency, and accuracy due to this frequency effect, but similar in terms of revealing no evidence of transfer-effects to a new context (Bygate, 2001; Gass et al., 1999; Lynch and McLean, 2000).

DDL, through its usage-based approaches of noticing, discovery, and experiential learning (Flowerdew, 2015), as well as its "grappling with raw data" (Cobb, 2005), is believed to make a convincing case between the strong and weak interface positions, where explicit knowledge is seen to lead, at some stage, to automatization, whereby the learnt forms can become part of the user's long-term memory and fluent sub-conscious functionality (O'Keeffe, 2021). Examination of DDL practices in terms of what is required to stimulate learners cognitively will raise awareness of the relation of DDL to the interface debate and how this understanding will inform DDL instruction

to magnify the likelihood of knowledge transfer from explicit to implicit (O’Keeffe, 2019). There is widespread consensus that the core pedagogical contribution of DDL is its potential to encourage learners to construct their L2 knowledge independently getting multiple exposures to language data through concordancing (Flowerdew, 2015; Johns, 1994; Lee et al., 2019). Multiple instances create ‘frequency effect’, which may accelerate the intuition of the pattern at a sub-conscious level (Ellis, R., 2002; Tomasello, 2003). Moreover, the target item is made salient in the concordance line within KWIC format, it promotes the operation of ‘input enhancement’ (Chappelle, 2003; Wong, 2005). In addition, by providing learners with opportunity to meaningfully engage with language through inductive learning, which enhances learner involvement, known as ‘involvement load hypothesis’ (Laufer and Hulstjin, 2001), acquisition of the target item becomes easier (Lee et al., 2019).

From a usage-based perspective, learning is largely determined by the frequency of exposure to new language, suggesting that the more often constructions are experienced and understood together, the more entrenched they become (Perez-Paredes et al., 2020). Thus, at the declarative phase, DDL will encourage learners to notice the construction through repeated encounters and abstract patterns from meaningful input. They gain factual understanding of knowledge, which they can declare and repeat – they know what they know. At the procedural phase, the intuited declarative knowledge will be applied by learners through meaningful engagement with tasks – they know how to use this knowledge. The procedural knowledge interacting with declarative knowledge is likely to become subconscious and lead to automatization, which allows to deploy knowledge spontaneously, fluently, and effortlessly. Thus, automatized knowledge passes from explicit learning to implicit knowledge, from external to internal, from conscious learning to subconscious knowledge (O’Keeffe, 2019). However, as O’Keeffe (2019) puts it, these links are attributed rather than proven since the main issue here is the dearth of investigations that would allow us to engage with the debate. In this respect, Lee et al. (2019, p. 26) stress the value of corpus-driven approaches and call for more studies where “how learners construct their knowledge deserves core attention.” Boulton and Cobb (2017) point to the need for delayed post-testing to reveal the contribution of DDL to long-term benefits, such as implicit knowledge. Related to this, Han and Finneran (2014) and O’Keeffe (2021) argue that further advances in SLA research would benefit from a concerted effort to identify which aspects of grammar are susceptible to a strong, weak, or no interface relation.

To understand the contribution of DDL instruction to grammar acquisition, which is one of the foci of this study, there is also a need to discuss the ways grammar is explored through language corpora. This will be discussed now.

2.5.2 Exploring Grammar Through Language Corpora

The traditional definition of grammar teaching is the presentation and the practice of discrete grammatical structures (Hedge, 2000; Ur, 1996). However, teaching grammar is not limited to the presentation and the practice of grammatical items. They can also be taught by providing learners opportunity to discover grammar rules, by multiple exposures to these rules, or by means of corrective feedback on learner errors that can arise when performing communicative tasks (Ellis, R., 2006). Thus, broadly defined, grammar teaching involves any technique that can help the learner internalize the grammatical form either by developing metalinguistic knowledge or by processing it in comprehension and/or production (Ellis, R., 2006). There is an agreement among Second Language Acquisition (SLA) researchers that implicit knowledge or automaticity is the prerequisite of acquiring second language (L2) competence (Doughty, 2003; Graus and Coppens, 2016; Han and Finneran, 2014; O’Keeffe, 2019). Drawing on different theories of L2 acquisition, a number of studies have been conducted to measure the impact of various grammar teaching approaches. However, there is no consensus regarding the effectiveness of a particular grammar teaching approach in facilitating the automatization of taught knowledge leading to the debate around interface hypotheses (Han and Finneran, 2014; O’Keeffe, 2019).

As discussed elsewhere (e.g. Section 2.5.1), the construct pairing of inductive and deductive learning is considered as part of the explicit approach to instruction and, within this perspective, it is seen to best contribute to implicit knowledge. According to DeKeyser’s (1995, p. 380) definition, “Inductive learning means that examples are encountered before rules are inferred; deductive learning means that rules are presented before examples are encountered.” As discussed earlier, DDL deploys both of these approaches in language instruction.

Various investigations have been conducted in the context of DDL to find out the efficacy of inductive and deductive approaches. Most studies target lexis and collocations, while few studies focus on grammar and syntax. Johns (1994) was one of the earliest researchers to advocate the use of DDL in grammar teaching, where

language acquisition can be effectively facilitated through the analysis of organized concordance input. The instructional effect of DDL on grammar learning was endorsed not only by early researchers (Conrad, 2000), but also by further experimentation findings. For example, Hong's (2010), Smart's (2014), and Moon and Oh's (2018) studies show that the inductive DDL intervention led to more gains in the knowledge of determiners, passive voice, and the verb *to be*, respectively, rather than the deductive approach. Similar effects were revealed by Huang's (2014) study, where the inductive DDL treatment contributed to the creation of more accurate lexico-grammatical patterns. Moreover, Lin and Lee (2019) found out that both approaches were equally effective in terms of enhancing the learners' grammar skills and learning attitudes. Abdul-Ameer's (2019) study report positive outcomes of inductive learning in the acquisition of English grammar rules for the Iraqi university students. The findings in the study by Mizumoto et al. (2016) indicate that guided DDL-type induction for grammar development may be beneficial for both deductive and inductive learners. Still another study by Nugraha et al. (2017) concluded that the inductive approach of DDL can be effective in teaching and learning grammar for its promotion of active learning. A recent finding reported by Lin (2021) is that DDL can be pedagogically suitable for all grammar learners across different levels of language proficiency; however, it should be treated with caution with regard to the development of learner attitudes, such as motivation or self-efficacy.

The empirical research, as accounted above, seems to approve the use of DDL in grammar development. However, it mostly targets the higher levels of language proficiency and fails to provide empirical evidence for low-level grammar learners. Certain reservations can be found in the discussion on DDL related to the inappropriateness of corpus-based grammar instruction for low levels (Aston, 2001). The explanation is that given the inductive and discovery nature of learning in DDL, learners need to have a certain level of linguistic knowledge to be able to cope with concordancing (Chen, 2011; Lee et al. 2019; Liu and Jiang, 2009). Despite this, Boulton's (2010) study presented encouraging results indicating improved grammar performance and preference for DDL due to its treatment at a beginner level. Given the scarcity and inconsistency of empirical evidence, there appears the need for the investigation of DDL effects on grammar acquisition at lower levels (Lin, 2021).

It should be noted that the model that underpins grammar teaching in DDL aligns with the model of cognitive grammar which aims to account for actual language

data rather than to idealize a language system, attempted by generative grammar. Cognitive grammar is usage-based and, therefore, prototypicality is seen as a suitable approach to analyzing language constructions (Langacker, 1987):

The prototype approach offers a more realistic account in many instances, but adopting it implies that class membership is not predictable in absolute terms: it is a matter of degree, decreasing as an entity deviates from the prototype, with no specific cutoff point beyond which speakers abruptly become incapable of perceiving similarity and thus assimilating an entity to a category. One would be wrong to claim that the prototype model is non-predictive (...) – but its predictions are statistical rather than absolute.

(Langacker 1987, p. 49).

This means that grammar rules are formed as reflections of regularities in the actual language use. DDL deploys such an approach to language analysis offering statistical (frequency-based) language input at a lexico-grammatical level. The manifestation of this approach can be found in Carter and McCarthy's (1995) grammar teaching framework that includes Illustration-Interaction-Induction (I-I-I).

Illustration' means wherever possible examining real data which is presented in terms of choices of forms relative to context and use. 'Interaction' means that learners are introduced to discourse-sensitive activities which focus on interpersonal uses of language and the negotiation of meanings, and which are designed to raise conscious awareness of these interactive properties through observation and class discussion. 'Induction' takes the consciousness-raising a stage further by encouraging learners to draw conclusions about the interpersonal functions of different lexicogrammatical options, and to develop a capacity for noticing such features as they move through the different stages and cycles of language learning.

(Carter and McCarthy, 1995, p. 217)

This leads to an understanding that teaching grammar rules and providing opportunities to use them in controlled practice do not guarantee the acquisition of the linguistic competence. Therefore, learners should raise their awareness of how language functions through sufficient exposure to grammatical items. This will enable learners to discover L2 grammar elements by "reconciling their new findings with their current interlanguage, that is "noticing the gap" between their understanding of the use and usage of a particular feature, and examples of its use by native speakers" (Mishan, 2004a, p. 38). Thus, learners should receive opportunity to explore and assimilate knowledge, as well as autonomy to learn and use what they are developmentally ready to learn and use.

A similar approach for grammar development can be applied in DDL, when learners improve their own writing by correcting their own errors through concordancing, which is used in this study as a parallel task for grammar development. This will continue the discussion of grammar teaching and learning through DDL in the following section.

2.5.3 Writing Development and Language Corpora

Grammar teaching involves corrective feedback, which is provided by the teacher on learner errors when they arise in communication. Corrective feedback can take the form of an indication of an error; provision of the correct target form; metalinguistic explanation of the linguistic structure; or the combination of these (Ellis, R., 2006). Zamel (1981) explains the importance of corrective feedback stating that “The teacher’s output becomes the input for the students and determines the reaction to that performance” (p.149). Corrective feedback allows learners to notice the gap between their erroneous utterances and the target feature, which facilitates second language acquisition (Schmidt, 1990). Carrol (2000) points to the danger of failing to detect errors, as it breeds fossilization. In line with Schmidt’s (1990) ‘noticing hypothesis’ (as discussed in Section 2.4.1) and Long’s (1996) ‘interaction hypothesis’ (which states that comprehensible input achieved through interaction is essential in promoting language acquisition), Russell and Spada (2006) underline the importance of the degree of explicitness in facilitating ‘noticing’ of lexico-grammatical items in the input throughout interaction.

In light of the benefits of DDL, there has been a growing interest in the use of corpora in L2 writing classroom, where students are taught how to respond to teacher-identified (coded or underlined) errors in their writing and self-correct (e.g. Chen et al., 2015; Crosthwaite, 2020; Mizumoto et al., 2017; Poole, 2016; Sun and Hu, 2020). Commonly, learners have relied on intuition to correct grammar or checked with native speakers (Yu-Jueng, 2009). The emergence of corpora, as a searchable database of authentic and comprehensive language, shed light on increasing quality and sustainability of sentence-level error correction in L2 writing. It allows learners to go beyond this editorial intuition and gives a second opinion to intuition in checking the grammaticality of their writing (Conrad, 1999). As Yoon (2008, p. 45) states, “The

mastery of lexical and grammatical accuracy can lead to an increased confidence in themselves as L2 writers as well as a possible increase in the quality of their writing.”

In contrast to the belief that grammar is not teachable (Krashen, 1981; Truscott, 1996), research has proved grammar correction as effective for L2 writers (e.g. Chandler, 2003; Ferris and Roberts, 2001). However, providing learners with direct corrections would prevent them from testing alternative hypotheses; therefore, the most effective way would be to “make learners try to discover the right forms” (Corder, 1981, p.11). Here the importance of the degree of explicitness of corrective feedback is clear. In this regard, one of the highlights of Crosthwaite’s (2020) study should be mentioned – “less is more” – which suggests that more indirect corrective feedback can be associated with increased corpus consultation, while more direct feedback conditions result in negating the need for corpus use.

In the process-based approach, where multiple drafts of student writing are assessed, learners are able to improve their own writing guided by the teacher’s feedback, thus actively participating in the writing process (Lee, 2011). At the redrafting stages of the process writing approach, learners attend to corpora to find solutions to the highlighted problematic areas and make their writing more natural by generating new hypotheses. This inductive way of dealing with error correction is supported by the constructivist theory of learning derived from developmental psychology, which views individuals as active participants in the construction of their own meaning from their own experiences (Williams and Burden, 1997). Since increased cognitive work leads to more learning gains, this way is more likely to create conditions necessary for language acquisition to occur (Cobb, 1997). These benefits of corpus use in L2 writing have been corroborated by a number of empirical studies.

Having enjoyed support from constructivism, discovery learning, and noticing hypothesis, the inductive approach of error correction has also capitalized on much research. The latter provides insights into which types of error are immune to feedback and amenable to corpus-based error correction. Researchers claim that corpus use raises writer’s language awareness and decreases error frequency (Biber et al., 1998), develops critical thinking and problem-solving skills (O’Sullivan, 2007), fosters discovery learning and autonomy (Chambers, 2005), and enhances writing performance (Crosthwaite, 2020; Liu and Jiang, 2009; Yoon, 2008). While a larger number of studies use DDL in L2 writing for correcting errors related to lexis or vocabulary, the following

account will mostly report on DDL studies focusing on the correction of grammar errors for the improvement of writing.

Gaskel and Cobb (2004) investigated the role of using corpus feedback in correcting sentence-level grammatical errors of Chinese learners in an English writing course. Although they noted that “adapting concordances for lower level learners’ grammar development is less straightforward than for lexical development”, they recorded increase in the accuracy rate of error correction. Todd’s (2001) study focused on learners’ lexical errors coded by their teacher and revealed that corpus consultation enabled them to induce valid patterns and use them in the correction of their own errors. O’Sullivan and Chambers (2006) conducted research with graduate and undergraduate English speaking students of French and found that corpus use was beneficial for learners in reducing L1 interference and correcting errors, particularly related to prepositions and idiomatic expressions. They also noticed that graduate learners’ attitude towards this experience was more positive than undergraduate learners’ reaction, which is in line with Granath’s (2009) belief that advanced learners can benefit more from corpus work.

According to Tono et al. (2014), not all error types can be corrected by consulting a corpus. In the process of revising writing, errors that received high correction accuracy were omission and addition errors, while misinformation errors were not easy to identify and correct. Similarly, Chang and Sun (2009) found that learners performed better in proofreading tasks related to collocations, assisted by scaffolding prompts, which means that the type of errors and guidance can have impact on the effects of corpus work. The results of the study carried out by Crosthwaite (2017) suggested that the students were likely to successfully correct errors of collocation but were less successful for errors of morphosyntax. It was also suggested that the perception of the usefulness of DDL for grammar learning was less than that for lexis. The implication was the importance of identifying the error type to address in a timely manner with focused feedback leading to corpus consultation and affecting its success. In the same vein, the study by Dolgova and Mueller (2019) concluded that the success of error correction is largely determined by the type of error being addressed. The learners tended to correct register errors more than lexico-grammatical errors.

The study carried out by Perez-Paredes et al. (2012) aimed to explore learners’ behavior in working with corpora for tackling the use of cleft sentences. It was found that the participants used the simple functions of corpus search and avoided POS tags,

wildcards, or regular expressions. Another study by Chang (2014) included general and specialized corpora for academic writing. The analysis showed that both corpora contributed to learners' performance in writing; however, the graduate students gave preference to the specialized corpus due to its direct relevance to academic writing, as a resource to learn more about writing conventions of academic discipline. This implied that teachers should be cautious in the selection of corpora to meet learners' language needs.

Yoon and Hirvela's (2004) investigation discovered students' positive attitude towards the corpus use, its effectiveness in L2 writing, and a correlation between a high motivation for improvement and the use of corpora. In a further study, Yoon (2011) explains that through proper corpus training and assistance, direct corpus-based work may promote learner autonomy in L2 writing. Similar supportive attitude related to the corpus use for error correction was expressed by the participants in Idrizi and Miftari's (2018) research. Luo and Liao (2015) showed that corpora, compared to online dictionaries, are more effective as reference resources for reducing more lexico-grammatical errors and achieving more accuracy in L2 writing. Yoon and Jo's (2014) study examined the effectiveness of direct and indirect access to corpora for error correction in writing and the use of learning strategies. They reported evidence in favor of the former, where the learners acted as "language detectives", which drove them to adopt more cognitive learning strategies and restructure their errant language knowledge more effectively.

Literature, however, also voices some challenges mentioning that corpus consultation is time-consuming for both teachers and students (Crosthwaite, 2017; Smith, 2011; Sun, 2007), most learners do not receive critical thinking training necessary for processing induction (Tung et al., 2015), or they usually rely on the teacher as a source of correcting errors (Liou and Peng, 2009). All these challenges make it difficult for L2 writers to identify errors, navigate through concordances, analyze the output, and generate new hypotheses. Moreover, while studies mention the factors that may influence the outcomes of corpus consultation, including error types, teacher's training and guidance, selection of corpora, learners' language proficiency, most of them are targeted at advanced level students in an academic English environment. Thus, more empirical research has yet to emerge to determine the effects of corpus use at lower levels of language proficiency, challenges encountered by learners and their reactions in the process of mitigating their lexico-grammatical errors,

as well as the difference in contribution between the traditional and corpus-based error correction in L2 writing. We need, then, a greater understanding of incorporating the corpus component for grammar development in a writing classroom.

Along with the foci presented above, a limited number of studies also explored the impact of DDL on learner autonomy, as another affordance of DDL, which is one of the aims of the current study and will now be discussed.

2.5.4 Fostering Autonomy Through Language Corpora

Autonomy has been linked strongly with DDL and has been hailed as central and transformative (Vickers and Ene, 2006). Along with key concepts of authentic data, learner-control, discovery learning, and revolutionaries, the autonomy that DDL can foster (Boulton, 2009) chimes with paradigmatic shifts in language teaching in terms of promoting constructivism and communicative language teaching (Boulton, 2007; Carter, 1995; McCarthy, 1995) especially because DDL is an approach in which “the language learner is also, essentially, a research worker, whose learning needs to be driven by access to linguistic data” (Johns, 1991a, p. 2). Benson (2001) states, research work should be available not only to researchers but also to learners to be able to directly access the natural language outside the classroom, and DDL, as a technology-based approach, provides an environment for the development of learner autonomy. The development of autonomy that DDL underpins is due to the central attention given to the enhancement of “learners’ ability ‘to puzzle out’ how the target language operates from examples of authentic usages” (Odlin, 1994, p. 320).

To be able to draw the alignment between DDL and the theory of learner autonomy, it is necessary to understand what the concept of autonomy and independence assume. Over the last decades, the concept of autonomy and independence have gained momentum becoming ‘buzz-words’ within the context of language teaching and learning (Little, 1991), which has placed a premium on the role of language learner. This reshaping of teacher and learner roles is conducive to a radical change in the age-old distribution of power and authority that used to plague the traditional classroom and in the curriculum towards a more- learner-centered learning. Autonomy is the capacity to take control over one’s own learning (Benson, 2001). It is the situation in which learners accept the overall responsibility for their own learning (Holec, 1981; Little, 1991). Autonomous learners are viewed as being able to determine

their own objectives, define the content and progress of their own learning, select the appropriate methods and techniques to use, monitor their own process of acquisition, and evaluate the outcome of what they have acquired and what they need to learn (Holec, 1981; Little, 1991).

Autonomy is not a ready-made product, a personal quality, or an article of faith; it is achieved in the environment of cognitive and metacognitive strategies, motivation, attitudes, and knowledge about language learning, which is by no means “teacherless learning” (Sheerin, 1997). Sheerin (1997) explains that “teachers have a crucial role to play in launching learners into self-access and in lending them a regular helping hand to stay afloat” (p. 63). Although the transition from teacher-control to learner-control is fraught with challenges, it is through teachers’ willingness and readiness to transfer part of their instructional responsibilities to their learners that learner-control finds its expression. Through active involvement in the management of their own learning, which starts inside the classroom, learners go through a change from a position of being teacher-dependent to a position of being an independent learner (Benson, 2001). This view of where power should reside has led to the emphasis in the literature on autonomy and learning ‘how to learn’ in language learning (Voller, 1997).

The ways that DDL can be linked to the concept of learner autonomy are apparent. Firstly, as a self-access instrument rich in authentic samples of language and flexible in use, a corpus allows learners to find answers to their questions relating to their lexico-grammatical and stylistic choices. As Holec (1981) states, one of the key prerequisites for learner autonomy is selecting methods and techniques to be used. Being aware of what instruments are available and experiencing them in the classroom can translate into the ability and readiness to take more control over one’s own learning. Learners will be able to make informed decisions on the selection of resources most suitable and effective for their own learning needs, cognitive and learning styles. Thus, the implementation of corpora in the language classroom will teach learners how to notice, raise consciousness, and process language data inductively, generate and test hypotheses, and make generalizations. In Conrad and LeVelle’s (2010) words, “Learner autonomy is increased as students are taught how to observe language and make generalizations rather than depending on a teacher who states rules for them” (p. 548). Bernardini (2002) mentions serendipitous learning when learners discover new facts about language while analyzing another aspect of language. This kind of discoveries

stimulate learners' motivation and interest to solve more language problems, which they pose to themselves and to others.

Aston (2001) stresses that the most appealing part of language corpora is their potential for autonomous learning, when part of the responsibility is delegated to the corpus as a result of the shift in teacher and learner roles. Consequently, both the teacher and the learner attempt to find the best answers to questions, which evolves into learner empowerment, fundamental to the development of learner autonomy. It is due to this sense of empowerment that the learner returns to the corpus for more input in the future (Little, 1999).

Since learner autonomy starts with teacher autonomy, Little (2004) states that “We must provide trainee teachers with the skills to develop autonomy in the learners who will be given into their charge, but we must also give them a first-hand experience of learner autonomy in their training” (p. 179). Teachers should be able to negotiate course requirements, and “the basis of this negotiation must be a recognition that in the pedagogical process teachers as well as students can learn, and students as well as teachers can teach” (Little, 1995, p. 180). Language corpora allow for achieving this goal opening two-way channels of communication for such processes. Moreover, the autonomous teacher can create a learner corpus and based on the interlanguage analysis, identify the areas that need to be addressed more intensively.

For planning a DDL-based environment fostering autonomy, Johns (1997) suggests three steps: identification, classification, and generalization. First, learners explore the target form in the corpus, after which they decide on the category of patterns the form represents, followed by the formulation of rules based on the provided data. Carter and McCarthy (1995) propose a teaching framework including three Is, as presented above (see Section 2.5.2). Illustration is the stage when real data is presented in terms of choices of forms relative to context and use; Interaction discourse-sensitive activities engage learners in the negotiation of meaning; and at the stage of Induction, learners are encouraged to draw conclusions about lexico-grammatical options, thus developing the capacity of noticing, necessary for further language learning.

The Common European Framework of Reference for Languages (CEFR), as introduced in Section 2.4.2, emphasizes the importance of heuristic skills, which go beyond the general ability to learn (i.e. *savoir-apprendre*) and include the ability to use new technologies, the ability to find and process new information, and the ability to

observe and draw conclusion. The effective use of corpora can be counted as among these heuristic skills. Moreover, it goes in line with the recommendation of the Council of Europe (2001) that highlights provisions “for learners to become increasingly independent in their learning and use of language” (p. 108).

Empirical research, although limited, provides some insights into the contribution of DDL to the development of autonomous skills. Because of the long-term nature of some of the effects of DDL, such as fostering autonomy, language awareness, noticing, and pattern induction, operationalization of DDL becomes hard and, therefore, results in the lack of empirical support (Flowerdew, 2015). Moreover, such underoperationalized variables, including autonomy, are difficult or impossible to quantify (Boulton, 2012). While studies report positively related to the development of autonomy through DDL, evidence also suggests that learners usually stop using corpora after the classroom DDL treatment (e.g. Crosthwaite and Cheung, 2019). In relation to this, Charles (2014) proposes that learners personally build corpora, which motivates them more to work independently in future. The study by Marza (2014) found out that DDL treatment enhanced the ESP students’ understanding of the potential of independently relying on a specialized corpus for future professional queries. The findings reported by Fenik and Dikilitas (2014) showed an increase in learners’ eagerness to discover and construct knowledge, as well as in autonomy and motivation to study more vocabulary. Sah’s (2015) comparative study reported results in favor of DDL with III (Illustration-Interaction-Induction) as compared to DDL with PPP (Present-Practice-Produce) approach; however, both frameworks contributed to the development of learner autonomy. The pedagogical implication of Dung’s (2016) study was that hands-on concordancing can be helpful in self-correcting errors, increasing learners’ confidence, and making them more autonomous. Similar evidence is provided by Smirnova (2017) related to the drop in the number of collocation errors and to the increase in autonomous and self-correction skills. Chen’s (2017) analysis indicates that corpus-based business collocation pedagogy can be effective for raising learners’ collocation awareness and learner autonomy. The Corpus-Based Program training, administered by Adbel-Samea Quora et al. (2018), led to significant improvement both in students’ writing skills and learner autonomy.

To sum up the above discussed, DDL studies seem to agree that the pedagogical hallmark for DDL, which accords with constructivism (O’Keeffe, 2021) is in its potential to encourage learners to construct their language knowledge independently by

exploring the real language use through corpus input (Johns, 1994; Cobb, 1999; Flowerdew, 2015; Lee et al., 2019). Through various DDL activities, which encourage inductive learning by observing corpus data, making inferences, and formulating rules, learners become more active, more involved, and, ultimately, more autonomous (Gilquin and Granger, 2022). This active and independent approach underpinning DDL is seen to enhance learning. As previously mentioned, the other pedagogical motif of DDL, which is a key concept in the domain of socio-cultural theory, is scaffolding, where the degree of autonomy and self-regulation is determined by the degree of teacher mediation (O’Keeffe, 2021). The initial training to operate independently and develop independent learning skills and strategies is believed to allow learners to ‘surpass instructional intervention and become a better, self-regulated learner’ (O’Keeffe et al., 2007, p. 55). This is effectively illustrated by Mukherjee’s (2006) cline based on learner autonomy, ranging from teacher-led to learner-centered DDL activities. Similarly, O’Keeffe (2021) presents the cline of teacher control – student freedom, which provides useful insights into DDL manifestations based on a set of variables. This leads to a discussion on the operationalization of DDL, more specifically, on the treatment of DDL, training in corpus tools, and learning materials, which will be the focus of the following section.

2.6 How and What: Operationalization of DDL

Many works in the area of DDL relate to how to operationalize it, and the key topics that arise include the direct and indirect uses of DDL, the integration of corpus tools, the treatment of DDL, and the design of learning materials, which will be discussed now.

2.6.1 Hands-on and Hands-off DDL

Language teachers who have received training in corpus linguistics can resort to DDL as a supplement to their conventional teaching in two ways – direct or indirect. This means that learners can use concordances indirectly through corpus-based materials designed by teachers as handouts or they can have direct computer-based experience with corpora (Chambers, 2022). The direct and indirect approaches are also termed as ‘hard’ and ‘soft’ (Gabrielatos, 2005), or ‘hands-on’ and ‘hands-off’ (Boulton, 2010) approaches, respectively.

According to Johns (1991), hands-off corpus driven activities can be introduced at lower levels of language proficiency for immediate results. They require minimal or no corpus training, which can be an advantage for learners who are reluctant to work with software or are not well aware of how to work with it or how to interpret the results (Boulton, 2010). However, the mere fact that learners work with a corpus-based handout does not guarantee successful learning unless the teacher is able to use them judiciously (Frankenberg-Garcia, 2014). For example, if the teacher's randomly selected concordance lines ask learners to infer the meaning of a random word from context, learners might find it frustrating assuming that they could more effectively find the meaning of the word in a dictionary. Instead, the concordances can be used to reinforce the meaning of the word or expand learners' previous one-off contact with the word. On the one hand, corpus based handouts can help learners avoid scrolling down countless concordance lines, when they have to read unedited texts and cannot decide what to look for. On the other hand, they will not be able to develop competency in using corpora (Frankenberg-Garcia, 2014). The soft type of DDL can be a solution in contexts where computers are not available at regular basis, valuable classroom time can be wasted because of the lack of technical back-up or inappropriate searches, and both teachers and learners are overwhelmed by the use of "new material (the corpora), new technology (the software), and new approach (DDL) all at once" (Boulton, 2010a, p. 539). Despite the overstated motivating factor of technology in education (Jarvis, 2004), computers can be unappealing for many teachers (Farr, 2008), as well as learners (Bernardini, 2002), and, therefore, become an obstacle for wider uptake of DDL (Yoon and Hirvela, 2004).

The use of prepared materials allows the teacher to tailor activities to learners' needs and abilities (Boulton, 2012) and avoid the indiscriminate use of concordances (Frankenberg-Garcia, 2014). This way the teacher can edit the language by leaving out the difficult language, by excluding offensive or sensitive language, etc., thus sheltering learners from many problems of working with raw corpus data (Frankenberg-Garcia, 2014). Furthermore, printed materials can provide a gentle lead-in to hands-on experience (Gabrielatos, 2005), and "scaffolding can be gradually reduced until students can be presented with concordance output to investigate independently and unaided" (Johns et al., 2008, p.495).

The difference between direct and indirect DDL is not merely the medium of delivery, but more than that. Hands-off concordancing does not have the full potential

of hands-on corpus work. The latter can be achieved through extensive training, though it is often difficult to implement in an already established syllabus (Turnbull and Burston, 1998). The benefits that learners can extract from hands-on corpus consultation include flexibility, autonomy, lifelong learning, and long-term recall (Boulton, 2012). Direct corpus use can also provide learners with an experience of a linguist. However, there is a doubt as to whether it is necessary and a suggestion is given that hands-on corpus activities, like handouts, should be immediately applicable to learners' language learning interests, needs, and goals (Frankenberg-Garcia, 2014). Through hands-on experience, learners have more opportunity to find answers to their individual questions, to select data relevant to them, to see more contexts, which are selectively printed on handouts. In the direct treatment of corpora, the roles of teachers and learners are changed: the teacher is no longer the sole source of knowledge but rather a facilitator of the learning process, and the learner can become more independent and capable of how to best search the corpus, analyze the data, and interpret the outcome (Chambers, 2022).

The survey of 80 evaluations of DDL studies, conducted by Boulton (2010b), revealed that most researchers favor computer-based corpus work, while only four studies preferred paper-based work. While studies report various findings on the learners' gains from DDL, Boulton (2012) suggests that they should be treated with caution, meaning that several factors need to be considered – practical, cultural, individual, and pedagogical. Both hands-on and hands-off DDL have benefits and limitations, hence each might be appropriate for certain learners, teachers, and contexts. Related to this, Gilquin and Granger (2022) note that the decision on the type of DDL treatment is crucial. Teachers need to be able to make a correct choice as to whether learners should query the corpus by themselves or use the handouts prepared by the teacher in advance. The choice depends on a number of factors, including the availability of the necessary hardware and software, the level of learners, and others. As already mentioned previously, there is no agreement on the efficiency of direct and indirect approaches. While some researchers claim that both approaches are equally effective (e.g. Vyatkina, 2016), and many others are of the view that learners benefit more from the corpus-based handouts devised by the teacher, the opposite was claimed by Boulton and Cobb's (2017) meta-analysis. Integration of DDL into a language classroom, in a direct or indirect way, requires knowledge and skills in the appropriate use of corpora, which is now discussed.

2.6.2 Integrating Corpus Tools

It has often been noted that the availability and use of a computer and a corpus in the language classroom is not enough for DDL (Bernardini, 2000; Reppen, 2010; Romer, 2011; Sinclair, 2004). The “corpus-informed language pedagogy” (Braun et al., 2006, p. 5), which comprises all the complexities of the field, requires three important steps, which allow both teachers and learners to avoid the pitfalls of DDL and successfully implement it – (i) careful selection of a corpus, (ii) awareness of corpora design, and (iii) skills and knowledge of its correct use. First, the choice of a corpus needs to be made with consideration of a number of factors, including learners’ age, educational background, time period, genre of texts, etc. Second, the teacher needs to raise awareness of how a corpus is designed, which is essential for preparing both hands-on and hands-off activities (Zaki, 2016). Corpora exploration is carried out through a concordancing program, which is typically used to conduct searches for a word or a group of words in different formats – as a frequency list, key word in context (KWIC), collocations, part of speech tagging (PoS), and so on (Meyer, 2002), as further discussed. Third, the exploitation of a corpus demands certain skills and knowledge on the part of the teacher, which enable him/her to conduct corpus-based explorations, to receive more language-related insights and to evaluate corpus results in light of the preset pedagogical goal. In this respect, O’Keeffe and Farr (2003) conclude that “The more teachers know about corpora and how to use them, the more they will be empowered to evaluate corpus-based materials objectively” (p. 412). Regarding learners’ role, it is no less important for them to understand the benefits and know-how of corpus use, which will lead to more engaging and cognitively conscious language learning process (Zaki, 2016).

A careful selection of a corpus for DDL methodology can be done based on the knowledge about the different types of corpora. Thus, literature on DDL mentions a range of corpora, which were presented earlier in Chapter One. The types of corpora are various: monolingual, bilingual, written, spoken, native, non-native, and others. As Gilquin and Granger (2022) state, it might not be wrong to say that any type of corpus may be adopted by DDL; however, each can be used for a particular purpose. Bilingual corpora, for example, can best be suited for translation trainees, where they have the chance to compare their own translations against the original texts, presented side by side. According to Bernardini (2004, p. 20), the suitability of this type of corpus is in “drawing learners’ attention to (un)typical solutions for typical problems found by

mature, expert translators.” Specialized corpora are more appropriate for English for specific purposes, where learners gain knowledge and skills to use in particular disciplinary contexts (Hyland, 2019). To raise awareness of interlanguage features in the form-focused instruction, DDL can effectively deploy learner corpora, which comprises language produced by non-native speakers (Granger and Tribble, 1998), and allows for ‘tailor-made feedback’ (Mukherjee, 2006, p. 19). Cotos (2014) shows that the local learner corpus can be effective in terms of learning outcome and language authentication. Considering the issue of authenticity, pedagogic corpora seem to be promising, as being created for language teaching and learning purposes and not for linguistic research, they are better contextualized and more directly relevant to learners (Chambers, 2019).

Knowledge about the different types of corpora is necessary but not enough for the operationalization of DDL unless a corpus is combined with a corpus query tool (Gilquin and Granger, 2022). Tools designed to exploit corpora should be learner-friendly (Lee et al., 2019). As Crosthwaite and Cheung (2019, p. 171) emphasize, “Complicated or unappealing corpus query tools are one of the hurdles for the successful uptake of DDL.” *Sketch Engine*, for instance, made up of corpora in more than 90 languages, offers a simple tool *SKELL* for language learners. This tool was designed by Kilgariff et al. (2015, p. 66) as ‘a stripped-down, non-scary version of *Sketch Engine* for use by learners.’ The interface is simple and the entry of a word or phrase provides 40 examples of complete sentences. This limited number of sentences, as revealed by Hirata and Hirata’s (2019) study, can solve two problems – the incompleteness of sentences and the large number of samples – previously reported as problematic for learners. The *BAWE* corpus is attractive in higher education due to its *Quicklinks* feature, which provides hyperlinks to concordances of words and phrases identified as problematic for learners (Vincent and Nesi, 2018). *AntConc* (Anthony, 2019) is freely available and easy to use. *Wordsmith Tools* (Scott, 2020) offers DDL the opportunity of blanking out the search words in concordances. *Lextutor* provides easy access to actual language use without training. Both *BNClab* (Brezina et al., 2018) and *TLC Hub* (Gablasova, 2019) attract learners to the spoken language samples through data visualization and make them more receptive to the information to be discovered.

All these resources above are easy to use and, therefore, may have the potential of popularizing corpus-based instruction; however, as noted by Chambers (2022), publications reporting on the use of corpora tend to focus on either large publicly

available corpora (e.g. Li, 2017) or small custom-made corpora, otherwise called pedagogic corpora (Perez-Paredes, 2020; Willis, 1998). Mark Davies's *English-Corpora.org* has often been reported as one such publicly available resource that can considerably benefit language learning and teaching combined with guidelines on the use of its tools (e.g. Poole, 2018), as mentioned by Gilquin and Granger (2022). The *List* tool in a concordance program can be used to provide frequency information. This includes training in: how to find multiple examples of the word in context; what words are used before and after the key word; the parts of speech before and after the key word, words with the same root; different forms of the word, and synonyms. Generating word lists can be particularly useful for vocabulary learning (Reppen, 2022). The *Chart* tool provides information about the use in different registers and in different years, which helps learners to understand variation due to situational factors. Other features are *Collocates*, which provides collocations, and *Compare*, which compares how two words are used. *KWIC* is still another tool, which Reppen (2022) views as a powerful learning tool that can be used to introduce a new structure or to raise awareness about a lexico-grammatical pattern. Moreover, this function allows learners to see a word or structure in high concentration in a short period of time. In addition, learners can get valuable insights into the patterns of use – which words can go together and which words do not – which is often a puzzle in teaching and learning (Reppen, 2022). As can be seen, there are many ways to use corpora in a language classroom, and this can be facilitated through various activities, which will be the focus of the following section.

2.6.3 DDL Treatment and Learning Materials

Concordances may be presented in various ways. As Breyer (2006, p. 162) notes, the range of activities is 'limited only by the imagination of the user'. Presentations can be in KWIC format, or in complete sentences, selectively, edited, or in original form, on screen, printed or as hands-on work, each having its challenges and benefits. The choice of presentation and activity depends on a number of factors, as described below.

The degree of teacher mediation is one factor considered in the presentation of DDL activities. The cline of these activities can range from teacher-led to learner-led (Gabrielatos, 2005; Mukherjee, 2006, O'Keeffe, 2021). This range may include cloze tests, fill-in exercises, grouping patterns, finding the missing word, translations through

a bilingual corpus, error correction, editing, revision of one's own work, and others. The teacher-led end provides more controlled tasks, while the learner-led end promotes discovery learning (Bernardini, 2004, p.22), when learners 'browse large and varied text collections in open-ended, exploratory ways.' This, according to Hunston (2002, p. 171), is more suitable for 'very advanced learners who are filling in gaps in their knowledge rather than laying down the foundations.' On the trajectory from the teacher-led end to the learner-led end, the degree of mediation decreases and that of self-regulation increases, where learners have more freedom and more responsibility for their own learning (O'Keeffe, 2021). Between the two ends of the cline, activities with various types of 'filter' can be located (Gavioli, 2005, p. 30).

Another issue considered in the literature is the extent to which authenticity of data is manipulated. Manipulation may aim at manageability, when the quantity of data is reduced; readability, when difficult concordance lines are discarded (Kuo et al., 2001); frequency, when the most frequent uses are illustrated (Levy, 1990); usefulness, when only data judged as useful is presented (Tribble, 1997) - as well as simplification (Gabrielatos, 2005) and editing (Wicher, 2020). However, this type of principled selection of language data is biased and can be avoided through random selection, which is likely to maintain more 'semblance of fidelity to the data' (Johns, 2002, p. 110). Boulton (2009b) advocates not undermining the authenticity advantage of DDL, as it allows learners to get exposed to the realities of the language they are likely to encounter outside the classroom. In this regard, Gabrielatos (2005, p. 18) points out, "This manipulation should be carried out with the understanding that the adapted samples are not good guides to the frequency of a language item." Lee et al. (2019) claims that DDL can be more effective if the concordance lines are carefully selected by the teacher. Nesselhauf's (2004) finding is another proof of the effectiveness of manipulation of concordance input, especially at low levels.

Another decision to be made when doing DDL is related to the choice between direct and indirect approaches of DDL. While there is no unanimity in opinion as to which approach is more effective, as discussed earlier, the choice is often determined by the availability of the hardware, learners' level of language proficiency, and others (Gilquin and Granger, 2022). Boulton (2008), for example, suggests paper-based concordances at lower levels of language learning. Corpus-based handouts can solve the issue of 'incomplete sentences', which has often been complained about by learners, as observed by Johns (1986). While this is a fact, Boulton's (2009a) experiment with low-

intermediate level learners reports better results after working with the KWIC format than with full sentences. This outcome is suggested to be due to the salience achieved by the alignment of the occurrences of the search word under one another, which is less in a sentence view. In essence, corpus-based handouts can address all the above mentioned issues of readability, usefulness, and others (Gilquin and Granger, 2022). Direct corpus use provides learners with an experience of a linguist (Chambers, 2022), and potentially secures the long-term benefits of language awareness, autonomy, lifelong learning, and long-term recall (Boulton, 2012). As already discussed, hands-on corpus consultation can serve various purposes, including lexis, grammar, and translation. Learners can improve their own work through the direct corpus use by deciding themselves what they want to check or by correcting the problems underlined by the teacher (e.g. Crosthwaite and Stell, 2020; Kennedy and Miceli, 2001). Thus, the direct approach can maintain the status of the corpus as a ‘sleeping resource’ (Johns, 1998, p. 22), supporting language learning whenever the need arises.

Operationalization of DDL also demands a choice of a teaching framework that would serve well for the preset learning goal. DDL offers a model that is alternative to the traditional PPP (Presentation-Practice-Production) model. Johns (1991) presents it in the sequence of Identify-Classify-Generalize, where learners observe the variations of the form under study, name the distinction in metalanguage or informal terms, and formulate a rule, respectively. A similar pedagogical treatment for grammar instruction was proposed by Carter and McCarthy (1995) in the format of three Is, namely Illustration, Interaction, and Induction. At the first stage, learners are exposed to numerous examples of the target item, followed by discussion and sharing of observations and opinions at the second stage. Finally, they come up with a rule for the language feature based on their observations and discussion. Flowerdew (2009) adds a fourth I between the second and the third stages – Intervention – which is realized through guiding questions built into the software discussed before and after each activity. A number of studies have used this framework in their treatment of DDL. One example is Crosthwaite’s (2020) study, which uses this model of treatment in an online DDL course focusing on L2 error resolution in academic setting. The study suggests that while the self-guided learning approach is possible to implement, DDL appears to be more successful when there is a high degree of scaffolding. Another study conducted by Sah (2015) compares the III and PPP frameworks and reports findings in favor of the former in terms of contributing to better learning outcomes in grammar.

Similar pedagogical strategies are proposed by other researchers. Kennedy and Miceli's (2001) framework is based on a four-stage search strategy: (1) formulate the question, (2) devise a search strategy, (3) observe the examples and select relevant ones, and (4) draw conclusions. In their study, Kennedy and Miceli (2017, p. 93) analyze the results of the learners' consultation of a corpus, provide suggestions on how to get the most advantage from corpus data, and advocate 'to cultivate in learners a propensity for open-ended searches and an "observe and borrow chunks" mentality.' DDL activities have also been reported to be based on another four-step model, developed by Chujo and Oghigian (2008), with the following sequence: (1) hypothesis formation through inductive DDL tasks, (2) hypothesis confirmation by teacher, (3) hypothesis testing through follow-up exercises, and (4) production through follow-up exercises and teacher feedback. This strategy was adopted, for instance, by Nugraha et al (2016) and proved to be effective in developing the learners' grammar knowledge. Based on Gass et al.'s (2013) classic L2 acquisition model, Ma et al. (2021) suggests the sequence of testing learners' knowledge to reveal errors, observing and analyzing the corpus data, discovering language patterns inductively, and practising the target language. Essentially, all these sequences facilitate the necessary conditions to promote noticing, which is a necessary prerequisite for a focus-on-form instruction to be effective (Flowerdew, 2015).

DDL, thus, is a significant complement to the queries and failings of intuition alone (Sinclair, 2004). It can be used with differing levels of language proficiency and differing degrees of sophistication to address language learning, depending on the specific or long-term needs and motivations (Boulton, 2016). "Ultimately, the teacher should decide when and how to introduce corpora appropriately for their students, who will then be in a position to decide when and how to use them for their own purposes" (Boulton, 2016, p. 24).

2.7 Conclusion

The rapid development of computer technology made computers an indispensable part of education and led to the emergence of the sub-discipline of computer-assisted language learning (CALL). As illustrated by this chapter, the latter decades of the 20th century were an essential period for the development of corpus linguistics. Since then, corpora have been exploited both in linguistic description and in

language teaching applications, thus forming the backdrop to data-driven learning (DDL).

DDL, as one technology-based approach to language instruction, has the potential to provide an environment for the development of students' cognitive strategies and multi-literacies of the digital era. In addition, the emphasis has shifted from deductive to inductive learning, and 'noticing' (Schmidt, 1990) of corpus data is promoted in the form of concordance citations as language input and self-discovery of lexico-grammatical patterns (Bernardini, 2004; Braun, 2005; Gabrielatos, 2005; Hunston, 2002; Mukherjee, 2006; O'Keeffe et al, 2007; Romer, 2006).

DDL creates a learning environment where students are not simply provided with correct answers to queries about grammar or lexical questions. In this environment, students construct answers without obtaining feedback on whether their answers are correct. They use the concordance lines generated by a concordancing program and, through this process, they induce the language rules. As a result, concordancing requires the learner to take on the role of a language explorer and the teacher to take on the role of a facilitator (Bloch, 2009). The teacher does not provide learners the mere language rules but guides them in the exploration of authentic data and in pursue of their own interests – a process termed as the guided construction of knowledge (Mercer, 1995).

Corpora provide a repository of authentic, or natural, texts for language learning. Besides teachers' preferences for natural texts, studies of second language learning have revealed that when learners are engaged in meaningful activities where they have a chance to manipulate the language they raise language awareness, as well as lexical and linguistic consciousness, acquire more language knowledge, and retain more information for longer time. Corpus-based activities directly address these both areas by meaningfully engaging learners in language learning (Reppen, 2022). Moreover, this scaffolding trajectory of exploration, analysis, hypothesis-testing, and inferences, empowers learners to reach the stage of independent deconstruction of input and assimilation of new knowledge, that is learner autonomy.

The survey of the literature, as we could see, reports on valuable insights offered by a number of conceptual papers and empirical studies. However, it does not leave the role of DDL without criticisms. The contemporary concerns and debates, involved in relation with DDL, have to deal with the issue of authenticity when choosing between the direct and indirect corpus-based approaches, the selection of appropriate corpora for

teaching/learning purposes, the design of corpus-driven teaching materials and tasks, the training of teachers and learners in the use of corpus tools, technological considerations, and the impact of DDL on the interface between explicit and implicit knowledge and procedural memory. Furthermore, concerns derive from the dearth of empirical quantitative investigations at low levels of language proficiency, with longitudinal DDL treatment and large-scale design. Literature also points to the need to conduct delayed post-testing that would allow to go beyond immediate learning outcome and measure the long-term learner performance and secure reliability in the contribution of DDL instruction to knowledge acquisition. While the overwhelming focus in research is on the role of DDL in the acquisition of lexis or a particular grammar item and in academic setting, a need arises for research into a wider range of grammatical points and identification of language areas that would benefit more from DDL. Moreover, studies investigating the development of learner autonomy, which has gained momentum in pedagogy, appear to be scarce in the context of DDL. Thus, the presence of these concerns makes it difficult for a wider audience to be convinced in the payoffs of DDL and extend the confines of acceptability of DDL as an effective teaching practice.

The use of DDL, as shown by the meta-analyses of DDL studies, has increased in many educational contexts including Asia, Europe, and the United States, while the affordances of corpora for DDL have neither been applied nor experimented in the Armenian context. The present study was, therefore, designed to conduct a comparative evaluation between the conventional language instruction and DDL instruction within the Armenian context. Particularly, it aims to find out the contribution of DDL to the acquisition of grammar knowledge for low level adult learners studying English outside the academic context. The study also aims to reveal the participants' attitude towards this new corpus-based treatment for grammar learning, as well as the impact of DDL on the development of learner autonomy.

The next chapter will present the methodology of the study, as well as the insights gained from the pilot study that informed a more rigorous design of the main investigation.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

As presented in Section 2.7 above, the original intention of this research is to investigate the contribution of DDL to the development of grammar knowledge at low levels of language proficiency and in the Armenian EFL context outside the academic setting, the changes in thought and action in terms of acquiring autonomy, and the learners' attitudes towards DDL. Thus, this mixed-method experimental project was set up, where the following research questions were formulated:

1. To what extent can DDL in an Armenian context improve pre-intermediate learners' knowledge of English written grammar items?
2. To what extent can DDL foster learner autonomy in discovering grammar knowledge through corpus consultation?
3. What are the learners' attitudes towards working with corpora to discover the grammar points and improve their own writing?

The findings of the experiment are discussed within the epistemological perspective adopted by the current study, as presented in Chapter Two. Thus, to answer the first research question, the study engages with the theories of learning - constructivism and socio-cultural theory - underpinning DDL, and reveals the contribution of SLA pedagogical models, such as noticing, discovery, and the usage-based paradigm, deployed by DDL in developing learners' grammar knowledge. This may lead to insights into the impact of the above models of knowledge construction on the proceduralization and long-term retention of the taught knowledge, identifying those grammar points that are more amenable to corpus consultation. To answer the second question, the study engages with a discussion on the affordance of the above pedagogical underpinnings of DDL in fostering autonomy in language learning. The third research question addresses a more qualitative understanding of the efficiency of DDL to the first question, bringing to light some of the fears, challenges, and benefits of corpus use in the Armenian context.

At an early stage of the project, a pilot study was designed to have primary evidence to uncover insights into ways of effective design of corpus applications in an

EFL classroom and to raise awareness of any challenges before the main study. Thus, this chapter starts with the pilot study, including its methodology, results, and discussion. The pilot study was carried out from March to May of the academic year 2017-2018 and greatly contributed to the design of a more comprehensive and longitudinal main study, which lasted for five months, from September to February of the academic year 2018-2019. The following section deals with the methodology of the main experiment and provides detailed information on the research design and instrumentation for data collection and data analysis.

3.2 Pilot Study: Research Design

DDL, as previously mentioned, has not been practised in the Armenian EFL context and, consequently, nor has its efficiency been researched. To inform a more rigorous design for the main study, there was a need to conduct an action research that would seek to experiment with corpus consultation. Moreover, literature reports operational uncertainties related to the use of DDL with low level learners. Consequently, this mixed-method pilot study was designed to experiment with direct and indirect approaches of DDL to gain primary proof of the concept of the operationalization of DDL, as well as to bring to light some of the fears, challenges, and benefits of using DDL at lower levels of language proficiency. It particularly aimed to answer the following research questions:

- 1) Is there a difference in the learning outcomes between paper-based handouts and computer-based hands-on DDL at lower levels of language proficiency?
- 2) Is there a difference in the learning outcomes between different levels of language proficiency?
- 3) What are the learners' preferences and attitudes towards the use of DDL on paper and on computer?

The dimensions that this pilot study employed from the continuum of possible dimensions of DDL, illustrated by Gabrielatos (2005) (see Figure 3.1) included 'soft' or paper-based DDL with simplified input and 'hard' or computer-based DDL with authentic input, both promoting inductive, learner-centered approaches of learning through individual and pair/group work.

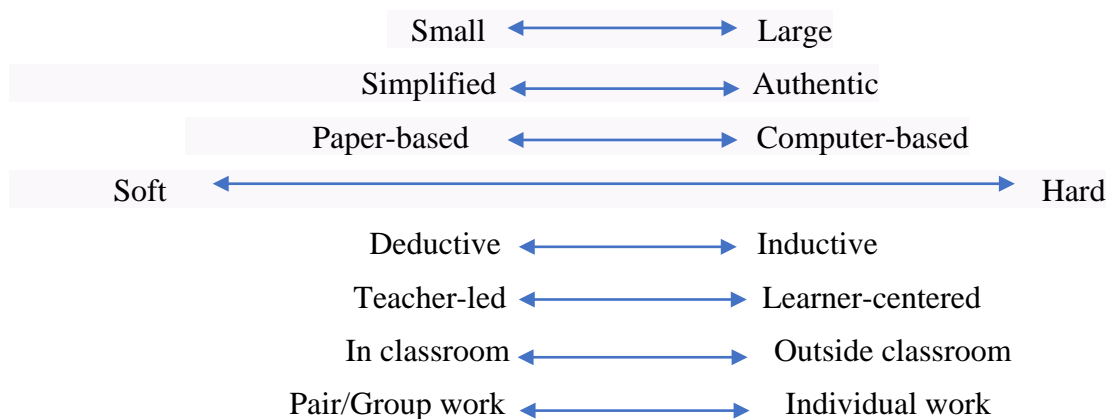


Figure 3.1 *Continuum of Possible Dimensions of 'Soft DDL' and 'Hard DDL'*

The teaching framework established through these dimensions provided compatibility with explicit language instruction. It reserved a central role for noticing or consciousness-raising and placed the learners in an active role to induce the meaning and use of new language forms and build upon their existing knowledge.

3.2.1 Participants

The participants were 18 Armenian learners studying English at elementary (A2) and pre-intermediate levels (B1), according to the Common European Framework of Reference for Languages (CEFR). Thus, there were two classes, A2 and B1, with 9 participants in each group. They were employees of the Armenian Nuclear Power Plant (ANPP), aged 30-50, with the gender proportion of 30% female and 70% male in each group. They had been selected by the management of the plant to study English to be able to get access to job-related reference materials that are only available in English, to participate in international seminars and conferences, to make good presentations and write reports in English. It should be mentioned that this cohort of participants are not typical of DDL studies where more often the participants are university students with intermediate and higher proficiency levels of English, as noted by the metastudies on DDL (e.g. Boulton and Cobb, 2017; Lee et al., 2019; Perez-Paredes, 2019). The elementary group had passed A1 level and the pre-intermediate had completed A1 and A2 levels, and both groups were successfully transferred to A2 and B1 levels, respectively, based on their final achievement test results. Each group had classes twice a week, for three hours each session, and the textbooks they used were *Interchange 1* and *Interchange 2* authored by Jack C. Richards. The classes were held at the Training Center of ANPP and delivered by me.

The study used the principle of convenience sampling where the researcher selects the research sample based on ease and proximity to the researcher: the students are easy to reach and easy for the researcher to contact and, therefore, convenient in her research. The participants for this action research were my student cohorts at that period, and there were a few reasons that necessitated their recruitment. There were no changes in the learners' academic timetable, and the new pedagogical treatment of direct and indirect DDL was possible to be implemented in a real class time integrated into the conventional EFL classroom. And no less importantly, the genuine relationship, having been established between me and my students, allowed for more authentic and reliable responses. In the meantime, to avoid the issue of the conflict of interest, the learner-autonomy profile form and student interviews were administered by a third party.

3.2.2 Ethics

Ethical clearance for carrying out the pilot study was sought from and granted by the Mary Immaculate College Research Ethics Committee. The steps set out to adhere to the research ethics procedures and guidelines and ensure the ethical treatment of the participants were the following:

- The ANPP Training Center Manager was sent an information letter (see Appendix A) asking for his permission, with an overview of the research project, followed by an informed consent form (see Appendix B) to be signed before the treatment.
- The participants were fully informed about all the aspects of the research during a class and given sufficient time to make decisions on their own participation. The information was provided in writing (see Appendix C), as well as verbally. Students' participation in the research project was confirmed by their signed informed consent (see Appendix D).
- The signed consent forms allowed the data to be used for research purposes. The participants were assured of confidentiality and maintenance of dignity and welfare, and offered the opportunity to receive a report about the results and conclusions of the research project.
- The data drawn from the tests and interviews were anonymized. Participants were not identified by their actual names, but assigned codes, were not discussed

outside the research context, and research findings were presented as a summary report.

- Access to information about individual participants was restricted to the researcher, and all the data was stored on a password-protected computer.

3.2.3 Treatment

To address the pilot research questions in Section 3.2, the study recruited 18 learners of English, divided equally into an elementary (A2) group and a pre-intermediate (B1) group, as described above. They had regular classes of English twice a week for three hours each session, delivered by the same teacher. DDL was integrated into their conventional learning for 10 weeks – 5 weeks paper-based and 5 weeks computer-based instruction. Practically, both groups first received paper-based DDL, followed by computer-based DDL, for which the Corpus of Contemporary American English (COCA) was selected. Both approaches included studying the grammar points presented in their coursebooks and promoted induction of grammar rules on the part of the learner instead of conventional explicit explanation of rules on the part of the teacher, as described in more detail below. In terms of the rationale behind which items were studied using paper versus those that used computer, we just moved along the sequence of the coursebooks so that the first 5 weeks’ grammar points were on paper and the second 5 weeks’ points were on computer. It should also be acknowledged that this type of random division could be considered a limitation. Since the difference in the level of difficulty of the target items affecting their potential of being amenable to corpus consultation was not controlled, it could lead to varied learning outcome. However, this was mitigated by the interview data, which will be discussed further. The grammar items explored are listed in Table 3.1.

Table 3.1

Summary of Instructed Grammar Items for Elementary and Pre-Intermediate Groups

Elementary Group (A2)			
Grammar items studied through paper-based DDL		Grammar items studied through computer-based DDL	
1.	Simple present statements and wh-questions with <i>be</i>	9.	Simple past statements, yes/no and wh-questions
2.	Time expressions: <i>at, in, on, around, early, late, until, before, and after</i>	10.	Present perfect statements, yes/no and wh-questions
3.	Demonstratives: <i>this, that, these, those</i>	11.	Adjective + infinitive; noun + infinitive
4.	Simple present statements and yes/no and wh-questions with <i>do</i>	12.	Modal verbs for suggestions: <i>could</i> and <i>should</i>

5.	Present continuous statements and yes/no and wh-questions	13.	Modal verbs for requests: <i>can, could, may, would, and will</i>
6.	Quantifiers: <i>all, nearly all, most, many, much, a lot of, some, few, little</i>	14.	Expressing agreement: <i>so, too, neither, and either</i>
7.	Adverbs of frequency: <i>always, almost always, usually, often, sometimes, hardly ever, almost never, and never</i>	15.	Comparative and superlative forms of adjectives
8.	<i>There is/There are; any/some</i>	16.	Future with present continuous and <i>be going to</i>
Pre-Intermediate Group (B1)			
Grammar items studied through paper-based DDL		Grammar items studied through computer-based DDL	
1.	Simple past; <i>used to</i> for habitual actions	9.	Infinitives and gerunds for uses and purposes
2.	Quantifiers with count and non-count nouns: <i>too many, too much, fewer, less, more, not enough</i>	10.	Imperatives and infinitives for giving suggestions
3.	Evaluations and comparisons with adjectives and nouns: <i>not ... enough, not enough ..., as...as, as many/much ... as</i>	11.	Conditional sentences with <i>if</i> clauses
4.	Simple past vs. present perfect	12.	Passive (simple present, simple past)
5.	Future with <i>be going to</i> and <i>will</i>	13.	Present perfect continuous
6.	Modals for necessity and suggestion: <i>must, need to, (don't) have to, ought to, had better, should (not)</i>	14.	Participles as adjectives
7.	Two-part verbs	15.	Relative pronouns for people and things
8.	Requests with modals and <i>Would you mind...?</i>	16.	Modals and adverbs for permission, obligation, and prohibition

The corpus-derived handouts developed by the teacher included simplified corpus evidence (e.g. selecting sentences that appeared to be more suited to the level) and encouraged induction of grammar rules, which was carried out in the classroom in pairs or groups. The examples were presented in the KWIC format, that is in the form of a concordance, where the item under study is in the middle, which makes it easier to discern patterns (see Appendix H for a sample teaching material for hands-off DDL). During the hands-on DDL, the students had access to the authentic data on the computer, which aimed to promote discovery of lexico-grammatical patterns through individual work outside the classroom and discussion of feedback in the classroom. The transition to the hands-on experience was scaffolded with tasks devised and guided by the teacher (see Appendix I for a sample teaching material for hands-on DDL).

Both types of DDL instruction were based on the four-step teaching framework proposed by Chujo and Oghigian (2008). This study added a fifth step between the first and the third, and the adopted guided procedure included: (1) forming hypotheses through inductive corpus-driven tasks; (2) sharing hypotheses in groups; (3) verifying the validity of hypotheses with the teacher; (4) practicing the language point in a follow-

up controlled exercise; (5) producing the language item through follow-up activities (see Appendix T for a sample lesson plan aligned with this 5-step guided procedure). The rationale behind this choice can be found in the paradigmatic stance undertaken by this study, that is in the shared constructivist and socio-cultural epistemological ground between theory and DDL, where the key pedagogical concepts of noticing, discovery, usage-based learning, cognitive stimulation, and social interaction can be operationalized through the above 5-step model of knowledge construction. Thus, firstly, the learners were provided with instructions on corpus work for a particular grammar item and encouraged to induce and form their own hypotheses about the use, form, meaning, and function of the language point by exploring the related concordance lines. At the second stage, they were given opportunity to engage in social dialogue and share their own generalizations about the grammar point in pairs or in groups. To be able to check the validity of the hypotheses, the teacher provided guidance by eliciting the learners' answers and giving feedback, which allowed the learners to reorganize or confirm their knowledge and arrive at a right conclusion. As following tasks, the practice of the discovered pattern was realized through controlled exercises, followed by its production through free writing tasks.

3.2.4 Corpus Training

The learners received training in how to work with a corpus and navigate through concordances, which was a crucial part of the treatment. As mentioned above, the Corpus of Contemporary American English (COCA) was selected to carry out data-driven learning. This introductory training was held at the Training Center of ANPP and lasted for three hours. The participants were introduced to the corpus training tools and their functions on a large screen via a computer and a projector, after which they got registered on COCA by their mobile phones (the center is not equipped with computers sufficient for all learners) and had some practice in operating the tools. Considering the groups' low levels of English language proficiency, the learners were provided with a handout listing the corpus tools and functions, both in English and Armenian (see Appendix G for Corpus Training Tools). To mediate the challenge of the foreign language, as well as that of acquiring a new skill, the training session was delivered in their L1 - Armenian. This ensured that they were able to gain the necessary skills and knowledge about the direct corpus work. The training proved to be encouraging as it was accepted with enthusiasm and willingness to acquire new skills and knowledge

about a new technological learning tool. The corpus functions that they were trained in and further used in grammar tasks are provided below:

- “List” - provides frequency information; includes training in how to find multiple examples of the word in context; what words are used before and after the key word; the parts of speech before and after the key word; words with the same root; different forms of the word, and synonyms;
- “Chart” - provides information about the use in different registers and in different years;
- “Collocates” - provides collocations;
- “Compare” - compares how two words are used (e.g. beautiful and handsome).
- “KWIC” (key word in context) - helps us visualize the grammatical patterns in which a word appears.

3.2.5 Evaluation Data

The study pursued a mixed-method design; the quantitative data was obtained from pre-tests, post-tests and final tests, and the qualitative data – from the semi-structured student interviews (see Appendix N).

To assess the intervention effect, post-tests were administered after each new treatment. Thus, each group took a separate pre-test before the DDL instruction, corresponding to the group’s proficiency level. After the first month of paper-based DDL instruction each group did a post-test, and after the second month of computer-based instruction they sat a post-test and, in the end, a final test relevant to each level of proficiency – elementary and pre-intermediate. All the tests were based on the grammar points covered throughout the 2-month instruction and included completion or gap-filling activities each comprising several points to measure the performance on each grammar item. As indicated in Table 3.1, the post-tests and final test designed for the elementary group included grammar tasks related to: *simple present; time expression; demonstratives; present continuous; quantifiers; adverbs of frequency; there is/there are; simple past; present perfect; modal verbs for suggestions; modal verbs for requests; expressing agreement; comparative and superlative forms of adjectives; and future with present continuous and be going to*. The tests developed for the pre-intermediate group assessed the learners’ grammar knowledge on: *simple past; used to for habitual actions, quantifiers with count and non-count nouns, evaluations and*

comparisons with adjectives and nouns, simple past vs. present perfect; future with be going to and will, modals for necessity and suggestion; two-part verbs; requests with modals and Would you mind...?; infinitives and gerunds for uses and purposes; imperatives and infinitives for giving suggestions; conditional sentences with if clauses; passive (simple present, simple past); present perfect continuous; participles as adjectives; relative pronouns for people and things.

The evaluation data from the pre- and post-test results was assessed through Wilcoxon t-test - non-parametric equivalent of paired t-test. As noted before, despite the issue of the difference in the level of difficulty of hands-on and hands-off grammar points, which the study failed to control, the analysis of the qualitative data confirmed the findings from the quantitative data. The statistical analysis of the test results, conducted for each group, revealed the impact of both the hands-on and hand-outs methods on the learners' grammar competency. This provided answers to the first research question that aimed to find out if there was a difference in the learning outcomes between paper-based handouts and computer-based hands-on DDL for each proficiency level. The comparison of the test results between the groups revealed the difference in the outcomes between different levels of language proficiency, thus answering the second research question.

The evaluation data also included semi-structured interview data, which explored the learners' engagement in the learning process and their attitudes and preferences towards the different approaches of DDL, which the third research question attempted to answer. More specifically, the questions sought answers on their attitudes towards studying grammar, the contribution of DDL, both on paper and on computer, to their grammar knowledge, their preferences for discovery of rules on their own and direct explanation of rules, the benefits they gained and the challenges they experienced from concordancing, and their motivation related to further use of language corpora. The interviews were administered in focus groups at the end of the DDL treatment. They were conducted in Armenian to ensure that the interviewees were able to fully and accurately convey their ideas and feelings. Participation in the interviews was based on the participants' consent, and all the learners in each group agreed to be interviewed. The interview data was translated from Armenian into English, transcribed manually with color codes to help identify the data patterns under each pre-defined theme and analyzed according to these themes. The data collection procedures and analyses will be more detailed in Section 3.3.

3.3 Results and Discussion

Pre- and Post-Test (Quantitative Data)

To answer the research questions as to whether there is a difference in the learning outcomes between paper-based handouts and computer-based hands-on DDL, as well as between different levels of language proficiency, statistical analysis of the pre- and post-test results of each group was conducted. First, the results for the elementary group were computed through the Wilcoxon test – non-parametric equivalent of the paired t-test. Table 3.2 indicates a higher value for the critical W (5) than for the observed W (0) for the post-test after the paper-based method, meaning that there is a statistically significant difference. This cannot be observed between the pre-test and post-test after the computer-based training, as the critical W (3) is lower than the observed W (4). This implies that the elementary level learners did not benefit more from the hands-on training, which could be explained by the fact that the sentences in the concordance lines were too long or complicated for them to work with, whereas the paper-based corpus data was adapted, enabling them to gain more from it. Similar findings were drawn from the qualitative data, as reported by the participants, which helped to address the limitation of the uncontrolled variable of the level of difficulty affecting the potential of each target item being amenable to corpus consultation, thus confirming the findings above.

Table 3.2

Wilcoxon Test for Elementary Group Between Pre-Test and Post-Tests (N = 9)

	M	SD	W obs.	df	W critical	Sig. (2-tailed)
<i>Descriptive statistics</i>						
Pre-Test	68.4	12		8		0.05
Post-Test (after paper-based DDL)	82.5	11	0		5	
Post-Test (after computer-based DDL)	72	11	4		3	
Final Test	85.2	10	0		5	

Similar analysis was conducted for the pre-intermediate group. As seen in Table 3.3, the critical values of W (5,5,5) are higher than the observed values of W (3,0,0), which is considered a statistically significant difference between the pre-test and all the post-test results, this implying that both indirect and direct corpus-driven learning

contributed to the learners' grammar knowledge . However, there is no significant difference in the post-test results between hands-on and hand-outs methods. As given in Tables 3.2 and 3.3, the final test results for both levels signify the positive contribution of the overall data-driven learning for both levels.

Table 3.3

Wilcoxon Test for Pre-Intermediate Group Between Pre-Test and Post-Tests (N = 9)

	M	SD	W obs.	df	W critical	Sig. (2-tailed)
<i>Descriptive statistics</i>						
Pre-Test	60	7.42		8		0.05
Post-Test (after paper-based DDL)	67	8.5	3		5	
Post-Test (after computer-based DDL)	70	9	0		5	
Final Test	74.5	11	0		5	

The cross-comparison between the gains on the post-tests and final test for the groups is illustrated in Table 3.4. As can be seen, both groups benefited from the paper-based DDL, where the elementary group improved its performance by 14.1%, which is twice as much as the gain for the pre-intermediate group, 7%. However, this percentage was much lower for the elementary group (3.6%) and almost three times as high for the pre-intermediate group (10%) after the direct hands-on work. This implies that the gains for the elementary group were more from the corpus-driven handouts rather than from the direct use of the corpus; whereas the pre-intermediate group recorded more gains from the hands-on corpus work. Nonetheless, the final test results indicate that both the elementary group (16.8%) and the pre-intermediate group (14.5%) benefited from the combination of direct and indirect uses of DDL, as the critical value of *W* (5) is higher than the observed value of *W* (0) for the final test for both levels, presented in Tables 3.2 and 3.3.

Table 3.4

Gains on Post-tests and Final Test for Elementary Group and Pre-Intermediate Group

Group	Pre-Test Means	Post-Test (after paper-based DDL) Means (M) and Gains (G)	Post-Test (after computer-based DDL) Means (M) and Gains (G)	Final Test Means (M) and Gains (G)
Elementary	M = 68.4	M = 82.5 G = 14.1%	M = 72 G = 3.6%	M = 85.2 G = 16.8%
Pre-Intermediate	M = 60	M = 67 G = 7%	M = 70 G = 10%	M = 74.5 G = 14.5%

Semi-Structured Student Interviews (Qualitative Data)

The next step was to see where the possible differences could lie in the groups' preferences and attitudes towards the use of DDL, which helped to answer the third research question. Semi-structured interviews were conducted in Armenian with each group separately at the end of the DDL treatment and manually transcribed. The analysis was carried out according to pre-existing framework of certain themes, rather than inductively emerging themes, to achieve deeper insights into particular issues under investigation. Therefore, summarized comparative analysis of the patterned data deriving from the responses between the two groups will be presented for each issue, supported with the English translation of the interviewees' original responses.

1. Do you enjoy studying grammar?

Both groups stressed the importance of studying grammar, explaining that it is necessary for them to clearly convey their ideas during international visits, yet very often it is difficult to remember grammar rules or apply them correctly in their speech or writing. They mentioned that it is very common for Armenian teachers of English to devote much time to teaching grammar. However, the approach that they commonly apply is providing direct explanations of rules, followed by practice through grammar exercises.

Interviewee 3 (Elementary): *I think grammar is very important – without studying grammar, you cannot speak the language correctly. I can't say that I enjoy studying grammar, because it is not easy to remember all the grammar rules, but I understand that it is necessary.*

Interviewee 8 (Pre-Intermediate): *Everything is important in studying the language – listening, speaking, the words, and grammar is even more important because it helps us to study the language in an organized way. I really want to improve my grammar knowledge as we have various international meetings, and I want to express my thoughts clearly without an interpreter.*

Interviewee 4 (Elementary): *I think so too ... yes, grammar is important and we need to do more grammar activities. This method, working with the corpus, was completely new. In our schools and universities, I think, teachers do not use this technology; they just explain the rule, and learners have to memorize it and then do some grammar exercises. But this was a new experience, and I liked it. It was interesting.*

2. *How did the DDL, both on paper and on computer, help you improve your grammar?*

Most learners in the elementary group did not share the experience of pre-intermediate learners that computer-based work helped them improve their grammar. They mentioned that working with COCA was not easy and it could be more helpful if they could spend more than a month on it. However, they favored the paper-based approach explaining that it provided simplified language samples that were more comprehensible and relevant for their proficiency level, and, therefore, they did not have to cope with complex sentences in most cases, as during the hands-on work. Conversely, the majority in the pre-intermediate group gave preference to the direct computer-based corpus work, mentioning a number of reasons - the experience of a learning approach that was completely new, the attainment of the new skills of working with corpus tools, the attractiveness of the rich language samples, and the feeling of the confidence that they know where to refer to when the need for solving a language-related problem arises. Even though they mentioned the challenge of dealing with long and often complicated concordance lines, they were impressed by the opportunity to engage with real, authentic language which also gave them a sense of cultural awareness. Both groups correctly noticed that COCA is a huge resource of examples and all possible variants of sentences and patterns.

Interviewee 6 (Elementary): Well, the method itself seems very useful, because it encourages you to engage with the language more, but working with COCA was too challenging – many of the sentences were completely incomprehensible for me. I liked more working with handouts; the method was the same, but the sentences were simple and discovering rules was easier and more interesting.

Interviewee 5 (Pre-Intermediate): I think that education, in general, should teach how to work with data, how to use resources so that students can overcome the challenges they face. Being an instructor at the power plant, I deliver lecturing to interns, but I always feel that knowledge is not enough – they also need hands-on experience to operate equipment. This is the same. Working with the corpus gave us new skills, practical skills. It's like the Chinese proverb "Don't give a man a fish, but teach him how to fish".

Interviewee 9 (Pre-Intermediate): In my opinion, direct corpus experience was more useful. Yes, that's true, there were many examples I was not able to

understand, but it was impressive to see so many examples. In fact, you can meet all the possible examples that are used in the language. Handouts were not so attractive – it was like usual work, but the method was new. Now, when I know how to use the corpus, I feel more confident. And, in general, any new skill or knowledge can give more confidence.

3. Which do you like better – discovering rules on your own or direct explanations of rules?

The answers in the elementary group were not diverse regarding the question above. While they liked the experience of discovering rules in the indirect paper-based approach, they expressed reservations related to that experience in the direct computer-based approach, which they considered time-consuming and too challenging. In the pre-intermediate group, the responses were diverse. Some participants felt motivated about the discovery learning and reported that although there are not any grammar rules in the language corpus, they can find a lot of examples related to the rules, which helps them discover the rule by themselves. However, more learners in both groups preferred direct explanation of rules explaining that it is easier, faster and you avoid making mistakes. At the same time, they acknowledged that discovering rules is pleasant and helps retain information for a long time.

Interviewee 9 (Elementary): The issue is not with discovering rules on my own – yes – that’s really interesting to test yourself, to see whether you have that skill of discovering knowledge by yourself, but the issue is that you cannot do it if you do not understand 80% of the information.

Interviewee 2 (Elementary): I prefer to study grammar rules with the teacher because this way is correct and errorless.

Interviewee 1 (Pre-Intermediate): There are not specific grammar rules in the corpus, but if you search for a grammatical structure, you can find a lot of examples that belong to that grammar rule and you can discover the rule by yourself. This is very useful. But because I have very little time, I prefer direct explanation of rules.

Interviewee 3 (Pre-Intermediate): Of course, I like it when I discover rules on my own. This way I remember the information for a long time. But it is easier when the grammar point is explained.

4. What did you like about concordancing?

What the learners liked about concordancing was the statistical information, the key word in context, and, most importantly, when they succeeded inducing the correct grammar rules on their own. The difficulties were connected with the selection of good examples when dealing with computer-based corpus work, for which they had to read a lot of examples. For the elementary group, a lot of information in concordances was viewed as unnecessary, as they were not able to comprehend the meaning of complex sentences, which is why they gave preference to the simplified corpus-based handouts. What was encouraging about their responses was that they said now they know they can turn to a language corpus to correct their own mistakes or find answers to their own questions related to grammar or vocabulary. A few of them also mentioned the advantage of multiple contexts where the key word is used. In general, they expressed a positive attitude towards working with the language corpus.

Interviewee 3 (Elementary): For me, working with the corpus on the computer was not useful because I had to read a lot of sentences just to find sentences which make sense to me. It might have been useful if I had spent longer time on it. I think it was more effective to work with the handouts when the teacher selected the examples herself. That time, I was able to discover more rules, which was very interesting.

Interviewee 2 (Pre-Intermediate): The most interesting part for me was when I was able to correctly discover the grammar rule, but not always it happened. During this experience, you can discover not only rules, but also yourself, your abilities. I didn't know about a corpus. It's really a good resource for independent work. Now I can explore grammar very easily – just open the corpus and find what you need.

Interviewee 1 (Pre-Intermediate): The statistics of the combination of words is interesting and useful. I also liked the design when you can see the key word underlined in all sentences. It helped to see the word in many contexts and remember it better. In general, I have a positive attitude to this experience. If I need to correct my own mistakes or find some information, I will use COCA.

5. What were the difficulties in working with the corpus?

Among the difficulties pointed out by both groups were related to hands-on corpus experience. According to them, the difficulties were caused by the sentences that

were too long or too complicated to comprehend, as illustrated by extracts above. The elementary group also reported their concerns about the large amount of time spent on corpus work. However, the pre-intermediate group mentioned that despite the challenges above and due to the richness of corpus data they were able to identify many concordance lines relevant to their own understanding and base their inferences upon these samples. There was also mentioning in this group that the richness and diversity of the corpus data is also helpful time wise in finding the right grammatical example.

Interviewee 4 (Elementary): *I like studying foreign languages, but my time is so limited that I can't spend a long time on it. Especially working with COCA required a long time – it has a lot of unnecessary sentences, and most of them are difficult to understand.*

Interviewee 4 (Pre-Intermediate): *Sometimes I have difficulty choosing good examples or sentences – they can be from difficult and boring texts, which I can't translate. So, I have to read all the examples. But there are so many of them that you can find at least a few relevant sentences and form an understanding about that grammar point.*

6. Did corpus-based activities motivate you to use language corpora in future?

Corpus-based activities motivated the pre-intermediate learners to want to do more grammar, as reported by them. Here, the elementary group again stressed the large amount of time required for this endeavor. For both groups, nevertheless, the attainment of new technological skills and the knowledge that there is a rich reference that they can turn to were presented as reasons for motivation for further engagement with language. As a follow-up question related to the role of DDL in language awareness, the learners could not answer whether or not the corpus raised their awareness of the language, but they can already realize that it is a productive way to enhance understanding about the language.

Interviewee 8 (Elementary): *Yes, sure. For example, in my free time I open the corpus and explore it.*

Interviewee 5 (Elementary): *No, I think COCA cannot help me at this moment, but, for sure, it is a useful tool for language learning, and I am happy that I know how to use it. Maybe, I will use it in future when my English improves.*

Interviewee 5 (Pre-Intermediate): *The corpus is a very interesting and useful resource and therefore it motivates me to use it more.*

Interviewee 9 (Pre-Intermediate): *In the past, when I needed to correct my mistakes or find information, I did Google search, but now I can do it with COCA as well. I like new learning programs and new learning processes, so my attitude towards the corpus is very positive. With the help of the corpus, my learning process is becoming more interesting.*

The discussion will be elaborated in the manner to address the research questions of the pilot study in light of the findings observed through the evaluation of the quantitative and qualitative data.

Research Question 1 *Is there a difference in the learning outcomes between paper-based handouts and computer-based hands-on DDL at lower levels of language proficiency?*

The assumption that paper-based and computer-based DDL might differently affect the learning outcomes of the same student cohort was verified by the assessment of learner performance both after the ‘soft’ and after the ‘hard’ DDL instruction. The analysis of the pre- and post-test results for the elementary group documented an insignificant effect of the real, unmodified language, but the substantial contribution of adapted handouts, on the learners’ performance. This difference was also observed between the two post-test results obtained after the ‘soft’ and ‘hard’ instruction. This finding suggests that the elementary level of learners can benefit more from the paper-based approach, which is likely to be due to the input being simplified or tailored to the readability and comprehensibility of the level. Although text adjustments have been criticized by some researchers giving central premise to the authenticity of data in DDL (Daskalovska, 2015; Smart, 2014), it can be stated that corpus-based handouts secure better learner comprehension, when the teacher selects the most suitable instances or adapts them to learners’ needs. It is also helpful when it does not seem worth reading hundreds of concordance lines for learning one element. Saying this, we also acknowledge that the representativeness of the language pattern under exploration is affected. This limitation is elaborated by Gabrielatos (2005) explaining that these putative corpus-informed texts sound as inauthentic as the traditional text, since they are packed with an unnatural number of certain linguistic features, which affects the other

elements of discourse. At the same time, he warns against ‘frequency worship’, which can deprive learners of alternative or idiosyncratic choices, and suggests that “ ‘less frequent’ does not mean ‘less acceptable’, and that ‘infrequent’ does not mean ‘wrong’, and that frequencies change according to context of use” (Gabrielatos, 2005, p.21). The primary evidence above can suggest that even though authenticity of data is sacrificed for its comprehensibility, more increased performance is observed due to the paper-based rather than computer-based DDL at elementary level. In this, respect, we can refer to Boulton (2011, p. 575) claiming that “boundaries are fuzzy, and any identifiable cut-off point will necessarily be arbitrary”. While Cresswell (2007) and Gabrielatos (2005) propose that experience in ‘soft’ or ‘deductive’ DDL can bring learners to a level of competence which will allow them to effectively use ‘hard’ or ‘inductive’ DDL (Cresswell, 2007; Gabrielatos, 2005), this pilot study demonstrated that the elementary level may as well start with the combination of ‘soft’ but inductive dimensions of DDL. The challenge does not appear to be with the inductive means of learning but with the comprehensibility of input learners are exposed to.

Similar analysis of the pre-intermediate group’s performance showed that the latter benefited from direct and indirect uses of DDL almost equally, this highlighting that the differences in paper-based and computer-based DDL instruction are expected to bring about varying degrees of success for learners with different proficiency levels. For the pre-intermediate group, hands-on corpus experience was beneficial as they were able to take advantage of the richness of the input and, consequently, to take more control over their own learning. The results give confidence to state that the quality of the output is largely determined by the quality of input, which enabled the pre-intermediate group to turn the possibility of corpus work into reality. The relevancy of the corpus input allowed them to investigate real language use and more detailed patterns, which gives more accurate and representative picture of a target item, to expose themselves to meaning and use in diverse contexts, to raise their consciousness of language beyond its monolithic representation, and therefore, gain more clues for inducing the meaning and use of lexico-grammatical patterns. Direct corpus consultation also prepares learners for independence, as a long-term asset. In this respect, it is worth mentioning Johns’ (1991) description that hands-on use of corpora is the epitome of induction. It is more learner-centered, allows access to more factual linguistic performance, the discovery of which by learners leads to the construction of their own linguistic competence, as well as gives more control over their own learning.

Research Question 2 *Is there a difference in the learning outcomes between different levels of language proficiency?*

To provide an answer to this research question, a comparative evaluation of the post-test results of the paper-based instruction was conducted between the elementary and pre-intermediate groups. The computation revealed that the gains from the paper-based approach were twice as much for the elementary group as for the pre-intermediate group. However, given the differences in the studied language items, which could have affected the learning outcome, it did not provide enough confidence to suggest that the elementary benefited more than the pre-intermediate group. The comparison between the post-test results of the ‘soft’ instruction and those of the ‘hard’ instruction increased the reliability of the findings that the elementary group achieved almost four times as many gains from the paper-based DDL as from the computer-based, this suggesting that the former approach is more compatible with the elementary proficiency level. One explanation that should be noted in relation with this outcome is the above, acknowledged as a limitation, variable of the difference in the difficulty level of grammar items, when easier items were presented for hands-off work, which could increase the likelihood of more learning gains. The reason for this outcome could also be the influence of the (un)suitability of grammatical items for corpus consultation, which was not minimized. However, on the other hand, it could also be explained that during the hands-off treatment there was more control over such variables, as the readability of authentic input, the amount of input, the cognitive burden, and the degree of teacher mediation, which led to more comprehensible input, also confirmed by the qualitative data, and, hence, better learner performance. To elaborate on how hands-off input works better for low level learners, it can be stated that the input is simplified on the paper leaving out the difficult or irrelevant language in the corpus. Activities are tailored according to learners’ needs and abilities, which is more motivating. The amount of input is reduced through hands-off work, and learners do not have to deal with countless concordances, which is often overwhelming. Thus, the hands-off work shelters learners from many problems of working with raw corpus data (Frankenberg-Garcia, 2014), increasing the comprehensibility and learnability of the target language.

Similar comparative analysis was conducted between the elementary and pre-intermediate post-test results of the computer-based treatment. It showed that the pre-intermediate learners were able to benefit from the hands-on corpus experience thrice as much as the elementary group. This finding suggests that while the elementary group

did not succeed in taking advantage of the computer-based work as the challenges here were not mitigated, but made more gains from the tailored input, the challenges resulting from unmodified input seem to have been overcome by the pre-intermediate level leading to increased performance. The calculations of the post-test results of the pre-intermediate group between these two approaches indicated almost similar performance, which can mean that handouts could be as effective as hands-on corpus work at least for low levels of language proficiency and for short-term learning outcomes. The analysis of the final test results between the two student cohorts administered at the end of the whole DDL treatment, recorded very similar increase in learner performance indicating that both the elementary group and the pre-intermediate group benefited from the combination of the direct and indirect uses of DDL. The findings of this cross-analysis appear to be in line with the perspective that DDL can be beneficial for low-level learners (e.g. Boulton, 2012; Yoon and Hirvela, 2004), thus contradicting the belief that only advanced learners can be entrusted with direct computer-based work (e.g. Granath, 2009). The findings can also serve as primary evidence for the statement that paper-based work with highly controlled activities can provide a gentle lead-in to more open-ended individual work and prepare learners well for further computer-based work (Gabrielatos, 2005).

Research Question 3 What are the learners' preferences and attitudes towards the use of DDL on paper and on computer?

The analysis of the semi-structured student interviews enhanced or confirmed perceptions derived from the quantitative data about a number of issues related to the direct and indirect uses of DDL, and to the use of DDL, in general. The discussion of this qualitative data will be grouped around two broad themes the pilot study was concerned with – the benefits and challenges of DDL, as reflected in the learners' attitudes towards the new pedagogical intervention, and go on to provide the teacher's reflection on certain issues related to this teaching practice.

Benefits of DDL

At the beginning of the interview, the participants stressed the importance of studying grammar for their professional needs and mentioned that the inductive approach of DDL, both on paper and on computer, was a new learning experience for them, as in Armenian EFL classrooms, English grammar instruction is commonly

deductive accompanied with direct explanation of rules. The elementary group apparently favored the paper-based approach primarily due to the simplified input (i.e. mediated by the teacher to suit their level, as discussed above), which mitigated the feeling of irrelevancy of authentic language and facilitated the discovery of linguistic rules. This finding reinforces the finding from the quantitative data, discussed above, that corpus-based handouts are more effective for elementary levels, as the use of prepared materials allows the teacher to tailor activities to learners' needs and abilities (Boulton, 2012) and avoid the indiscriminate use of concordances (Frankenberg-Garcia, 2014). As further analysis recorded, the majority of the pre-intermediate group gave preference to the computer-based corpus work, highlighting the new experience, the new knowledge and skills of new learning tools, the richness of language data, the ease of finding the needed example, the opportunity to engage with real language, as benefits of DDL instruction. Another point experienced in the pilot study was the feeling of confidence that there is a reliable source of language use to resort to in the absence of a native speaker. In Gabrielato's (2005) words, corpus-based introspection, being alternative to native speaker introspection, is empowering as another source of insights into language structure and use.

However, all this makes sense if learners are proficient enough to avail of these opportunities, and this availability was manifested not only in their positive attitudes towards the direct corpus work, but also in their improved learning outcomes, as presented above. Learners' preference for direct hands-on concordancing is encouraging since it provides more opportunity for securing such long-term benefits as noticing, language awareness, implicitness, and autonomy. Although the 5-week hands-on instruction was not sufficient to record this advantage, it can be suggested that through minimal support and mediation, termed 'scaffolding' by Vygotsky (a term coined by Psychologist Jerome Bruner (1966)), which can include strategic questioning by a teacher, structured collaboration, and dialogues within and between groups, learners can achieve self-regulation – an ultimate goal for any education.

Challenges of DDL

The pilot study brought to light some of the fears and challenges of using DDL. One of them is in line with Boulton's (2012) finding that the majority are generally favorable to the DDL approach as a whole, but after some time, they become less motivated, which could be explained by the idea that any novelty appeal diminishes over time. With regard to the preference between the discovery of language rules and

the direct explanation of rules, although most preference was given to the second, this was merely due to the opportunity to spend short time on learning rules. Meanwhile, they felt motivated and encouraged by discovery learning, which, as reported by them, facilitated the retention of knowledge. Thus, the reservations expressed towards DDL are not as much about the inductive mode of learning, nor about being sidetracked by technology, as about the exposure to indiscriminate language input. This created a number of challenges – the learners became less motivated after a while as they had to deal with information in concordances that were difficult to understand because of insufficient knowledge of the target language. As a result, they had to read a lot of examples to be able to select good samples and, therefore, spent a large amount of time. For the elementary group, a lot of information in concordances was viewed as unnecessary, as the search queries resulted in too much, too little, or too complex data which they were not able to comprehend, which is why they gave preference to simplified handouts. This finding was also mirrored in the elementary group's performance, which demonstrated higher results on the post-test of the paper-based instruction than that of the computer-based instruction. As the metastudies on DDL (e.g. Boulton and Cobb, 2017; Lee et al., 2019) note, most studies use DDL for intermediate and higher proficiency levels in academic setting as a writing resource, claiming that DDL works best for these variables. However, this study found that both the elementary group and the pre-intermediate group benefited from paper-based and computer-based work, respectively. Moreover, while in most studies the participants are full-time students, the cohorts of this study are taking their English in the workplace. This suggests that the use of DDL can be extended beyond the confines of academia to professional settings, beyond higher levels to lower levels of English, and beyond teaching lexis or writing to lexico-grammatical constructions. These lead to certain considerations on the part of the teacher, which will be the focus of the following discussion.

Teacher's Perspective on the Pilot Study

The DDL instruction for both groups was delivered by me, and insights were drawn from this experience as a teacher. It is apparently true that the knowledge and skills of using corpus tools equips EFL teachers with confidence that the language they bring into classrooms is 'the real world of language use' (Reppen, 2010); that features about language that had eluded our intuition are brought to light through corpora

(O’Keeffe et al., 2007); that they know the source of descriptive insights for language teaching/learning, which can directly influence the learning process (Bernardini, 2000).

The literature on DDL, discussed in Chapter Two, reports several concerns for teachers with the use of language corpora for pedagogical purposes. The concerns are related to the lack of computers (Tian, 2005), the considerable training required for effective DDL (Turnbull and Burston, 1998), the distortion of authenticity of language input (Kennedy, 1998), overwhelming experience of designing corpus-driven materials (Reppen, 2022; Zareva, 2017). The experience in the pilot as a teacher showed certain ways to address these concerns. Related to technological considerations, it can be suggested that both the lack of computers and the lack of class time can be mitigated when corpus tasks are assigned for homework and class time allocated to soliciting and refining learners’ hypotheses through feedback discussion in the classroom.

Reflecting as the teacher in the pilot, it became apparent that introducing DDL is a ‘disrupter’. This needed to be mitigated and mediated in my role as the teacher. Using DDL challenges the teacher as well as the student, it forces changes in action and mindset. It also requires confidence conviction on the part of the teacher. On my part, I had completed a doctoral module on Corpus Linguistics and Language Teaching within my structured program and so I felt equipped for the challenge of the undertaking and confident that it was worthwhile. From the teacher’s perspective, I also recognize that learners have to be trained in the use of corpora and data-driven procedures. In essence, this means that the teacher, using DDL, is not just trying to promote inductive learning of the rule, but learning *how* to discover the rule. This follows Zaki’s (2016) view that it is no less important for them to understand the benefits and know-how of corpus use, which will lead to more engaging and cognitively conscious language learning process. It should also be recognized that over-reliance on DDL cannot be a total solution or approach to language instruction; corpora provide evidence of actual reality of language use, serving as a source for checking out intuitions, but it does not directly, but most probably indirectly, enable us to experience and exploit real language. Thus, DDL should be treated as an enhancement, rather than substitution for the present teaching methodologies. Learners’ training in corpus use can be provided through a three-hour workshop (see Appendix G), which was accepted by the participants of the pilot with enthusiasm. While direct computer-based work can increase time investment on corpus training, and learners’ readiness to take up hands-on concordancing, it appears to be

more effective in terms of securing long-term learning habits. Therefore, for the main study, this was seen as a crucial component, as we discuss below.

The study also showed that the idea of being sidetracked by technology seem to be irrelevant, since the participants demonstrated interest in obtaining new knowledge and new skills that would contribute to their learning. The issue, as discussed earlier, was not with the reluctance to work with computers or hand-held devices but with the unmediated direct approach of concordancing that caused difficulties in comprehending the raw data. This leads to the consideration of another concern expressed in literature in relation with contrived examples of language, viewing them as distorted representations of language. However, it should be noted that authenticity is not necessarily a predictor for efficiency at low levels of language proficiency, as revealed by the pilot study. If we are to ensure that learning takes place, we should contextualize the input to learners' 'zone of proximal development'. This can be done through teacher-designed materials based on careful evaluation of corpus results in light of the pre-set pedagogical goal. In this respect, it is worth quoting O'Keeffe and Farr (2003), "The more teachers know about corpora and how to use them, the more they will be empowered to evaluate corpus-based materials objectively" (p.412). The pilot experience confirmed the concern that the development of corpus-based tasks is time-consuming; nevertheless, there seem to be one possible way to address this issue – as teachers, we will need to sacrifice time if we are called to contribute to long-term learning assets. Thus, to be able to overcome all these challenges, in-service teachers need to receive training in corpus instruction (a long-standing call as noted in O'Keeffe and Farr, (2003)).

Apart from the findings discussed above from the pilot itself, its overarching goal was to gain insights into the design of the main study - and these are the focus of the following section.

3.4 Insights from the Pilot Study on DDL

The underlying rationale of the pilot was to gain primary evidence for the concept of operationalization of DDL, which is reported inconclusively in literature on DDL, and to help inform the ultimate choice for the methodology of the main experiment, which would enable the research questions to be successfully addressed. The following issues and insights were drawn.

- It can be agreed that DDL should be accessible to learners with different needs and different preferences, but it should also be noted that different language proficiency levels will require different dimensions of the DDL continuum with different degrees of scaffolding and teacher mediation.
- DDL has to be treated as a supplementary (as it was in this pilot experience) rather than substitution for the current teaching practices – a corpus provides evidence of real language use, serving as a source for checking out intuitions, but it does not directly, but most probably indirectly, enable us to exploit the virtual reality of language.
- The cross-analysis of the quantitative data suggested that the pre-intermediate (B1) group succeeded in the hands-on DDL experience, while the elementary (A2) group benefited more from the handouts and had difficulty coping with direct corpus work. For the main study, it was decided therefore to focus on the pre-intermediate (B1) level, who would be able to avail of direct computer-based DDL.
- The issue of ‘technophobia’, which presented a concern before the pilot, was excluded through the interview analysis, when the learners expressed interest in gaining new technological skills for learning purposes and served another major element in the choice of ‘hard’ DDL.
- The pilot study confirmed the efficiency of assigning DDL tasks as homework in terms of saving time and access to computers.
- Even though the pre-intermediate group demonstrated high gain rates due to the direct corpus work, there was still the reported difficulty of working with authentic data. This suggested that the corpus-related tasks should be mediated by the inclusion of instructions guiding learners towards a certain ‘selective’ but authentic input, which is discussed further in this chapter.
- The pilot allowed the research to audit the scale of the work involved for the teacher in the development of the corpus materials. While the time was both crucial and worthwhile, it was important to be aware of the work that it entails when scaling up to the main study.
- This pilot was carried out as an action research, which did not include a control group, and, therefore, leaves doubts as to whether the increase in learner performance was due to DDL and not due to other factors. Hence, there is a need for an experimental design, which will include both a treatment group and a control group.

- Another issue emerged from the pilot was that it only assessed the taught grammar knowledge through controlled activities. To be able to understand the impact of DDL beyond the controlled performance, it is essential to observe language production in free tasks or activities, which will be integrated into the design of the main study.
- Another consideration emerging from the pilot was that DDL cannot be equally beneficial for all language teaching points. Hence, the need for the identification of those language areas that can particularly benefit from DDL treatment – an aspect which was not dealt with by the pilot and would inform a more conscious use of language corpora for future practices.
- As it was designed, the results of the pilot study described the immediate learner performance without any reference to retention of knowledge over time. If we are to gain insights into long-term benefits of DDL, such as implicit knowledge, long-term retention, learner autonomy, language awareness, noticing, and others – which the main study is concerned with – a delayed post-testing has to be administered.

This pilot study investigated the differences in the use of direct and indirect approaches of DDL in grammar instruction with lower level learners (at A2 and B1 levels of proficiency), thus questioning the dominant view in literature that DDL is only beneficial for advanced learners and gaining primary evidence for minimizing its operational uncertainties at low levels. We also note that the study was carried out in an Armenian EFL context where the integration of DDL into conventional language learning was the first attempt. Moreover, the study was conducted in a workplace with adults in a work-based training context rather than in the more often used university setting where full-time students are the participants of DDL studies. It has offered insights into the benefits and challenges of these approaches in this context while also contributing to the ultimate choice for and design of the methodology of the main study. The pilot informed a multi-dimensional design of the main study for further investigation of DDL to experience its potential that has remained unexploited and get a more in-depth picture of its beneficial effects. This will be detailed in the following Section 3.5.

3.5 The Main Study: Research Design

The previous section discussed a pilot study designed for two groups of learners of different levels (A2 and B1) to experience DDL both on paper (hand-outs) and on computer (hands-on) for improving their grammar knowledge. The underlying rationale was to bring to light some of the benefits, fears and challenges of using DDL and inform insights that would help mitigate the potential risks and maximize the possible gains from DDL, thus contributing to the methodology of the main larger-scale study.

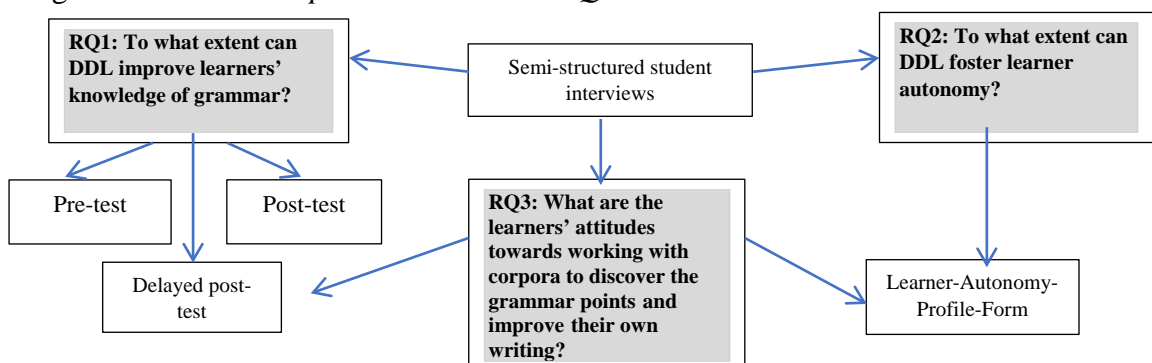
Taking into consideration the insights discussed in Section 3.4, the present study was set up to address the research gaps identified in Chapter Two.

The research questions are repeated here for ease of reference.

1. To what extent can DDL in an Armenian context improve pre-intermediate learners' knowledge of English written grammar items, as measured by the post- and delayed post-test results (described below)?
2. To what extent can DDL foster learner autonomy in discovering grammar knowledge through corpus consultation, as measured by the constructs and components of learner autonomy (described below)?
3. What are the learners' attitudes towards working with corpora to discover the grammar points and improve their own writing, as measured by semi-structured student interviews (described below)?

This study pursued an experimental design as it aimed to conduct comparative evaluation of the impact of conventional EFL teaching and corpus-based learning on language performance and learner autonomy. It is a mixed methods study that obtained both quantitative research data from the pre-, progress-, post-, delayed tests and Learner-Autonomy Profile (LAP) form, and qualitative data from the student interviews. There is strong interrelationship between the research questions and the research methods, and it is depicted in Figure 3.2.

Figure 3.2 *Relationship Between Research Questions and Research Methods*



As informed by the pilot, in order to utilize a corpus to its full data-driven procedures and engage with the investigation of long-term learning benefits, this project employed the direct computer-based approach for the main experiment. The participants were 18 pre-intermediate level students divided into groups: an experimental group and a control group, 9 participants in each group. The proficiency level corresponds to B1 according to the Common European Framework of Reference for Languages (CEFR). The choice of the proficiency level was justified by the pilot study, according to which the pre-intermediate level succeeded in availing of the direct computer-based DDL. The experimental design was prompted by the pilot suggesting that the inclusion of the control group would largely increase the credibility ascribed to the impact of DDL on learning outcome showing that the change in mind and action are not due to chance but due to DDL.

The experimental group received 4-month instruction which integrated conventional instruction and language corpora, thus creating a space for the learners to get more engaged in their learning process, to explore and discover grammatical points and improve their own writing, while the control group only received traditional grammar instruction providing direct explanation of rules and corrective direct feedback on their writing. The choice of this teaching framework for the experimental group was based on the insight of the pilot study that DDL has to be treated as a supplementary to rather than as a substitution for the current teaching practices. The Corpus of Contemporary American English (COCA) was selected for the learners in the experimental group for direct computer-based use, and they received training and support on how to navigate through concordances. The investigated grammar points and writing assignments were related to those studied in their textbook and each week both the treatment group and the control group were assigned four grammar points and two writing assignments. The following sections will provide detailed description of all the above mentioned elements of methodology.

3.5.1 Learner Participants

The participants of this research were 18 pre-intermediate level selected employees of the Armenian Nuclear Power Plant (ANPP), aged 25-45, who were studying English as a foreign language and had classes twice a week for three hours each at the Training Center of ANPP (see Appendix O for the metadata of all the

participants). The study used the principle of convenience sampling, as in the pilot study, where the researcher selects the research sample based on ease and proximity to the researcher: the students are easy to reach and easy for the researcher to contact and, therefore, convenient in her research. There were a few reasons that justified their recruitment. There were no changes in the learners' academic timetable, and it was possible for the new pedagogical treatment to be implemented in a real class time integrated into the conventional EFL classroom. The requirements of the experimental design of the study were met, that is the formation of a treatment group and a control group of the same level was feasible, and both groups were taught by the same teacher/researcher to ensure identical conditions. And no less importantly, the genuine relationship - having been established between the researcher and her students - allowed for more authentic and reliable responses.

The English classes were meant to enable the staff members to open up a wide variety of important reference material, guidelines, procedures, and others that is often only in English. Most importantly, they needed to improve their grammar to be able to write and communicate effectively for a variety of professional and social settings, including conferences, seminars, and workshops. The implementation of the direct computer-based DDL was assumed to promote a more effective language teaching and learning process and equip the learners with autonomous learning skills, thus satisfying their language learning needs.

3.5.2 Ethics and Data Compliance

Ethical clearance for carrying out this experimental study was sought from and granted by the Mary Immaculate College Research Ethics Committee (MIREC). The following steps were set out to adhere to the research ethics procedures and guidelines and ensure the ethical treatment of the participants:

- The ANPP Training Center Manager was sent an information letter introducing the goals and procedures of the project in a written form (see Appendix A for Information Letter), which was followed by a consent form (see Appendix B for Consent Form) signed by the manager.
- The students were informed about the purpose of the research and grouped based on their consent for participation both in the experimental group (see Appendix C for Information Letter and Appendix D for Consent Form) and the pre-test results. Prior to a person being able to participate in the research activities, their

informed consent was obtained. This duty was delegated to a third party, the researcher's assistant, to make sure that the consent was given freely and voluntarily and no coercion was used to obtain a person's consent.

- Prospective participants were fully informed about all the aspects of the research during a class by the researcher and given sufficient time to make decisions on their own participation. The information was provided in writing, as well as verbally. The brief information on the benefits of DDL predisposed the participants positively towards the application of more challenging practices in their learning process.
- The aspects of the project that might reasonably be expected to influence their willingness to participate included the nature and objectives of the project, the potential benefits, the requirements for participation, and confidentiality. The consent was explicit and obtained in writing. Participants were informed about their right to refuse to participate in or withdraw from the research at any stage without fear of consequence, and that this right would be respected.
- Agreement for participation was also obtained from the control group (see Appendix E for Information Letter and Appendix F for Consent Form).
- The administration of the Learner-Autonomy-Profile form and semi-structured student interviews were performed by an independent party to ensure the anonymity of participants and the voluntary nature of the research.
- During data collection, Mary Immaculate College research ethics procedures and guidelines were adhered to. Participation was voluntary, and all participants who opted in were asked to sign a consent form to allow the data to be used for research purposes. The participants were told about the general nature of the study, assured of confidentiality and maintenance of dignity and welfare, and offered the opportunity to receive a report about the results and conclusions of the research project.
- The data drawn from tests, questionnaires, and interviews were anonymized. Participants were not identified by their actual names, but assigned codes, were not discussed outside the research context, and research findings were presented as a summary report.
- Access to information about individual participants was restricted to the researcher and any research assistants on a need-to-know basis. External examiners only accessed the research project report, which included anonymized data.

- With regard to the storage of research materials, which included consent forms, pre- and post-tests, questionnaires, recorded interviews, and student writing samples, they were managed to ensure their security and integrity. Audio recordings were deleted immediately after transcription was complete. Original records of research materials and data were anonymized, encrypted, maintained accurately and stored securely in a locker, including data held on a password protected computer accessible only by the researcher.
- The storage and accessibility of the materials and data will be managed in a durable and retrievable form. They will be retained indefinitely as required by the researcher and safely disposed of at the end of the retention period.

3.5.3 Corpus Training

For the operationalization of the DDL approach, both a corpus and a tool to exploit it are essential. While any type of corpus could potentially be used in DDL, it is also worth noting that the selection of a corpus determines the ‘value and usefulness of the concordance’ (Whistle, 1999, p. 78). The ultimate success of DDL cannot be achieved without a tool used to exploit the corpus. Breyer (2006) mentions the overlooked role of concordancers in language pedagogy. While any type of concordancer can be used in the language classroom, and the distinction is not clear-cut, it is important for a concordancer to possess certain features, which include: responsiveness of search, the possibility to download quickly, the multiplicity of samples, the instantaneous sorting of the output (Stevens, 1995), and the possibility of creating exercises (Gilquin and Granger, 2010). Boulton (2008a, p. 38) also stresses the feature of user-friendliness of a corpus intended for learners who have to ‘get to grips with the new material (the corpora), new technology (the software), and a new approach (DDL) all at once’.

The approach taken to corpus training in this main study was in line with that which had been used in the pilot study. The introductory training was a three-hour session held at the Training Center of the ANPP, during which the treatment group received training in how to work with the analytical tools of the Corpus of Contemporary American English (COCA). Initially, the choice of the corpus was conditioned by the fact that it is a free technological tool and can be used online or downloaded for offline use (<https://www.english-corpora.org/coca/>). It is, therefore, easily accessible, and motivating for those who would be interested in pursuing their

own searches in future. The choice was later on justified by the pilot when the pre-intermediate learners recorded increased performance in the taught grammar after the direct hands-on corpus work.

The tools and their functions were demonstrated and explained on a large screen and practiced by the participants through their own mobile phones. The training material (see Appendix G) was provided both in English and in Armenian to ensure that the information was fully accessible to all the participants. Thus, the training covered information on frequency analysis, which reveals the most frequent words in a corpus and brings more objectivity into conclusions. They learnt how to investigate words in units through the clustering technique, which provides more contextual information about the use of the word. The concordance tool was introduced to enable the researchers to investigate the linguistic item in its co-text, characterized by the surrounding words of that item. To observe collocational relationship between words, or, as Stubbs (2001) defines, statistically frequent co-occurrence of words, the learners were taught the use of the collocation tool. Keyword analysis was explained, where the high frequency of words in one corpus is compared with a reference corpus, providing indications of the ‘aboutness’, style, and proper nouns of a particular text, by revealing the significantly key words in a corpus (Scott, 1999). Besides being able to use the corpus tools, reading concordances is also a new skill that requires training. Instead of the habitual left-to-right and line-by-line process, learners need to acquire the habit of a ‘center-outward’ reading.

3.5.4 DDL Materials

Concordances may be presented in various ways. As Breyer (2006, p. 162) presents, the range of activities is ‘limited only by the imagination of the user’. Presentations can be in KWIC format, or in complete sentences, selectively, edited, or in original form, on screen, printed, or as hands-on work, each having its challenges and benefits. Johns (1986, p. 157) notes the challenge of ‘unfinished sentences’ in the KWIC format for beginners. However, Boulton’s (2009a) study reports on a better learner performance at a low-intermediate level due to KWICs rather than complete sentences, as patterns become more visible when all the occurrences of the search word are aligned under one another.

Another issue that needs to be considered is the extent to which authenticity of data is manipulated. Manipulation, as already discussed in Chapter Two, may aim at manageability, readability (Kuo et al., 2001), frequency (Levy, 1990), usefulness (Tribble, 1997), as well as simplification (Gabrielatos, 2005) and editing (Wicher, 2020). Boulton (2009b) advocates not undermining the authenticity advantage of DDL, as it allows learners to get exposed to the realities of the language they are likely to encounter outside the classroom. In this respect, the pilot study served as primary evidence so as to be confident that the pre-intermediate level is capable of coping with authentic corpus input and therefore gaining more clues for inducing the meaning and use of lexico-grammatical patterns.

DDL activities, as shown previously, range from teacher-led to learner-led (Gabrielatos, 2005; Mukherjee, 2006), where the former provides more controlled tasks and the latter stimulates discovery learning (Bernardini, 2004). This range may include cloze tests, fill-in exercises, grouping patterns, finding the missing word, translations through a bilingual corpus, error correction, editing, revision of one's own work, and others. Hunston (2002, p. 171) claims that discovery learning can be suitable for 'very advanced learners who are filling in gaps in their knowledge rather than laying down the foundations'. However, driven by the aim to take the most advantage of DDL components, as well as the exclusion by the pilot of the issue of being sidetracked by technology, this study chose to implement discovery learning with pre-intermediate level learners to mobilize their cognitive skills, thus securing the long-term benefits of noticing, awareness, and autonomy. It employed the hands-on approach to avoid any manipulation of data and maintain the authenticity advantage of DDL. In the meantime, the study pursued the insight of the pilot that there should be a certain level of control over such variables, as the difficulty level of authentic input, the amount of input, the cognitive burden, and the degree of teacher mediation. This was expected to result in authentic but selective contextualized input. It trained the learners in a variety of corpus tools to help prevent tediousness and empower them to turn to corpora as a 'sleeping resource' (Johns, 1988, p. 22) whenever the need arises.

Considering the restrictions of the teaching environment, such as the lack of computers in the classroom and time constraints, the corpus work was assigned for homework, which was guided by the teacher through materials with certain guidelines, instructions, and activities related to a particular grammar item and followed by feedback discussions in the classroom (see Appendix I for samples of teaching

material). The pilot study had confirmed the efficiency of assigning DDL tasks as homework, which helped mitigate the challenges caused by the lack of class time and the lack of computers. By checking the completed tasks, the researcher made sure that the homework was actually done. Guided by the epistemological stance of this study, discussed in Chapter Two, there was a need to come up with a planning strategy that would reflect the nature of learning at a smaller scale, and, therefore, the following 5-step guided procedure was adopted, which was broadly in line with the approach taken in the pilot that was based on the four-step model, developed by Chujo and Oghigian (2008), and proved to be effective. This hands-on experience was mediated with tasks devised and guided by the teacher. The steps are as follows: (1) Form hypotheses through inductive corpus-driven tasks; (2) Share hypotheses in groups; (3) Verify the validity of hypotheses with the teacher; (4) Practice the language point in a follow-up controlled exercise; (5) Produce the language item through follow-up activities. This 5-step procedure aligns well with the paradigmatic stance adopted by this study. In the first step, the students had access to the authentic data on the computer, which demanded discovery of lexico-grammatical patterns through individual work outside the classroom according to the teacher-devised materials with guidelines and related activities. This procedure accords with the shared epistemological ground for DDL and constructivism, where learners engage in cognitive processes when grappling with raw data to detect patterns (Boulton, 2010; Cobb, 2005; Johns, 1994; O'Sullivan, 2007; O'Keeffe, 2020), rather than in artificial intellectual memorization and application of transferred rules. In the following step, the learners shared their hypothesized findings in groups and the ways they arrived at a conclusion on a grammar rule. This was followed by discussion of learner feedback with the teacher with the aim to check the validity of hypotheses. These stages emphasize the social dimension in the development of language and thought, which is a converging point between DDL and socio-cultural theory (Huang, 2011; O'Keeffe et al., 2007; O'Keeffe, 2020). It is through this stage that individual's cognitive processes are mediated psychologically (Vygotsky, 1986), and language, as one such psychological tool (Swain, 2006), allows learners to interact for meaning and shape and reshape their cognition (Flowerdew, 2015). The next stages allowed the learners to practice the grammar points in both controlled and free tasks. This follow-up controlled practice included various activities – gap filling, multiple choice, matching, transforming, and error correction. The integration of free tasks was prompted by the pilot to help observe the impact of the hands-on corpus experience beyond the controlled performance and see if the new grammar knowledge is also

mirrored in language production as a less controlled performance. To achieve this aim, the learners were assigned free paragraph writing tasks on particular topics that assumed the use of the taught grammar items and correction of errors to improve their own writing (see Appendix T for a sample lesson plan integrating the 5-step teaching framework). These stages are follow-up procedures to understand the effect of the interface between such important usage-based assumptions that are common in DDL and SLA, as the enhanced input promoting noticing of corpus data in the form of concordance citations and the cognitive effort in discovering lexico-grammatical patterns and abstracting rules, which might best facilitate language acquisition (O’Keeffe, 2021). This same approach was adopted for the design of the tests to assess the taught language performance both in controlled and in free tasks. This will be the focus of the section on Instrumentation.

Both the experimental and the control group covered a range of grammar points (see Appendix P for the complete syllabus) These included: *past simple statements, questions, and negatives; used to; quantifiers – many, much, few, little, enough, as...as; indirect questions; wish; past simple versus present perfect; future simple – be going to versus will; modals for necessity and suggestion – must, have to, need to, should; ought to, had better; two-part verbs; requests with can, could, would, would you mind; expressing purpose with infinitive and gerund; -ing after prepositions; infinitives for giving suggestions (be sure to; make sure to, etc.); adverbial clauses of time (before, when, after); real conditional; verbs followed by –ing; expressing agreement with positive and negative statements (e.g. So do I. Neither can I.); present simple passive and past simple passive; past continuous versus past simple; present perfect continuous; participle 1 and participle 2; relative pronouns (who, that, which); modals for permission, prohibition, obligation.*

The control group received explicit explanation of the abovementioned grammar rules and direct corrective feedback on their writing in English. Practically, the grammar instruction was carried out through a 2-step procedure: (1) Study the grammar rule explained by the teacher; and (2) Practice the grammar rule through follow-up activities.

3.6 Instrumentation

In order to obtain data to answer the research questions above, a multidimensional investigation was conducted. The data was collected through pre- and post-tests, progress tests, delayed post-test, Learner-Autonomy-Profile (LAP) Form, and semi-structured interviews with students. The post-, progress-, and delayed post- tests were used to understand the extent to which self-construction and co-construction of knowledge, aligned with the study's paradigmatic stance, could contribute to the development of grammar knowledge, which the first research question aimed to answer. They particularly informed about the conspired impact of the enhanced input and cognitive effort, stimulated by DDL, on the learnability of the target items. Furthermore, these instruments provided insights as to what extent the usage-based characteristics, such as salience, statistical processing, form-function contingency, pervasiveness of data, process-orientedness, promoted by DDL, were able to facilitate the abstraction of unifying concepts to arrive at prototypicality. It also became possible to engage with the contribution of cognitive processes of noticing, discovery, induction, and hypothesis-formation to long-term retention of knowledge. This understanding was fueled by the qualitative insights gained through student interviews, which uncovered the challenges, fears, and benefits of knowledge construction through corpus consultation, which was the aim of the third research question. The LAP form was helpful in finding out the effectiveness of the inductive direct corpus use, underpinned by the constructivist theory of learning and usage-based model of instructed SLA, in fostering autonomy in language learning, thus answering the third research question.

3.6.1 Pre-Test, Post-Test, Progress Tests, and Delayed Post-Test

The participants took a pre-test and were grouped into two groups of 9 students so that the mean scores of the test results for both groups were comparable. This was done to ensure identical conditions and reduce variability in the experimental results.

Similar to the practice of grammar points, the tests were designed to measure the learners' grammatical performance through grammar tasks testing the grammar items discretely, through error correction and free writing as parallel tasks to see if the grammar knowledge gains were also mirrored in less controlled activities. The integration of free tasks into the test design was informed by the pilot suggesting that in order to be able to understand the impact of DDL beyond the controlled performance, it

is essential to observe language production in free tasks or activities. The section on discrete grammar items contained 80 points and covered all the target items each tested through a number of questions to increase the credibility of the results. The error correction section, which scored 10 points, included 20 errors related to all the studied points, except showing agreement (e.g. *so do I; neither can I*), for the learners to notice and correct. The composition writing section was analyzed based on the proportion between the total number of the target items used by the learners and the number of their correct uses. The pre-test (see Appendix J) assessed the learners' current level of language skills before the integration of the corpus-driven learning into language classroom. The post-test (see Appendix K) determined the impact of the new treatment on the immediate learning outcome after the corpus-based instruction. This data was product-oriented and the comparison of the mean scores of the post-tests between the groups revealed the extent to which the learners were able to improve their knowledge of grammar, thus answering research question 1. The 7 progress tests contained grammar points, an error correction and a paragraph writing assignment each, with a total highest score of 40. These tests assessed the attainment of shorter-term immediate explicit knowledge contributing to answer research question 1. The observation of these tests also provided insights into which language items benefited more from the DDL instruction and whether there was any change between two immediate performances on a progress test and the post-test, and afterwards between immediate and delayed performances. The understanding that DDL cannot be equally beneficial for all language teaching points was another consideration emerging from the pilot study, giving rise to the need for the identification of those language areas that can particularly benefit from DDL treatment – an aspect which was not dealt with by the pilot and would inform a more conscious use of language corpora.

The delayed post-test (see Appendix L) was administered three weeks after the post-test. The design of the pilot study was such that it only described the immediate learner performance without any reference to retention of knowledge. If we are to gain insights into long-term benefits of DDL, a delayed post-testing has to be administered, which will provide answers related to the long-term retention of the taught items, as advocated by Han and Finneran (2014). Thus, the analysis of the delayed post-testing revealed the rates of changes, gains, and losses between the three tests. The comparison between the post-test and delayed post-test results measured the contribution of the cognitive strategies of DDL to knowledge retention in a longer term, thus providing a more comprehensive answer to research question 1.

3.6.2 Learner-Autonomy-Profile (LAP) Form.

To assess learner autonomy, as one of the long-term benefits of DDL reported in literature, and address research question 2, the LAP Form was distributed to both the experimental group and the control group at the end of the investigation (see Appendix M). Taking into account the components of learner autonomy and how they are fostered through language corpora, a form in English was developed to profile the four key constructs of learner autonomy: affective and motivational, action-oriented, cognitive and metacognitive, and social components. The form is adapted from Tassinari's (2012) study 'Evaluating learner autonomy: a dynamic model with descriptors'. It contains 30 items and measures the scores on a five-point Likert scale where the items ranged from 1 to 5 (1 = never; 2 = seldom; 3 = sometimes; 4 = often; 5 = always), each score meaning how often the learner performs the behavior. More specifically, the entries between 1 and 2 were interpreted as resistant behavior towards independent skills; those between 2 and 3 meant that the learner had a neutral attitude towards these skills; the entries between 3 and 4 were considered as demonstration of neutral to positive attitude; and the values from 4 to 5 were interpreted as expressions of a supportive approach to the attainment and implementation of self-regulated learning skills.

The affective and motivational component aimed to measure the learners' willingness to do more challenging things, improve their independent language learning skills, among others. The action-oriented component elicited feedback on the learners' abilities, knowledge, and skills related to: selecting and using a variety of materials and resources, choosing different methods and strategies, choosing to learn outside the classroom, addressing language corpora to solve language-related issues, studying independently to improve their grammar knowledge, correcting their mistakes to improve their own writing, and managing their learning independently. The assessed features under the umbrella of cognitive and metacognitive component included the abilities to analyze structures and patterns in L2, compare them with L1, draw conclusions from their own observations and recognize culturally specific similarities and differences. It also assessed the learners' abilities to evaluate, make decisions, and reflect on materials and resources for language learning, as well as awareness of their strengths and weaknesses, and their personal growth as a language learner. The evaluation of the final, social, construct targeted the learners' abilities to learn with and from others, to work in pairs and groups, to modify their stance to achieve a group decision, to ask competent L2 speakers for help, and decide whether to cooperate with others or work independently to structure their own learning better.

To find out whether the items are closely related as a group and reliably measure the underlying construct of learner autonomy, Cronbach's Alpha was used as a measure of internal consistency reliability. The Reliability Statistics in Table 3.5 provides the actual value of alpha coefficient close to 1, $\alpha = 0.813$, indicating that these multi-scaled items have relatively high level of internal consistency. This calculation confirmed the relevancy and interrelatedness of the questions, meaning that the designed questionnaire could reliably measure the variable of interest and, therefore, could provide an accurate evaluation of an individual's relative capacity to take on a self-directed approach to language learning.

Table 3.5

Reliability Statistics for LAP Questionnaire

Learner Autonomy and its Components	Cronbach's Alpha	Cronbach's Alpha based on Standardized Items	Number of Items
Learner Autonomy	0.813	0.797	30
Affective-Motivational	0.743	0.724	5
Action-Oriented	0.810	0.805	9
Cognitive-Metacognitive	0.814	0.790	11
Social	0.736	0.711	5

To ensure that the questionnaire measures one dimension or variable, it was also attempted to measure the correlation between the items of each of the four learner autonomy constructs separately. The outputs, interpreted as good ($0.9 > a \geq 0.8$) and acceptable ($0.8 > a \geq 0.7$) internal consistency, confirmed that the unidimensionality of the questionnaire could guarantee meaningful interpretation of results.

This instrument helped to answer whether and to what extent the new pedagogical intervention enabled the learners to take on a self-directed approach to language learning.

3.6.3 Semi-Structured Student Interviews

Semi-structured student interviews were conducted in focus groups with all 9 participants of the experimental group based on their consent at the end of the

experiment. Similar to the format of the pilot study, the interviews were conducted in Armenian to ensure the accurateness and completeness of the interviewees' responses. The interviews aimed at exploring the learners' engagement in the learning process, the change in their attitudes towards their own learning, the development of their language learning skills, and the ways of demonstrating autonomous abilities in working with concordances. Qualitative data help to observe unobservable areas and gain 'an understanding of the lived world from the perspective of the participants involved' (Richards, 2009, p.187).

Fifteen questions (see Appendix N) were designed that would allow the area of investigation to be adequately explored but at the same time would be open enough to allow a certain degree of diversion. In particular, the questions were aimed at providing insights into the impact of corpus work on the learners' knowledge of grammar and improvement of their writing, on their attitude towards studying grammar and writing in L2, as well as on their awareness of language. They were also meant to receive feedback on the learners' experience with discovering rules and correcting their own mistakes through hands-on work, as compared to direct explanation of rules, their preferences for textbook-based and corpus-driven grammar activities, the challenges and benefits of the novel practice, their motivation to continue using corpora independently, and their understanding of an effective language learner. The interviews were transcribed and analyzed according to certain themes: DDL as a grammar development resource; DDL for cognitive stimulation; DDL and its challenges; and DDL for independent learning. The collection and methodological approach to the analysis of the interview data will be discussed in more detail in the following section. This qualitative data helped to answer the third research question on learners' attitudes towards working with corpora to explore grammar points and improve their own writing.

3.7 Data Collection and Analysis

As mentioned above, the research data is both quantitative, from the pre-, progress-, post, delayed post-tests, the LAP Form, obtained both from the experimental group and the control group, and qualitative, from the student interviews with the treatment group. The pre-test was conducted at the beginning of the research. The progress tests were administered throughout the treatment. At the end of the research,

after the four-month treatment, the post-test was administered and the LAP Form with the confidentiality report was distributed. The student interviews were carried out with the experimental group after the research by an independent party to ensure the anonymity of participants and the voluntary nature of the research. The delayed-post testing was administered after a three-week interval of the new pedagogical intervention.

For the analysis of the quantitative data, the Statistical Packages for Social Science (SPSS) was used. In the first stage, to understand the descriptive quality of the data, the averages and variances of variables of the pre- and post-tests were calculated through descriptive statistics. The significance of the difference was calculated through non-parametric equivalents of independent t-test and paired t-test, which allowed us to run four comparisons and calculate their effect sizes, as well as measure the contribution of cognitive strategies to retention of knowledge. Thus, the Mann-Whitney U-test was used to analyze the pre-test results between the experimental group and the control group. Similar computations were conducted for the post-test results between the two groups. Further, the control group's performance was compared between the pre-test and post-test through the Wilcoxon test, followed by similar comparison for the experimental group. The relative size and magnitude of the effects for the above-mentioned four comparisons were assessed through Cohen's *d* test. To more closely examine those areas in which the possible differences could be detected, the mean values of the learners' performance on each section of the pre-test and post-test were calculated for each group. Similar computations were applied to the seven progress tests for both groups, as well as each section of the tests, to reveal the learners' immediate performance affected by both types of instruction and identify those language areas that are more likely to benefit from DDL instruction. Thus, all these statistical cross-analyses allowed us to answer the first research question on the extent to which the inductive grammar teaching and indirect error correction technique of DDL instruction could improve learners' knowledge of grammar.

In the second phase, descriptive statistical procedures were used to compute the averages and variances of the delayed test results for both the control group and the experimental group. To understand the rates of change during this interval, a comparison was conducted between the three tests. To get deeper insights into this finding, the rates of the gains and losses in percentages in separate areas from test to test were computed. Detailed investigation was carried out into the learners' performance on

each grammar item on the way from declarative explicit knowledge to proceduralized implicit knowledge, as measured by the progress test, post-test, and delayed post-test, to gain understanding as to which particular grammar aspects had higher retention in the long-term memory. There was also an attempt to measure the strength and direction of the relationship between test results, for which Spearman's Rank Order Correlation was conducted between the mean gains on the progress tests and delayed post-test, as well as between the mean gains on the post-test and delayed-post-test. These analyses provided more comprehensive answers to the first research question adding insights into the contribution of cognitive strategies to the acquisition of taught knowledge.

For the analysis of the LAP Form, the mean values for the overall responses of both the experimental group and the control group were computed. In the following stage, the mean values for the separate learner autonomy components were calculated. Before data collection, reliability statistics was carried out through Cronbach's Alpha to confirm that the items in the questionnaire are closely related as a group and reliably measure the underlying construct of learner autonomy. Another attempt was made to measure the strength and direction of the relationship between the learners' performance on the delayed post-test and their autonomous learning skills, for which Spearman's Rank Order Correlation was used. In this stage, we were able to answer the third research questions that sought to find out the extent to which DDL could contribute to independent learning skills.

Finally, learners' responses to the semi-structured interview questions were translated from Armenian into English, transcribed manually, color coded, and analyzed according to certain themes (see Appendices Q and R). Semi-structured interviews involve a set of questions that are asked to all participants, but use an open-ended interview format where interviewees are 'encouraged to elaborate on the issues raised in an exploratory manner' (Dornyei, 2007, p.136). Thematic analysis refers to a method for 'identifying, analyzing, and reporting patterns (themes) within data' (Braun and Clarke, 2006, p. 79). The current study based the analysis on a six-stage process, suggested by Braun and Clarke (2006), which involved a sequence of data transcription, data coding, theme searching, theme reviewing, theme defining, and reporting. The reason for the implementation of this approach was its possibility to create a 'thematic network', or otherwise stated, 'a way of organizing a thematic analysis of qualitative data' (Attride-Stirling, 2001, p. 387).

Despite the subjective and interpretative nature of thematic analysis, this study managed to secure methodological rigor upon which 'the exploratory and explanatory

power' of thematic analysis rests on (Attride-Stirling, 2001, p. 403). This was achieved by selecting a deductive approach to the analysis. While inductive approach analyses the data according to themes that emerge naturally, deductive approach does it on the basis of pre-existing frameworks. The rationale behind the selection of a deductive approach for this study was in the high expectations of certain themes to emerge that would provide more comprehensive and deeper insights into the issues under investigation. In this respect, Braun and Clarke (2006) note that if questions prepared for interviewees are recorded as themes, the analysis will be of little or no use. It was also planned to employ an inductive approach if any unexpected theme was to arise; however, this was not the case. Another step to ensure that the identification of themes was robust was to consider the sufficiency of patterned data to support each individual theme.

On a practical level, first the interview recordings were transcribed in English and looked through so as to increase familiarity with the data. Next, the transcription was color coded, which involves highlighting sections, sentences, or phrases in different colors each corresponding to a code describing an idea or feeling. Then, the coded data was collated together to gain an overview of the recurring points. Generation of themes was achieved by identifying patterns among the codes and combining them into themes. The review stage was necessary to make sure that the themes accurately represented the data. Finally, the identified themes were defined and named as: DDL as a grammar development resource; DDL for cognitive stimulation; DDL and its challenges; and DDL for independent learning. The discussion of the themes was supported by informant quotes that served the representativeness of a particular theme. Privileging the objectivity in the perception of the issues under study, any emerging pattern, even those against the preliminary assumptions, was considered part of the richness of data and was not excluded from discussion.

3.8 Conclusion

This chapter presented the pilot study and set out the research methods used to address the research questions of the main study, which aimed to investigate the contribution of DDL to grammar knowledge for low level adult learners outside the academic setting in the Armenian context, its impact on the development of independent learning skills, as well as learners' attitudes towards corpus consultation. As presented above, this is a mixed-method study, which obtained its evaluation quantitative data

from pre-, progress, post-, delayed post- tests and Learner-Autonomy-Profile Form, and the qualitative data from semi-structured student interviews. The study employed 18 participants of pre-intermediate level (B1), aged 25-45, studying English at the Training Center of the Armenian Nuclear Power Plant. They were divided into an experimental group and a control group. The experimental group received longitudinal, 4-month instruction which integrated conventional instruction and language corpora, thus creating a space for the learners to get more engaged in their learning process, to explore and discover grammatical points and improve their own writing, while the control group only received a conventional approach to grammar instruction with direct explanation of rules and direct corrective feedback on their writing. The investigated grammar points were related to those studied in their textbook and each week four grammar points were introduced to both groups and practiced through various types of controlled grammar activities presenting grammar items discretely, through error correction tasks and free writing tasks. The Corpus of Contemporary American English (COCA) was selected for the learners in the experimental group for direct computer-based use, and they received support on how to navigate through concordances. This hands-on experience was scaffolded with tasks designed and guided by the teacher.

Similar to the practice of the grammar points, the tests measured the learners' grammatical performance through grammar tasks testing the grammar items discretely, through error correction and free writing as parallel tasks to see if the grammar knowledge gains were also mirrored in less controlled activities. Thus, the pre-test ensured identical conditions for both groups before the integration of DDL instruction and comparable data to answer the research questions mentioned above. The progress tests assessed the attainment of each grammar point immediately after the corpus treatment, and the post-test provided a product-oriented data that determined the impact of the new treatment on the learning outcome after the four-month corpus-based instruction. The delayed post-test was administered three weeks after the post-test to reveal the rates of changes, gains, and losses between the three tests. The comparison between the post-test and delayed post-test results measured the contribution of cognitive strategies to long-term retention of knowledge and provided insights into which language items could be more amenable to DDL instruction. These analyses addressed research question 1. In order to address question 2, which was concerned with understanding of how learner autonomy could be fostered through language corpora, the LAP form, profiling the four key constructs of learner autonomy: affective and motivational, action-oriented, cognitive and metacognitive, and social components, was

administered at the end of the investigation. Finally, semi-structured student interviews were conducted to address research question 3, which aimed at exploring the learners' engagement in the learning process, the change in their attitudes towards their own learning, the development of their language learning skills, and the ways of demonstrating autonomous abilities in working with concordances. These research methods provided rich evaluation data, and the results gained from this data will be the focus of the following chapter – Chapter Four.

CHAPTER FOUR

RESULTS

4.1 Introduction

The research gaze of this study, informed by the gaps identified in the literature and discussed in Chapter Two, focuses on an attempt to add to the body of empirical studies on DDL at low levels of language learning to complement the theoretical arguments and qualitative data that currently dominate the discussions of DDL. More specifically, it aims to investigate the contribution of DDL to low-level learners' grammar knowledge and learner autonomy in the Armenian context within the ethos of Constructivism and usage-based model of language learning, thus fostering reciprocity between theoretical and pedagogical underpinnings of DDL.

The longitudinal investigation, carried out through the research methods introduced in Chapter Three, helped to answer the following research questions:

4. To what extent can DDL in an Armenian context improve pre-intermediate learners' knowledge of English written grammar items, as measured by the post- and delayed post-test results (described below)?
5. To what extent can DDL foster learner autonomy in discovering grammar knowledge through corpus consultation, as measured by the constructs and components of learner autonomy (described below)?
6. What are the learners' attitudes towards working with corpora to discover the grammar points and improve their own writing, as measured by semi-structured student interviews (described below)?

The results of the evaluation data collected from pre-, post-, progress, and delayed post-tests, the LAP Form, and semi-structured student interviews are the foci of this chapter consisting of eight sections. The first six sections present a comparative evaluation of conventional and corpus-based instruction, the impact of DDL on learner performance in grammar through statistical analysis of test results, as well as identification of those language teaching points that benefited more from DDL in terms of long-term retention. The seventh section reveals the contribution of DDL to learner autonomy. Finally, the qualitative data obtained from semi-structured student interviews is analyzed according to certain themes.

4.2 Pre-Test and Post-Test (Quantitative Data)

The pre- and post- tests (see Appendix J and Appendix K), which measured the learners' grammar knowledge, were conducted to obtain comparable data for both groups and answer the first research question as to what extent the learners could improve their knowledge of grammar as a result of the integration of DDL in their learning. As introduced in Chapter Three, the pre-test was administered to ensure identical conditions for both groups, and the post-test was conducted to assess immediate learner performance accounting for explicit knowledge. The tests tested the knowledge of grammar items discretely through controlled tasks, error correction tasks, which also helped to explore the development of noticing skills, and free paragraph writing tasks, which made it possible to move beyond the declarative performance and explore the reflection of the instructed knowledge in free language production. The analysis of the three sections of the tests will be treated separately below.

Grammar

The grammar section of the pre- and post-tests covered all the taught grammar knowledge and was scored based on the correct uses of the target grammar items. The data was analyzed through Mann-Whitney U and Wilcoxon tests, the non-parametric equivalents of independent t-test and paired t-test, which allowed us to run four comparisons and calculate their effect sizes, as discussed below. The analysis related to which target items benefited more from DDL treatment will be the focus of further sections.

To understand the descriptive quality of the data, first the averages and variances of variables of the pre- and post-tests were calculated through descriptive statistics, as illustrated in Table 4.1. The descriptive analysis on the grammar section shows that the range of the minimum and maximum scores of the pre-test (45) and post-test (23) for the control group were not the same. Also, the values of standard deviation for the pre-test ($SD = 16.00$) and for the post-test ($SD = 9.02$) indicate this difference where the group's performance on the post-test was more homogenous. However, from the comparison of the mean values and medians of both tests, it can be seen that there was little difference (7%) in the learning outcome (pre-test $M = 52.75$, median = 55 and post-test $M = 58.13$, Median = 54.5).

Table 4.1

Mean Values on Pre-Test and Post-Test Grammar Section for Experimental Group and Control Group (N=18)

		Central Tendency				Dispersion	
		Mean	Median	Min.	Max.	Range	SD
Control group	Pre-test	52.75	55	30	75	45	16.00
	Post-test	58.13	54.5	50	73	23	9.02
Experimental group	Pre-test	51.88	58	29	70	41	16.36
	Post-test	69.63	71.5	45	80	35	10.8

Similar dispersed performance on the pre-test (41) was detected for the experimental group and more homogeneity on the post-test grammar performance (35). Although the range and standard deviation for the treatment group were greater than the average difference from the mean scores for the control group, the calculations of the means (pre-test $M = 51.88$, Median = 58 and post-test $M = 69.63$, Medians = 71.5) for the experimental group revealed an increase in the learning outcome by 25%, indicating a significant difference between the pre- and post-test results.

Table 4.1 illustrates that the information on central tendency and dispersion for the pre-test was very similar for both groups, meaning that identical conditions were ensured before the integration of DDL, which allowed the reduction of variability in the experimental results. However, because the standard amount that the scores differed from the mean was large in both cases (control group $SD = 16$ and experimental group $SD = 16.36$), it meant that the learners' performance was similar between the groups but not homogenous within the group. Conversely, the amount of variability in the distribution of the post-test scores was smaller for both groups (control group $SD = 9.02$ and experimental group $SD = 10.8$), which suggests that more homogeneity can be attributed to the learners' performance on the post-test within each group. While the calculations of the post-test minimum and maximum scores revealed some difference between the groups, a substantial difference can be observed in the means and medians (control group $M = 58.13$, Median = 54.5 and experimental group $M = 69.63$, Median = 71.5). This strongly suggests that, in the grammar section, the experimental group outperformed the control group as a result of the new pedagogical intervention.

The descriptive statistical examination of the averages and variances was useful in anticipating further more accurate analysis. Thus, the Mann-Whitney U-test was used to analyze the pre-test results of the experimental group and the control group. The outcome of the calculations, presented in Table 4.2, allowed us to accept the null hypothesis that the medians of both samples were identical. Since the U value (29.5) was bigger than the critical U value (13), the result was not significant at $p < 0.05$ level. This identical outcome was due to the fact that neither group had received any new pedagogical intervention, which was necessary to secure comparability of the post-test results.

Table 4.2

Mann-Whitney U-Test between Experimental Group and Control Group at Pre-Test Grammar Section (N=18)

	Median	SD	U obs.	df	U critical	Sig. (2-tailed)
Control Group	55	16.00	29.5	16	13	0.05
Experimental Group	58	16.36				

Similar computations in Table 4.3 conducted for the post-test data between the two groups indicated statistically significant difference expressed by the critical value of U (13) greater than the observed value of U (12.5). This means that the null hypothesis had to be rejected because the medians of the groups were significantly different at $p < 0.05$ level, thus suggesting that the learners benefited more from the DDL instruction.

Table 4.3

Mann-Whitney U-Test between Experimental Group and Control Group at Post-Test Grammar Section (N=18)

	Median	SD	U obs.	df	U critical	Sig. (2-tailed)
Control Group	54.5	9.02	12.5	16	13	0.05
Experimental Group	71.5	10.8				

The non-parametric equivalent of the paired t-test, namely Wilcoxon test, was used to gain a more definitive answer as to whether or not the difference in the mean values between the two groups could be ascribed to the new treatment and not to chance. To analyze the difference, first the control group's performance was compared between the pre-test and post-test through the Wilcoxon test. The output, provided in Table 4.4, indicates that the critical value of $W(1)$ is smaller than the observed value of $W(13)$, which is interpreted as a non-significant result at $p < 0.05$ level. This allowed us to confirm that there was no statistically significant difference between the pre-test and post-test results of the control group, meaning that the conventional grammar instruction and direct corrective feedback did not appear to contribute significantly to the learning outcome.

Table 4.4

Wilcoxon Test for Control Group between Pre-Test and Post-Test Grammar Sections (N=9)

	Median	SD	W _{obs.}	df	W _{critical}	Sig. (2-tailed)
Pre-Test	55	16	13	8	1	0.05
Post-Test	54.5	16.36				

The next step was to use the Wilcoxon test to compute the difference between the pre-test and post-test results for the experimental group. The null hypothesis that the medians of the samples are identical was rejected, as the critical value of $W(3)$ is higher than the observed value of $W(1)$, as seen in Table 4.5. According to this result, the difference is considered statistically significant at $p < 0.05$ level, which adds to the confidence that the DDL instruction enabled the experimental group to significantly improve their grammar knowledge.

Table 4.5

Wilcoxon Test for Experimental Group between Pre-Test and Post-Test Grammar Sections (N=9)

	Median	SD	W _{obs.}	df	W _{critical}	Sig. (2-tailed)
Pre-Test	58	16.36	0	8	3	0.05
Post-Test	71.5	10.8				

To go over the use of statistical significance and quantify the difference between the samples to facilitate the interpretation of the substantive significance of the result, the relative size and magnitude of the effects for the above-discussed four comparisons were assessed. Table 4.6 illustrates the outcome of the assessment, according to which the magnitude of the effect sizes of $d = 0.02$ and $d = 0.68$ is small and medium, respectively, implying that the traditional way of grammar instruction and direct corrective feedback on writing had medium effect. However, the differences of $d = 1.21$ and $d = 1.64$ indicate large effect, which means that the contribution of DDL as a grammar resource was significant; therefore, in a practical sense, the experimental group outperformed the control group.

Table 4.6

Effect Size and Magnitude of 4 Comparisons of Mann-Whitney U-Test and Wilcoxon Test

Comparisons	Effect Size	Magnitude*
Mann-Whitney U-Test between Control Group and Experimental Group at the Pre-Test	$d = 0.02$	Small effect
Mann-Whitney U-Test between Control Group and Experimental Group at the Post-Test	$d = 1.21$	Large effect
Wilcoxon Test for Control Group between the Pre-Test and Post-Test	$d = 0.68$	Medium effect
Wilcoxon Test for Experimental Group between the Pre-Test and Post-Test	$d = 1.64$	Large effect

*The rationale for these benchmarks can be found in Cohen (1988, pp. 79-80)

Based on this cross-analysis of the data, which added to the credibility of the findings, it would be meaningful to state that the significant difference in the learner performance was due to the direct computer-based method of DDL and not due to chance.

Given that the statistical analysis of the grammar section showed significant difference between the groups' learning outcomes, the intention was to closely examine the other, error correction and writing, sections as well to find out whether any difference could be detected in less controlled activities.

Error Correction

The error correction section, which scored 10 points, comprised 20 errors accounting for all the target grammar constructions, except for the structure showing agreement (e.g. *So do I; Neither can I.*). At this stage the number of the target items, detected and corrected by the learners, was calculated for each group. The computations of the means yielded very similar results for this section of the pre-test between the groups (Control Group $M = 2.25$, Experimental Group $M = 2.25$), meaning that both groups were able to correct similar number of errors (5 errors on average). This made the data comparable in further steps. During the post-test, the groups performed differently in this section, as indicated by the means (Control Group $M = 3.5$, Experimental Group $M = 5.63$), which interprets that the average numbers of errors identified and corrected by the control group and the experimental group were 7 and 12, respectively. This can suggest that the corpus-based treatment contributed to the enhancement of the learners' grammar knowledge and noticing skills more than the conventional treatment.

At the following stage, it was also necessary to understand where the possible differences between the groups could lie. More specifically, the intention was to gain insights into the types of errors that the learners succeeded or failed to correct. The identification of the error types corrected by the learners revealed diversified performance for the control group, while more patterned learning outcome could be abstracted for the experimental group. Thus, the latter demonstrated better performance in correcting errors related to: *quantifiers with countable and uncountable nouns, verbs followed by gerunds, modals (for necessity and suggestions, for permission, prohibition, and obligation), past simple, present perfect, future simple, comparisons and evaluations with nouns and adjectives (as...as, enough, too), relative pronouns, and expressing wish.* The grammar knowledge that scored lower was related to *present perfect continuous, passive, requests, indirect questions, two-part verbs, participles as adjectives, past continuous vs. simple past, purpose with infinitive and gerund, and real conditional.* This finding suggests that corpus consultation can benefit some grammar points over others. This merits further analysis which will be addressed in Section 4.3. It is speculated that where items involve constructions at the collocational border between lexis and grammar, DDL may be more successful perhaps because learners find it easier to notice and correct the related errors more efficiently (see Section 4.3 for further discussion and analysis).

Writing

The writing section of the tests (see Appendix J and Appendix K), was scored based on the proportion between the total number of the target items used by the learners in their writing and the number of their correct uses. The pre-test data from the writing section indicated almost identical performance associated with the mean values of $M = 2.37$ and $M = 2.62$ for the control group and the experimental group, respectively. During the post-test free writing production, however, learner performance between the groups was different with the mean scores of $M = 6$ for the control group and $M = 7.63$ for the experimental group. The analysis showed that the experimental group outperformed the control group by using 121 correct target constructions related to past simple, present simple, and future simple, as required by the task, while this number for the control group was 73. It was also interesting to examine the differences in the use of these three types of constructions, even though they accounted for a limited amount of the taught grammar knowledge. The calculations revealed that the proportionate use of the target items between these three types for both groups was the same. This means that the past tense was associated with the highest number of correct uses for both groups, followed by the present tense, which in its turn outnumbered the use of the future simple tense. Further calculations, nevertheless, showed differences between the groups for each grammar point in favor of the experimental group. The biggest difference was observed in the use of past simple constructions (CG – 33, EG – 61), followed by present simple (CG – 30, EG – 42) and future simple structures (CG – 13, EG – 18). Based on the analyses above, it can be suggested that the direct corpus consultation and the indirect corrective feedback that the learners received on their writing throughout the treatment encouraged them to engage with more language input and more successfully apply the learned knowledge in free production.

To illustrate these differences between the tests and the groups, the values in all the three sections above were converted into percentages, as presented in Figure 4.1. The comparison between the tests shows that the control group increased its performance in the grammar, error correction, and writing sections by nearly 6%, 13%, and 37%, respectively, and the experimental group increased their results by 22%, 34%, and 50%, correspondingly. The comparison between the groups' performance on the post-test shows that the experimental group outperformed the control group by nearly 17%, 21%, and 16% on grammar, error correction, and writing sections, respectively. These results once again accord with the finding that the DDL treatment enhanced the

learners' grammar knowledge and noticing skills, which was evidenced in all the three sections of the post-test.

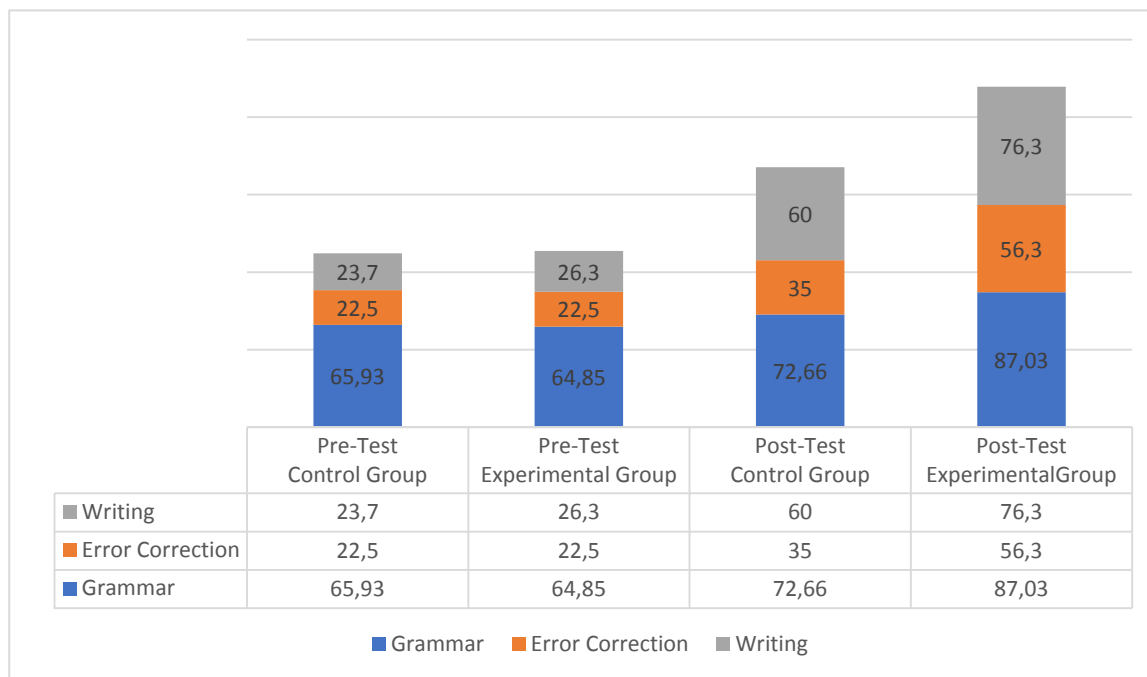


Figure 4.1 Mean Values on Each Section of Pre-Test and Post-Test (in percentages)

4.3 Progress Tests (Quantitative Data)

Throughout the four-month instruction, both groups sat seven progress tests including different grammar teaching points, an error correction assignment, and a writing task, similar to the design of the pre- and post-tests. Observation of progress tests was conducted which aimed to reveal the extent to which both the conventional grammar instruction and data-driven grammar teaching contributed to the learners' short-term explicit knowledge. While the post-test measured learners' short-term explicit knowledge immediately after the whole treatment, the progress tests measured this knowledge in a shorter term, immediately after the presentation of three or four grammar points. The rationale for narrowing down the performance term even more was to reveal the difference in contribution to discrete grammar items between the two instructional methods, as well as the change in performance between two different short terms.

Figure 4.2 represents this comparative evaluation, according to which the total mean values of each section of the seven tests for the experimental group was slightly higher than those for the control group, implying that although both types of instruction

developed the learners' short-term explicit knowledge, the experimental group benefited more from DDL learning.

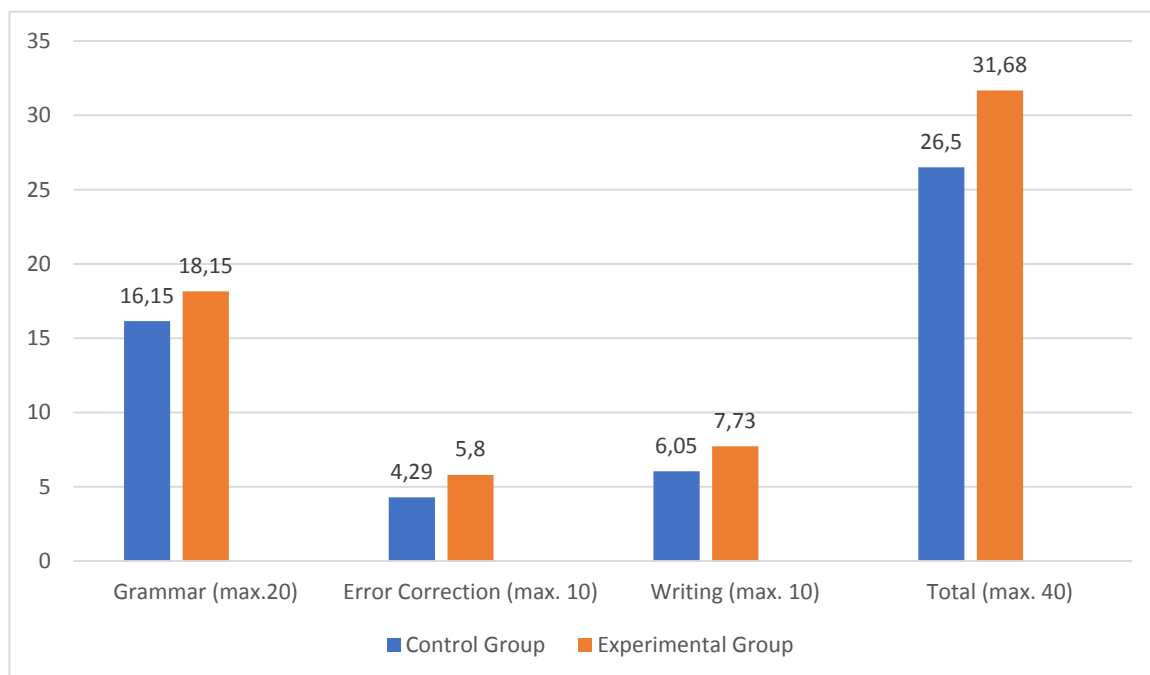


Figure 4.2 Total Mean Values on Each Section of the 7 Progress Tests

Further more detailed analysis aimed to investigate each section of the progress tests separately to gain more in-depth insights into the differences in conventional and DDL instruction. The first target was the grammar section, for which results are provided in Figure 4.3.

This allowed us to not only observe the difference in mean values on the grammar section of each test between the groups, but also to identify the lexico-grammatical aspects that benefited more from DDL instruction. Thus, the lines illustrate that the experimental group almost always performed better than the control group. The grammar sections on which the learners' received almost the same results included grammar points such as *indirect questions, be going to vs. will, modal verbs for necessity and suggestion, two-part verbs, requests, real conditional if, and expressing agreement with so and neither*. This implies that both types of instruction equally affected the attainment of the aforementioned grammar points. The areas in which the experimental group scored higher than the control group ranged from *past simple statements, negatives, and questions, used to, quantifiers for countable and uncountable nouns, comparisons with as...as, to expressing wish, past simple vs present perfect, Participle 1 and Participle 2, relative pronouns for people and objects, and modals for*

permission, prohibition, and obligation, which could suggest that DDL instruction was more effective in studying these grammar items.

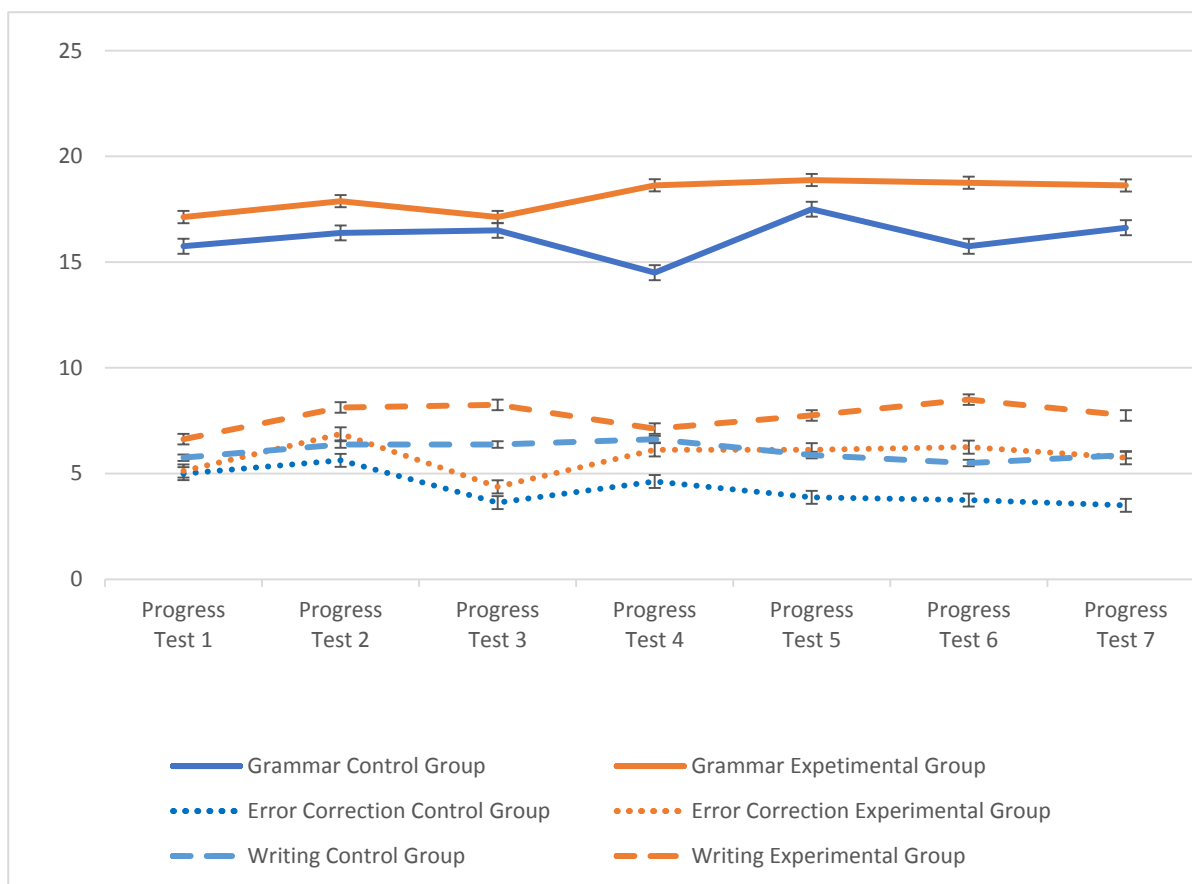


Figure 4.3 Mean Values on Each Section of Each Progress Test

The highest performance could be detected in relation to *infinitives for giving suggestion, expressing purpose with infinitives and gerunds, verbs following prepositions, present simple passive and past simple passive, past continuous vs. past simple, and present perfect continuous*, as evidenced by the big difference in the mean scores between the groups. While this finding provided some insights into the types of grammar items that benefited from DDL, as previously noted in Section 4.2, more confident assumptions were made after the analysis of the delayed post-test data and the analysis of the gains and losses between the three tests, identifying those language areas that could be more amenable to corpus consultation, as further presented in Section 4.4.

The following observation was conducted with the error correction section to find out the impact of the corrective direct and indirect feedback on learner performance. As indicated in Figure 4.3, both the control group and the experimental group started with almost the same outcome on the error correction section (Control group Progress Test 1 $M = 5$ and Experimental group Progress Test 1 $M = 5,12$).

However, the experimental group was able to achieve higher results throughout the treatment period by detecting and correcting more errors, which is demonstrated by the steady growth in the mean values on each progress test after Progress Test 3, while the developmental line for the control group had a slight decrease during this period. This means that the indirect corrective feedback, which encouraged corpus consultation for correcting grammar points, was more beneficial in developing the learners' grammar knowledge and noticing skills; hence their improved learning outcome.

To examine the development of the grammar knowledge in free writing as a parallel task, it was useful to interpret the results on the writing section. Thus, the line graph in Figure 4.3 shows that both groups had similar trend of development with the experimental group always demonstrating higher mean values by 15-17% on each progress test due to their correct use of a higher number of target grammatical items. It can be implied that the inductive grammar instruction and indirect corrective feedback, which stimulated the employment of discovery and noticing skills to improve one's grammar knowledge and correct one's own writing, contributed to the attainment of more grammar knowledge, which is also reflected by a higher degree of accuracy in writing.

4.4 Delayed Post-Test (Quantitative Data)

The findings of the detailed investigations of the pre-test, post-test, and progress test results can evidently reflect the beneficial effect of DDL on explicit short-term knowledge (Han and Finneran, 2014; Boulton and Cobb, 2017). To gain a more comprehensive answer for the first research question, it was also necessary to unfold the contribution of cognitive strategies of discovery, induction, hypothesizing, generalization, and others, stimulated by DDL, to long-term implicit knowledge, as measured by the results of the delayed post-test administered three weeks after the post-test. In the first stage, descriptive statistics were used to compute the averages and variances of the delayed test results on the grammar section for both the control group and the experimental group. The calculations in Table 4.7 indicate that the experimental group performed better ($M = 67$) than the control group ($M = 55.25$) after a three-week interval between the post-test and delayed post-test.

Table 4.7

Mean Values on Delayed Post-Test Grammar Section for Experimental Group and Control Group (N=18)

		Central Tendency				Dispersion	
		Mean	Median	Min.	Max.	Range	SD
Control group	Delayed-Post-test	55.25	54	44	73	29	10.19
Experimental group	Delayed Post-test	67	71	48	80	32	11.31

Although the amount of variability in the distribution of scores is smaller for the control group ($SD = 10.19$) than for the experimental group ($SD = 11.31$), the means and medians indicate a significantly better learning outcome in favor of the experimental group. This suggests that the experimental group was able to retain more knowledge due to the data-driven approach to learning. The significance of this difference is confirmed by the Mann-Whitney U-test results below in Table 4.8. As can be seen, the critical U value (13) is equal to the observed U value (13), which means that the result is significant at $p < 0.05$ level.

Table 4.8

Mann-Whitney U-Test between Experimental Group and Control Group at Delayed Post-Test Grammar Section (N=18)

	Median	SD	U obs.	df	U critical	Sig. (2-tailed)
Control Group	54	10.19	13	16	13	0.05
Experimental Group	71	11.31				

To understand the rate of changes during this interval, a comparison was conducted between the grammar sections of the three tests. Thus, the line graphs in Figure 4.4 show a significant improvement for the experimental group between the pre-test and post-test, as well as the post-test and delayed post-test, as opposed to the control group. There was a slight drop rate between the post-test and delayed post-test for both groups. Although the drop rate was not significant, the control group had 1.5 times as

high drop rate as the experimental group. Otherwise interpreted, the gain between the pre-test and post-test was 3 times as high for the experimental group as for the control group, and the loss between the post-test and delayed post-test was 1.5 times as low for the experimental group as for the control group. This analysis could suggest that the cognitive stimulation required in DDL enabled the experimental group to gain more explicit knowledge and retain it in a long-term with a few losses, while the contribution of the conventional grammar instruction was less in the acquisition and retention of language knowledge, hence a higher drop rate in a long-term.

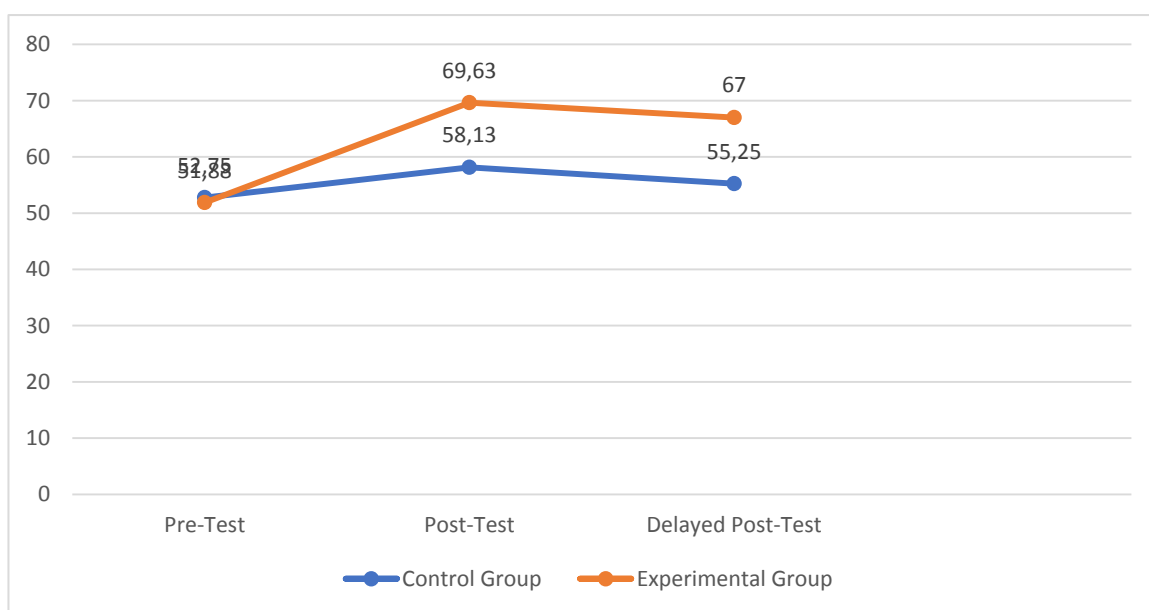


Figure 4.4 *Mean Values on Pre-Test, Post-Test, and Delayed Post-Test Grammar Sections*

It was also interesting to calculate the rates of the gains and losses in percentages in separate areas (grammar, error correction, and writing) from test to test to get deeper insights into this finding. Table 4.9 provides the mean scores on each test for each group, along with the rate of change between the tests in percentages. As mentioned earlier, the averages on the pre-test results for both groups were the same and the distribution of the mean scores between the three sections of the test was almost the same, which ensured the comparability of the data through identical conditions. In the immediate post-test grammar, error correction, and writing sections, the control group had a modest improvement by 6.73%, 12.5%, and 36.3%, respectively, while the experimental group gained significantly more – 22%, 33.8%, and 50.1%

correspondingly. The latter is more than three times, two and a half times, and one and a half times as much as the gains for the control group.

The comparison of the post-test data against the delayed post-test results for both groups revealed the extent to which the learnt knowledge was retained in a long-term. In the grammar section, even though both groups had almost the same rate of loss (- 3.59% and - 3.28%), it constituted nearly half of the gain for the control group (- 3.59%, + 6.73%) and only one-seventh of the gain for the experimental group (- 3.28%, + 22%). This implies that the latter was able to proceduralize six times as much knowledge in the long run.

Table 4.9

Gains and Losses in Mean Values and percentages Between Pre-, Post-, and Delayed Post-Tests

Control Group				Experimental Group			
	Grammar	Error Correction	Writing		Grammar	Error Correction	Writing
Pre-Test	52.75	2.25	2.37	Pre-Test	51.88	2.25	2.62
Post-test	58.13 (+ 5.38 = + 6.73 %)	3.5 (+ 1.25 = +12.5 %)	6 (+ 3.63 = + 36.3 %)	Post-test	69.63 (+ 17.75 = + 22 %)	5.63 (+ 3.38 = + 33.8%)	7.63 (+ 5.01 = + 50.1 %)
Delayed Post-test	55.25 (- 2.88 = - 3.59 %)	2.25 (- 1.25 = - 12.5 %)	4.37 (-1.63 = - 16.3 %)	Delayed Post-test	67 (- 2.63 = - 3.28 %)	5.38 (- 0.25 = - 2.5 %)	7.25 (- 0.38 = - 3.8 %)

The analysis of the error correction section, which was scored based on the number of corrected errors, revealed an unexpected computational outcome, where the 12.5% gained by the control group was lost as a result of the delayed testing, in this way pushing down the learner performance to the initial pre-testing outcome. Conversely, the loss rate of 2.5% for the experimental group was insignificant against the gain rate of 33.8%, thus still retaining the 30% of the acquired skills and knowledge. This finding could be interpreted in favor of the experimental group, which was empowered to detect and correct more errors through their improved grammar knowledge and honed noticing skills due to corpus consultation and retain more information in a longer term. Meanwhile, the control group was able to gain explicit short-term knowledge but failed

to draw upon this knowledge after a delay, which can be interpreted as a loss of learnt knowledge in a longer term. This kind of delayed outcome could mean that little explicit knowledge was internalized to become implicit, as part of the long-term memory.

This finding was reinforced by the following analysis of the free writing task, which was scored based on the number of the correct uses of target grammar items. While the biggest gain was observed in the writing section, 36.3% for the control group and 50,1% for the experimental group, the loss rate between the post-test and delayed post-test was -16.3% and -3.8%, respectively. This shows that the control group had the biggest loss in the free task, meaning that the gained explicit knowledge does not appear to have become implicit and, therefore, was not cognitively available to them in free production for a longer term retrieval. This was not the case for the experimental group, as the latter were able to use more target forms in the free task, as well as in the controlled tasks, thus demonstrating a higher degree of interface between explicit and implicit knowledge.

4.5 Proceduralization of Grammar Items (Quantitative Data)

One aspect of the progress tests was to reveal the language aspects that are more or less likely to benefit from DDL, as short-term explicit knowledge. The analysis of the gains and losses between the pre-test, post-test, and delayed post-test results allowed for comparison of the long-term retention rates of the instructed grammar knowledge between the control group and the experimental group, thus revealing the impact of DDL cognitive strategies on implicit knowledge. To gain further insights into this issue and gain understanding as to which particular grammar aspects had higher retention in the long-term memory, detailed investigation was carried out into the learners' performance on each grammar item on the way from declarative explicit knowledge to proceduralized implicit knowledge, as measured by the progress test, post-test, and delayed post-test, respectively.

The grammar items were 22 in number and are listed in Table 4.10.

Table 4.10

Summary of Instructed Grammar Items

Grammar Item 1: Did you study English when you were younger?	Past simple
Grammar Item 2: I used to be rebellious, but now I am not.	Used to
Grammar Item 3: There is too much noise in our city.	Quantifiers (<i>many, much, few, little, enough</i>)
Grammar Item 4: Do you know how often the buses run?	Indirect questions
Grammar Item 5: My new apartment is not as big as my house.	Comparisons (<i>as...as</i>)
Grammar Item 6: I wish I had enough money to buy this car.	Wish
Grammar Item 7: I have never ridden a camel.	Present perfect
Grammar Item 8: I will probably stay home and relax.	Future simple (<i>be going to vs will</i>)
Grammar Item 9: You shouldn't forget your camera.	Modals for necessity and suggestion
Grammar Item 10: Put away the groceries, please.	Two-part verbs
Grammar Item 11: Would you mind sending this letter for me?	Requests (<i>can, could, would, would...mind</i>)
Grammar Item 12: Robots are used to perform dangerous tasks.	Purpose with infinitive and gerund
Grammar Item 13: Make sure to water the flowers every day.	Infinitives for giving suggestions
Grammar Item 14: If the weather is fine, we will go out.	Real conditional
Grammar Item 15: I enjoy reading a book in English.	Verbs followed by <i>-ing</i>
Grammar Item 16: I am not good at singing. Neither am I.	Agreement (<i>e.g. So do I. Neither can I.</i>)
Grammar Item 17: The pyramids were built by Egyptians.	Present simple passive; Past simple passive
Grammar Item 18: I was working here when I met my wife.	Past continuous versus Past simple
Grammar Item 19: She has been living in this city since then.	Present perfect continuous
Grammar Item 20: I am fascinated by her acting.	Participle 1 and Participle 2
Grammar Item 21: He is the man who you can rely on.	Relative pronouns (<i>who, that, which</i>)
Grammar Item 22: You are not allowed to smoke here.	Modals (permission, prohibition, obligation)

Since the task for each grammar feature varied, it was appropriate to transfer the number of the learners' correct answers into percentages, so that the data could be comparable. These computations are presented in Table 4.11.

Table 4.11

Mean Percentages on Each Grammar Item of Progress Test, Post-Test, and Delayed Post-Test

Grammar Items (GI)	Experimental Group			Control Group		
	Progress Test %	Post-Test %	Delayed Test %	Progress Test %	Post-Test%	Delayed Test %
GI 1 and GI 2: Past Simple; Used to	87.5	88.3	86.7	67.9	69.5	65.7
GI 3: Quantifiers (<i>many, much, few, little</i>)	87.5	78.1	83.3	82.4	56.3	57.1
GI 4: Indirect questions	75	81.3	71.7	73.9	71.9	53.6
GI 5: Comparisons (<i>as... as, enough</i>)	80.7	85.4	83.3	74.2	73.8	66.7
GI 6: Wish	88.9	50	55.6	75	25	42.9
GI 7: Present Perfect vs Past Simple	91.1	81.3	83.3	75	62.5	66.7
GI 8: Future Simple (<i>be going to vs will</i>)	72.2	90.6	77.8	68.8	59.4	60.7
GI 9: Modals (for necessity and suggestion)	92.5	87.5	75.6	93.8	70	68.6
GI 10: Two-part verbs	96.7	93.8	83.3	95.8	75	78.6
GI 11: Requests	86.7	96.9	81.7	87.5	87.5	71.4
GI 12: Purpose with inf. and gerund	100	87.5	83.3	81.3	68.8	60.7
GI 13: Infinitives for giving suggestions	98.8	85	83.3	83	66.5	60
GI 14: Real conditional	95.8	81.3	72.2	94.2	46.9	35.7
GI 15: Verbs followed by -ing	92.4	88.5	85	82.2	76.5	65.6
GI 16: Agreement (<i>So do I. Neither can I.</i>)	87.5	75	77.8	85.2	75	62.9
GI 17: Passive	87.5	75	55.6	72.9	65	62.9
GI 18: Past Continuous vs Past Simple	100	90	77.8	72	85.7	71.4
GI 19: Present Perfect Continuous	83.3	43.8	38.9	72	50	14.3
GI 20: Participle 1 and Participle 2	99.2	82.5	86.7	81.3	80	71.4
GI 21: Relative pronouns	100	100	100	95.8	95	100
GI 22: Modals (<i>perm., prohib., oblig.</i>)	91.7	81.2	94.4	61.1	50	52.4
Total Mean (in percentages)	90.2	82.04	78.06	80.8	67.2	61.4
Error Correction (out of 10)	5.8	5.63	5.38	4.29	3.5	2.25
Writing (out of 10)	7.73	7.63	7.25	6.05	6	4.37

Grammar Items 1 and 2: Past Simple and Used to

Table 4.11 shows that the experimental group scored higher on this grammar point in all the three tests than the control group. It suggests that past simple and *used to* can be better studied through DDL than via traditional teaching. The learners were able to detect patterns in raw data rather than understand and apply abstract rules formatted by the teacher. DDL enabled them to achieve more explicit knowledge, as measured by the progress test and immediate post-test, which was fully retained after a delay, meaning that this grammar knowledge was proceduralized. Although the control group was able to retain as much as it had gained, the gain rate was initially low, hence there was low likelihood of knowledge automatization.

Grammar Item 3: Quantifiers

The progress test results (which took place very soon after instruction) indicate that both the hands-on concordancing in the experimental group and direct grammar instruction in the control group contributed to the learners' performance equally. However, the post-test and delayed post-test results show different outcomes in favor of the experimental group. This implies that the cognitive engagement contributed to not only increased explicit knowledge, but also to its grammaticalization - a process that started with mental processes resulted in a high retention rate. While the direct explanation of the rule tapped the control group's increased explicit knowledge, illustrated by the progress test result, it was retained for a short time. As the immediate post-test result shows, there was a substantial loss in knowledge, which remained at the same retention level until the delayed testing.

Grammar Item 4: Indirect questions

Indirect questions was one of the grammar points that received equal but low contribution from both types of instruction. Although the experimental group improved its performance on the post-test, the initial low intake was retained after the delay. For the control group, the initial intake was retained during the post-test but had a high loss rate on the delayed post-test. This finding shows that neither DDL nor traditional instruction could significantly foster the acquisition of the grammar knowledge on constructing indirect questions. This could be explained by the observation that the corpus design does not allow for direct multiple exposures to this grammar structure, which reduces the cognitive processing effort resulting in a low uptake rate. Hence, as a result of the searchability and retrieval challenges, corpus consultation becomes less appropriate for this grammar point than for others to become automatized, but more effective than the direct supply of the grammar explanation.

Grammar Item 5: Comparisons

As indicated by the results in Table 4.11, the experimental group scored higher on all the tests than the control group. The high gains of explicit knowledge having undergone cognitive refinement brought about high retention rates for the experimental group. Conversely, the control group was able to retain the taught knowledge for a short term, as measured by the immediate post-test, and lost substantial part of it throughout the delay. This finding emphasizes the relevance and effectiveness of DDL for teaching comparisons.

Grammar item 6: Wish

With regard to the learners' performance on expressing wishes, the results were not encouraging in either approach. There was a high loss rate recorded by both groups from progress to post- to delayed post-test. The cause for the low transfer effect could be in the complex structure of the instructed input which is beyond collocational border. Also, it is noted that without advanced part-of-speech search query skills, corpus results are quite dispersed, with a mix of forms including subject-verb patterns, social routines and formulae (e.g. *wish you the best; wish you were here*, etc.) and noun forms.

Grammar Item 7: Present Perfect vs. Past Simple

This grammar pattern recorded a significantly higher learning outcome for the experimental group, which slightly decreased in the immediate post-testing and was retained at the same high rate in the delayed testing. Regarding the control group, the initial performance, assessed by the progress test, was much lower. It declined significantly in the immediate post-testing and became automatized at a low rate. This allows us to conclude that the learners were more successful in acquiring this knowledge through the self-discovery of lexico-grammatical patterns rather than through the traditional instruction.

Grammar Item 8: Future Simple

The short-term contribution of DDL and conventional instruction, evaluated by the progress test, was equal and not very high for learning future simple. Although the experimental group demonstrated enhanced performance on the post-test, it had a remarkable decline on the delayed test, thus returning to its initial acquisition rate. This means that the experimental group was able to proceduralize almost as much explicit knowledge as it had initially built, whereas the control group, having an equal instructional intake, lost part of it by the time of the post-test and appear to have retained this low rate at a subconscious level.

Grammar Item 9: Modals for Necessity and Suggestion

The corpus work and direct grammar explanation had similar impact on the learners' declarative knowledge of modals for necessity and suggestion. Both groups lost part of it both in a short term and in a long term. However, the experimental group's performance was more successful in both the short and longer term. This can suggest that DDL enabled the learners to achieve more automaticity and stability in relation to this particular grammar knowledge.

Grammar Item 10: Two-Part Verbs

The observation of two-part verbs (e.g. turn down the TV, turn it down) revealed that both groups scored equally high on the progress test, meaning that both instructional practices provided easy access to declarative memory. However, the learning outcomes were significantly different between the post-test results. The control group demonstrated a high loss rate and was not able to proceduralize more instructed knowledge into long-term memory. The experimental group was able to get access to declarative memory during the post-testing and maintain high performance. Despite a certain loss until the delayed testing, the experimental group still outperformed the control group in the long term. It can be inferred that DDL appears to have facilitated the interface between explicit and implicit knowledge.

Grammar Item 11: Requests

Both groups were equally successful in using requests in the progress test, as an assessment of short-term knowledge. Demonstration of this knowledge was enhanced in the post-test for the experimental group and retained the same for the control group, this indicating that there were no losses in the declarative memory for either group. As to what extent this knowledge was to become subconscious, the comparison between the delayed post-test results shows that the experimental group was able to retain the initial amount of gained knowledge, while the control group had losses, this being the evidence of explicit knowledge that was not internalized. In this regard, it can be stated that although both experiences enabled the learners to easily tap their short-term memory, the mental strategies of DDL provided a wider access to long-term memory.

Grammar Items 12 and 13: Purpose with Infinitive and Gerund; Infinitives for Giving Suggestions

These two grammar points are described together as they had similar trends of development. Thus, the groups significantly benefited from both types of instruction, but there were losses between the progress test and post-test, as well as between the post-test and delayed post-test, the experimental group always performing better than

the control group by nearly 20%. This means that, in the longer term, the experimental group was able to retain 20% more information and emphasizes the usefulness of corpus consultation in teaching the grammatical structures of expressing purpose and giving suggestions with infinitive and gerund.

Grammar Item 14: Real Conditional

Both the traditional and new approaches enabled the learners to achieve equally high learning outcomes in the short term; however, there were losses between the tests. The experimental group decreased its performance by nearly 20%, while the control group had a dramatic drop of more than 50%, indicating a significant difference between the long-term retention rates in favor of the experimental group. The losses of the experimental group might be explained by the observation that there was little chance for cognitive investment into studying this grammatical feature. The losses might also refer to the complexity of both the form and meaning for this item.

Grammar Item 15: Verbs Followed by –ing

DDL instruction appeared to be beneficial for introducing verbs that are followed by gerund. This is evidenced by the high intake as explicit knowledge on the part of the experimental group and the high retention rate, implying that the internalization of the discovered knowledge took place to a great extent. This was not the case for the control group, which had losses between the tests, suggesting that the absence of mental engagement caused weak knowledge transfer effect.

Grammar Item 16: Agreement

Teaching *agreement* through DDL and traditional practice resulted in similar learner performance, as measured by the immediate progress test. Both groups demonstrated 10% loss of knowledge on the immediate post-test. Between the post-test and delayed post-test, the experimental group retained the post-test performance, while the control group had another loss. This result could be explained by the fact that the study of this grammatical feature was not subjected to much cognitive engagement work and was more directly explained by the teacher, as in the traditional classroom.

Grammar Item 17: Passive

The observation on the learners' use of passive structures revealed that the controlled conditions of DDL instruction and conventional instruction contributed to the attainment of know-what knowledge. Despite this, there was a sharp decrease in the learners' performance on the immediate post-testing and delayed post-testing for both groups, which suggests that neither instruction was successful in achieving a high degree of spontaneous and effortless use of know-how knowledge.

Grammar Item 18: Past Continuous vs. Past Simple

This was the case when the learners in the experimental group achieved high understanding of the grammar point through DDL practice in a short term but had losses in a longer term. The control group was able to retain as much knowledge as it had gained. However, the delayed test-results on this grammar point were higher for the experimental group than for the control group. This could be explained by the following - while the experimental group had losses between the tests, their initially obtained high degree of explicit knowledge assisted them in constructing more implicit knowledge than the control group.

Grammar Item 19: Present Perfect Continuous

The comparison between the tests for each group illustrates a dramatic decrease in the acquisition of this grammatical feature. As regards proceduralization, nearly half of the declarative knowledge was lost, hence the reduced interface between explicit and implicit knowledge by 45% for the experimental group and by 58% for the control group. A little higher retention rate recorded by the experimental group could be ascribed to the cognitive intervention, which assisted the experimental group in building more short-term knowledge than the control group. Overall, neither solution was found to be effective in teaching the present perfect continuous.

Grammar Item 20: Participle 1 and Participle 2

Cognitive intervention fostered a higher gain in explicit knowledge than the direct metalinguistic explanation of the rule, as provided in Table 6.10. This means that despite a few losses between the tests, the experimental group was able to establish a stronger link between their working memory and long-term memory and, therefore, access their implicit automatized knowledge sub-served by the procedural memory to complete the delayed tasks.

Grammar Item 21: Relative Pronouns

The relative pronouns describing people and objects were easily acquired by the learners in both groups, as indicated by the 100% results on the delayed post-test. This type of achievement could be conditioned by the simple combination of structure, meaning and use, which secured easy transfer of knowledge and, therefore, stability.

Grammar Item 22: Modals (permission, prohibition, obligation)

Still another strong link could be established between the working memory and procedural memory by the learners who studied modals through cognitive processing using DDL. The high degree of explicit knowledge reached through corpus-based self-discovery in the experimental group facilitated the construction of implicit long-term

knowledge by the experimental group. The traditional instruction and corrective feedback, free of cognitive intervention, resulted in the construction of much less explicit knowledge, thus automatically reducing the probability of high retention rates in the control group.

To summarize the findings of this item-based analysis, it can be stated that the impact of DDL on the acquisition of different grammar points was varied. This is illustrated in Table 4.12. The grammar patterns that received high retention rates included *past simple, used to, quantifiers, comparisons, present perfect vs past simple, expressing purpose with infinitive and gerund, infinitives for giving suggestions, verbs followed by gerund, participle 1 and participle 2, relative pronouns, and modals for permission, prohibition, and obligation*. The observation revealed those grammar features that underwent more cognitive intervention supported by the corpus tools and the teaching materials in the experimental group received higher scores than the ones that were accompanied by direct explanation in the control group. It is posited that, in the case of both groups, the knowledge of the items which were processed with less mental engagement because of the lesser exposure to authentic corpus input were not easily accessed after the delay (i.e over time), thus affecting retention rates. This was the case in relation to knowledge related to *indirect questions, expressing wish, be going to vs will, two-part verbs, requests, real conditional, expressing agreement, passive voice, past continuous vs past simple, and present perfect continuous*.

Table 4.12

Grammar Items with High and Low Retention Rates for Experimental Group

Grammar items with high retention rates	Grammar items with low retention rates
Grammar Item 1: Past simple	Grammar Item 4: Indirect questions
Grammar Item 2: Used to	Grammar Item 6: Expressing wish
Grammar Item 3: Quantifiers (<i>many, much, few, little</i>)	Grammar Item 8: Future (<i>be going to vs. will</i>)
Grammar Item 5: Comparisons (<i>as...as, enough</i>)	Grammar Item 10: Two-part verbs
Grammar Item 7: Present perfect vs. Simple past	Grammar Item 11: Requests (<i>can, could, would,)</i>
Grammar Item 12: Purpose with infinitive,	Grammar Item 14: Real conditional

gerund	
Grammar Item 13: Infinitives for suggestions	Grammar Item 16: Agreement (<i>e.g. So do I; Neither can I</i>)
Grammar Item 15: Verbs followed by gerund	Grammar Item 17: Passive (present simple; past simple)
Grammar Item 20: Participle 1 and Participle 2	Grammar Item 18: Past continuous vs. past simple
Grammar Item 21: Relative pronouns	Grammar Item 19: Present perfect continuous
Grammar Item 22: Modals (permission, prohibition, obligation)	

Another important finding is related to the correlation between explicit and implicit knowledge. It was detected in most cases that the high degree of explicit knowledge appears to have led to a high rate of automatization and retention, as evidenced by the post-test and delayed post-test of the experimental group. Most of the grammar points that initially received high scores on the progress tests had higher retention rates than those that initially scored low. Only four of the grammatical features were declined to the category of a low retention rate, along with those that did not benefit much from DDL in a short term as explicit knowledge. To obtain statistical basis for this statement, as well as for correlations between other variables, Spearman's Rank Order Correlation was conducted, which will be discussed in the following section. The finding concludes that firstly, it is crucial to place the accent on the attainment of a high degree of explicit knowledge, and most importantly, through the implementation of mental strategies. This will increase the likelihood of internalizing the consciously learnt knowledge to become intuitive and stable as part of the long-term memory, and this can successfully be aided by DDL.

4.6 Correlations (Quantitative Data)

The final section of this chapter will introduce and discuss correlations between several variables of this study. Delayed test results, as an indicator of the construct of internalized implicit knowledge, were set against progress and post-test results, as measures of the construct of short-term explicit knowledge. There was also an attempt to measure the strength and direction of the relationship between the learners' performance on the delayed post-test and their autonomous learning skills.

To measure the relationship between explicit and implicit knowledge, Spearman's Rank Order Correlation was conducted between the mean gains on the progress test and those on the delayed test. The calculations revealed the value of the coefficient $r = 0.410$, p (2-tailed) = 0.064, which by normal standards, is interpreted as a positive, but statistically non-significant association between the two variables. This means that the explicit knowledge, gained through DDL and immediately measured by a progress test, administered right after the instruction of the grammar point, could positively correlate with and be a strong but not statistically significant predictor of implicit knowledge.

Another measurement of the relationship between these two variables carried out between the post-test results, as a measure of the variable of explicit knowledge, and delayed test results, as a measure of the construct of implicit knowledge, provided a value of the coefficient $r = 0.468$, p (2-tailed) = 0.03. This type of association between the two variables is considered statistically significant and allows us to reject the null hypothesis and accept that there is a strong positive correlation between the two variables at a statistically significant level. Thus, it can be suggested that the higher amount of explicit knowledge is constructed through cognitive intervention, the higher rate of retention and, hence, the higher rate of second language acquisition is achieved.

To understand the strength and direction of the relationship between the learning outcome and learner autonomy, the mean values of the learners' performance on the delayed post-test and those of the learners' responses to the Learner Autonomy Profile Form questions (see Appendix M) were calculated and ranked against each other. The correlation of these two variables, expressed by the coefficient value of $r = 0.299$, p (2-tailed) = 0.47, was interpreted as statistically not significant; however, they were found to be though weakly but positively associated. This can imply that the development of autonomous learning skills, including affective-motivational, action-oriented, social components, as well as cognitive-metacognitive strategies of noticing, hypothesizing, self-discovery, and generalization, can complement the acquisition of English as a second language.

4.7 Learner Autonomy Profile (LAP) Form (Quantitative Data)

The data on the development of autonomous learning skills obtained from the LAP Form (see Appendix M), administered with a confidentiality agreement, aimed to provide an answer to the second research question as to what extent data-driven learning

could foster learner autonomy as measured by the constructs and components of learner autonomy. As described in Chapter Three in more detail, the form was designed on a five-point Likert scale where the items ranged from 1 to 5 (1 = never; 2 = seldom; 3 = sometimes; 4 = often; 5 = always). The entries between 1 and 2 were interpreted as resistant behavior towards independent skills; those between 2 and 3 meant that the learner had neutral attitude towards these skills; the entries between 3 and 4 were considered as demonstration of neutral to positive attitude; and the values from 4 to 5 were interpreted as expressions of supportive approach to the attainment and implementation of self-regulated learning skills.

For the comparison of learners' attitudes towards their autonomous language learning skills, the mean values for the overall responses of both the experimental group and the control group were computed. As depicted by the scatterplots in Figure 4.5, the responses of the control group range from 1-5 ($M = 2.92$) where most of the answers fall between 2 and 4 showing neutral to near positive attitude in the implementation of independent learning skills. The responses of the experimental group fall into the range of 3-5 ($M = 3.77$) interpreted as near supportive attitude to the development and application of independent learning skills. Thus, the distribution of the mean values indicates that the responses of the control group, which undertook traditional grammar instruction, were more dispersed, while those of the experimental group, having received data-driven treatment, showed more supportive tendency on the continuum of the learner autonomy scale.

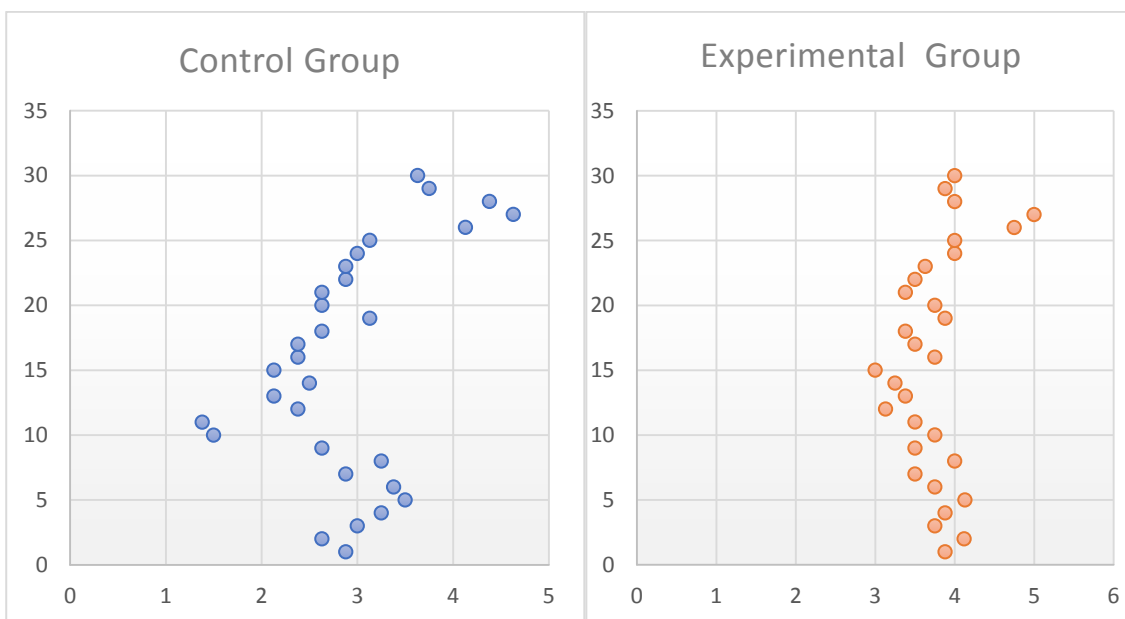


Figure 4.5 *Distribution of Mean Values for LAP Form Responses*

To find out more specifically where the possible differences could lie in the groups' responses and to understand whether these differences were due to the contribution of DDL, the mean values for each component of learner autonomy were calculated. The results in Table 4.13 illustrate that the biggest difference between the groups' responses is in the action-oriented component (Control group $M = 2.45$ and Experimental group $M = 3.53$). This allows us to explain that direct computer-based corpus instruction had the most influence on the development of the learners' abilities to select and evaluate language learning materials, to address to language corpora and use corpus tools to answer language-related issues, to correct their own mistakes and improve their grammar and writing independently and, in general, to manage their own learning. Since this component contained two questions related to corpus use, which the control group would be unable to respond, it was also decided to calculate the means without considering these two points. In this case, the difference between the groups' responses for this component (Control group $M = 2.67$ and Experimental group $M = 3.6$) became similar to that for the cognitive/metacognitive component, thus still ranking the highest.

Table 4.13

Mean Values and Interpretations on Components of Learner Autonomy (N = 18)

Component	Control Group	Difference	Experimental Group
Action-oriented component	$M = 2.45$ Neutral	$-/+ 1.08$	$M = 3.53$ Positive to Supportive
Cognitive and metacognitive component	$M = 2.7$ Neutral	$-/+0.95$	$M = 3.65$ Positive to Supportive
Affective and motivational component	$M = 3.05$ Neut. to Pos.	$-/+ 0.88$	$M = 3.93$ Positive to Supportive
Social component	$M = 4.1$ Supportive	$-/+ 0.23$	$M = 4.33$ Supportive

The second difference could be observed in the responses related to cognitive and metacognitive component (Control group $M = 2.7$ and Experimental group $M = 3.63$). This offers an implication that the inductive approach to grammar instruction and indirect corrective feedback on writing, endorsed by DDL, played an essential role in

raising the learners' awareness of their own learning and enhancing their analytical, evaluation, and reflective skills.

The component that was the third in respect of the amount of difference between the group was the affective-motivational component, where the experimental group ($M = 3.93$) was more intrinsically motivated and more positively positioned towards their own learning likely due to the new pedagogical intervention than the control group ($M = 3.05$). A slight difference was calculated for the social component of learner autonomy (Control group $M = 4.1$ and Experimental group $M = 4.33$), which could be explained by the fact that both the conventional and data-driven instruction incorporated interaction in pairs and in groups.

Thus, the findings suggest that the development of cognitive strategies through DDL increased learners' motivation, raised their language learning awareness, and, probably most importantly, fostered action-oriented autonomous language learning skills, which, in its turn, resulted in statistically significant difference between the control group and the experimental group in favor of the latter.

4.8 Semi-Structured Student Interviews (Qualitative Data)

This section provides the results of the qualitative data obtained through semi-structured student interviews (see Appendices Q and R for transcribed sample interviews), which revealed the learners' attitudes towards the data-driven learning, thus answering the third research question. As discussed earlier in Chapter Three, the interviews were conducted at the end of the investigation by an independent party to ensure the voluntary nature of the research. They were in Armenian to allow the informants to fully and accurately express their opinions and feelings. All the participants of the experimental group expressed their agreement to be interviewed. The results were translated, manually transcribed, color-coded, and analyzed according to certain themes that were highly expected to deductively, rather than inductively, emerge from the patterned data within pre-defined frameworks, in this way providing deeper insights into issues under investigation. This was a six-stage analysis, based on Braun and Clarke's (2006) methodology, as discussed in Chapter Three, which helped to arrive at a thematic network that aligns well with the research questions (see Appendix S) Thus, at the initial stages, the data was transcribed in English and coded in colors each corresponding to a code describing an idea or feeling. At the following stages, the coded data was collated together to gain an overview of the recurring points, patterns were

identified among the codes and combined into themes, which were reviewed at the final stage to ensure accuracy in representing the data. The codes describing such ideas as the improvement of grammar knowledge, correcting errors to improve one's own writing, exposure to corpus data, and others, allowed for the emergence of the theme that was defined as *DDL as a grammar development resource*. This aligns well with the first research question, which is concerned with uncovering the efficiency of DDL in the development of grammar knowledge at lower levels. The coded data that related to discovering language knowledge, raising language awareness, engaging with corpus data, or retaining information led to the definition of a theme that was named *DDL for cognitive stimulation*, which contributed to the first research question. The patterns identified among the code representing data on knowledge and skills in corpus use, motivation, independent knowledge construction, and social dialogue, opened up a possibility for uncovering another broad theme, defined as *DDL for independent learning*. The latter provides findings that accord with the second research question, which aims to reveal the contribution of DDL to learner autonomy. Another theme generated through pattern identification was defined as *DDL and its challenges*, which was achieved through the code concerning such concepts as corpus training, technological considerations, relevance of DDL to local context, working with corpus-based materials, and the degree of teacher mediation. The thematic network under analysis can be seen in Appendix S. While the discussion of a broader thematic analysis of the interview data will be the focus of Chapter Five, this chapter will provide summarized analysis of the patterned data resulting from the responses on each issue and supported by the informants' quotes.

1. Do you enjoy studying grammar?

Given the focus of this study, which is the use of DDL as a grammar development resource, it was interesting initially to find out the learners' attitudes towards studying grammar, in general. All the informants made similar comments on the role of grammar reporting that grammar is a key aspect of studying a language, as it helps to develop proficiency in language production, as well as reception. According to them, grammar is the language structure that enables learners to understand the construction of the language, to construct language, and continuously improve their language knowledge. Far more common were their responses relating to the role of grammar in professional settings - they referred to the impact of grammar knowledge on effective communication between foreign experts of their professional field during

international visits, meetings, and workshops. This common view can be confirmed by the following quotes.

Interviewee 3: *I consider grammar very important to be able to write and speak in English correctly. You might not know all the grammar rules, but you need to study at least the basic ones to be able to structure your speech. Knowing the basic rules, you will be able to continuously improve your knowledge of English.*

Interviewee 1: *Yes, I think grammar is a key to studying a language. Grammar helps me construct correct sentences. In fact, it is not easy to study grammar. Very often I have difficulties in communication because of my grammar, but I believe it is necessary for speaking and writing.*

Interviewee 6: *Yes, because grammar knowledge is very important to speak and write in any language. During these classes, I studied English grammar with great pleasure. Very often we have international meetings, and yes, that's true, you might speak English without knowing the grammar, but it's not enough for effective communication. Grammar is essential.*

2. Do you enjoy writing in English?

During the DDL instruction, the learners practiced the taught grammar points not only through controlled activities but also through free writing tasks. Therefore, this question aimed to reveal the participants' attitudes towards writing in English. As in question 1, the learners expressed similar positive attitudes mentioning that they like writing in English, and although there can be challenges due to the lack of vocabulary or imperfect grammar use, they often send email in English for professional purposes and consider improving their writing skills for preparing successful presentations during international visits. It is this link between studying grammar and meeting professional goals that was most frequently mentioned. The comment that is worth noting in relation to this question is that writing facilitates the retention of knowledge in the long term. The following quotes are typical.

Interviewee 2: *Yes, I enjoy writing in English, even though it's not easy for me. I make a lot of mistakes. But writing email messages is easier for me now, as I often communicate with my foreign counterparts by email.*

Interviewee 3: *English is a very beautiful language for me. I enjoy writing in English, as well as reading. Even though I do not have a rich vocabulary in English, I can express my thoughts and emotions in English.*

Interviewee 5: *In general, I like writing in any language. Especially, when you're learning a new language, it is necessary to write a lot. It helps to remember the*

learnt knowledge better. Now, I am trying to write more to improve my writing skills for professional needs.

3. How did COCA help you improve your knowledge of grammar?

The purpose of this question was to encourage the learners to reflect on their experiences with corpus work and inform the ways it helped them develop their grammar knowledge. Many comments outline the frequency information, the multiple examples with the target item, the concordances as a new way of noticing the key word in context. There was a unanimous view confirming the positive impact on the development of their grammar knowledge. They explained that despite the fact that the corpus does not provide any grammar rule or explanation directly, they were able to very often make generalizations on the use of a certain grammar point due to rich corpus data. This huge collection of texts from various fields in one place, as reported by the learners, gives a unique opportunity to explore any language-related issue from various angles. This patterned data can be observed in the quotes below.

Interviewee 8: Well, COCA doesn't have a specific grammar section, and it doesn't provide any grammar rule or explanation; however, the fact that you can see so many examples in one place, it helps you form some understanding about the use of the grammar point. It helped me improve my grammar, but it was unusual.

Interviewee 6: COCA is a huge database of texts, phrases, words, and so on, which are practically used in many spheres of life. And this gives us unique opportunity to study any concerning us issue from multiple perspectives. By exploring the word in different contexts with different tools, I think, we can get an idea of how to use a word or a grammar point correctly.

Interviewee 9: We are used to studying a language with the teacher and grammar books and at school and university we used to receive explanations immediately from the teacher. But COCA is a new way of improving the knowledge of grammar – you can find out not only the explanation of some language issue but also a lot of examples after studying the rule. This is a completely new experience but it is useful.

From the quotations reported above, it also becomes clear that corpus-based learning, being innovation in the local context of language teaching, was accepted as a useful experience in developing grammar.

4. How did COCA help you improve your writing?

As presented before, writing was part of the practice when the learners were provided with indirect corrections on their writing and encouraged to correct their own mistakes through direct corpus work. Writing was also part of the assessment, which revealed the reflection of the attained grammar knowledge in less controlled learner performance. The majority of the respondents framed the influence of corpus consultation in a positive light. A commonly expressed explanation behind their success was that they were exposed to multiple samples of language use, which enabled them to make judgments on the correct use, form, and meaning of the language issue to be corrected by themselves. There were only two negative comments in response to this question and they were connected with 1) concordance samples that sounded unusual, and 2) reading too many examples which was sometimes seen as tiresome. Most significantly, this experience appears to have led to better retention of instructional input.

Interviewee 7: COCA helped me improve my writing because it contains so many examples in different contexts that you can find the correct uses of grammar. When we made mistakes in school or university, we used to receive the correct answers from the teacher and never worked on the correction of our own errors. But when you correct yourself, I think it is easier to remember the information.

Interviewee 6: This corpus, with its practical examples, helps us understand how a word or a phrase is used, how a sentence is structured. So, based on these examples, it becomes possible to correct your own mistakes.

Interviewee 1: It was helpful but sometimes tiring.

5. Did COCA help you find grammar rules on your own?

As mentioned throughout the study, the inductive approach to studying grammar was selected for the students to engage in the self-discovery of lexico-grammatical patterns. There was consensus in their comments related to this new experience. They agreed that in most cases they were able to make generalizations about the uses of the target grammar items under study and appreciated the follow-up practice of verifying the validity of their hypotheses through dialogue with the class and the teacher. The key, in their account, to succeeding in the induction of the grammar rules appears to have been the multiplicity of examples in concordance form. A comment worth mentioning here is that the corpus helped not only discover the rules but also discover more contexts where the target form is or can be used.

Interviewee 6: *Yes, it did. This was a new learning experience, I mean in studying English, not in general, because in life we encounter a lot of situations when we need to solve issues by ourselves. This is a very similar experience and very useful, when you make your own judgments, also in life, and then compare them to others. So, it was really helpful when we compared our findings with the correct definitions provided by the teacher.*

Interviewee 2: *Yes, it helped me a lot. It was especially interesting when my findings appeared to be correct. There is so much information about a single language item and so many examples that by exploring them, you can get an idea of how it is formed.*

Interviewee 3: *And I would like to add that I was able not only to discover the rules, of course sometimes succeeded and sometimes failed, but also to discover many contexts where this form is used.*

6. Which do you prefer: discovering rules on your own or direct explanations of rules?

The respondents were subsequently asked to comment on their preferences between direct explanations of rules and discovering rules, and there was some variation in their responses. Some learners reported that they are in favor of first trying to arrive at some understanding about the grammar item by themselves and then checking the correctness of their conclusions, as it seems to facilitate the retention of knowledge. While some others did not mention their preferences explicitly, the reference to time constraints, and, therefore, the ease of direct explanation of rules, appear to suggest that they acknowledge the benefits of discovery learning and would undertake it unless their time was limited.

Interviewee 4: *I would prefer to first discover the rules by myself and then check whether or not my definitions are correct. For sure, as there is a saying, the difficult thing is to discover and not to learn what is discovered. However, when you discover, you learn not only what you are looking for, but many other things.*

Interviewee 1: *I am not very good at English and I can't spend much time discovering the rules by myself because of my work. In general, I liked this method of learning grammar; it helps remember the information better, but it might be more beneficial for university students who have more time to spend on their studies.*

Interviewee 3: *Of course, it's easier to study with direct explanations of rules and it does not demand much time, but discovering rules on your own can be more*

interesting and you can remember the rules which are discovered in this way more easily.

7. *Did corpus-based activities motivate you to want to do more grammar?*

In answering this question, not all participants presented the impact of DDL activities on their motivation to want to do more grammar in a positive light. The significant issue appears, unsurprisingly, to be the large amount of time spent on the search of a piece of information, which resulted in reduced motivation. Given the busy work schedule and the high level of sensitivity to safeguarding activities in the nuclear field, it seems reasonable that they report lack of time as the reason for their hesitation as regards wanting more corpus-driven grammar activities. However, this does not suggest that their motivation is diminishing because of the corpus practices themselves. While this new experience was reported to be motivating and effective, as also evidenced by the quantitative data, it can be impacted by the time factor. Some interesting counterpoints were offered by the informants, as provided below.

Interviewee 9: Not always did I succeed to find what I needed quickly and had to spend a lot of time searching and understanding examples. As a result, it became annoying and I didn't want to continue.

Interviewee 6: Yes, because deep processing of an issue allows you to understand how deep you can think.

Interviewee 2: Yes, because it is always interesting to look for your own approaches to understanding information. Moreover, these activities contribute to widening the scope of the uses of language.

8. *Did COCA raise your awareness of the language?*

The responses to this question did not provide long and explicit explanations - however, the reference to the multiple examples, various contexts, and discovery learning, appears to amount to the conviction that the learners were able to raise their knowledge about language by exploring the forms and functions of the language system. This appears to suggest that the pedagogical practice of DDL provided language learning opportunities that benefited the enhancement of learners' consciousness about descriptive language.

Interviewee 3: Well, there is so much information in one place that you can explore the language from different perspectives and understand how the language is

structured, what examples are more typical and so on. COCA is a good way to continue further studying of the English language if you have the skills of how to use it.

Interviewee 6: Yes, as I mentioned before, COCA has so many practical examples that by studying them you can enhance your understanding and imagination about the language.

Interviewee 5: Definitely yes, because the rich corpus data also contributes to language awareness.

9. What did you like about concordancing?

Aspects, hidden from the quantitative data, which were necessary to uncover were the attractions and challenges of concordancing for the learners. The interviewees agreed that although working with the corpus was a new experience, they liked the opportunity to construct their own meaning, compare it to others' findings, and check it against the teacher's explanation. This suggests that the 5-step model, designed by the researcher and implemented in the classroom, appears to be successful as a language learning method in terms of increasing learners' motivation and engagement in the learning process. Many comments were also related to the increase in confidence, this suggesting that the learners perceived themselves to be empowered by the attainment of skills and knowledge of new learning tools. Another aspect of DDL experience favored by the learners was the multiple real language samples in various real contexts, which gave them a view of the language from descriptive perspectives. The participants also presented the different functions of the corpus tools in a positive light, which they considered a unique opportunity to go beyond the monolithic representation of a language item and to explore it through various lenses. A final comment worth noting was the reference to collocations, which were easier to remember.

Interviewee 7: In fact, this was a really new experience for me – when I had to discover the language by myself. But I really liked it because it was interesting and helpful; especially when we shared our findings and received the correct explanation. I felt happy when my findings were correct and it also made me feel confident.

Interviewee 2: I think this is a good platform to study the language not only in the classroom but also by yourself whenever you have free time. It has so many tools and each has its specific role and significance, which allows us to understand the language more deeply. Unfortunately, this method, I mean working with the corpus, is not widespread.

Interviewee 4: *In general, I liked working with the corpus. It is a really rich resource of sentences and examples, which give you a sense of how people use the language in different contexts, in real life. For me, collocations were the most helpful, as they were easy to remember.*

10. What were the difficulties in working with COCA?

The participants were subsequently asked about the difficulties they encountered when working with the language corpus. Along with the benefits, discussed above, the direct corpus work was also accompanied with a few challenges, among which were the long time spent on searches for particular cases, the irrelevance of some texts to their language proficiency level, the length of the sentences, and technical issues. The general pattern emerging from their comments was related to the large amount of time required for concordancing. However, the reason for presenting this in a negative light was connected more with their busy work schedule, rather than with the experience itself; they seemed to acknowledge the positive impact of DDL on their learning, as evidenced both by the above reported assets and by the measurable quantitative data from the tests. The other issues, related to the readability of texts, when a lot of examples challenged their comprehension, as well as the technical issue, when the system required frequent upgrading of the account after several searches, were not frequently reported by the informants.

Interviewee 4: *The only difficulty for me was time. As I work different shifts, I don't have regular hours for my studies, and it's sometimes hard to spend longer time on corpus activities. But I don't mean that spending long time on searching for something or reading the examples in English is negative – just the opposite. This is a great opportunity to study the language.*

Interviewee 2: *I want to say that working with the corpus is not difficult but time-consuming. Combining work and studies is not easy and it does not allow for longer engagement with the language. But I also want to say that further use of COCA will contribute to better knowledge of English.*

Interviewee 3: *Sometimes the sentences were too long, and I had to open the whole context to understand the meaning. And also there were different parts of the same sentence as independent examples. Also, after several searches, we had to upgrade the account.*

Interviewee 6: *Except for technical issues, such as upgrading the account, there were no other difficulties.*

11. Do you prefer a grammar book or corpus-based activities?

As well as the comments provided on their preferences for direct explanations of rules and discovering rules on their own, the respondents' observations varied. Some people gave preference to grammar books explaining that books explicitly provide grammar rules, they are used to them and, therefore, it is easy to study with grammar books. However, in spite of that, they acknowledged that corpus-based activities can be more effective and interesting. As with the preference for direct explanations of rules, discussed in question 6, the reason behind the preference for grammar books was related to the ease of access and time-efficiency; this is encouraging in terms of pursuing further corpus-based work if the aim is to secure effective learning. Instead of prioritizing either choice, some others emphasized the importance of both the grammar book and the corpus-based activities as mutually complementary.

Interviewee 8: *Studying with a grammar book is easier, because it gives the explanation of a grammar rule, but I think corpus-based grammar activities are more interesting and can be considered more effective.*

Interviewee 5: *It's difficult to give a definite answer, but I prefer a grammar book because I am used to studying with it and it doesn't take much time to understand the grammar rule.*

Interviewee 2: *For me, both are good and they can complement each other. We can refer to the corpus if we want to see how a language point is used in various situations. The richness of examples can make us more aware of how it is used. And we can refer to a grammar book when we need direct explanations of grammar rules.*

12. Can you correct your own mistakes more easily to improve your own writing?

The development of independent learning skills is one crucial goal of DDL, and, therefore, equipping learners with corpus knowledge and skills was assumed to foster learner autonomy. Self-correction is one aspect of such regulation and it was practiced through hands-on corpus work throughout the experiment. In addressing this question, the participants' responses echo the findings of the Learner-Autonomy-Profile form, expressing supportive attitudes towards this behavior. Key in their comments is that they now know where to refer to when the need for self-correction arises – a platform against which they can compare and improve their own work – as well as how to correct their own mistakes due to the extensive practice.

Interviewee 3: *We had a lot of experience doing error correction activities, where we were supposed to find and correct errors, and we also did a lot of writing and corrected our own mistakes with the help of COCA. Sometimes it was difficult but now we know how to find correct answers.*

Interviewee 7: *I think yes, because I know how to use COCA. It's always useful to correct your mistakes on your own. In this way, you will never repeat the same mistake again.*

Interviewee 9: *Yes, there is what we can compare our work against.*

13. What is your attitude towards working with the language corpus?

The analysis revealed the learners' positive attitude towards working with the language corpus. This was expressed by their explanations that the language corpus, as a repository of a huge number of examples, allows them to get exposed to all of them at one place and instantly. Corpus work seemed to be sometimes tiring, but they found it as an interesting language learning tool. This positive attitude was probably the reason that all the participants' responses confirmed their willingness to continue using the language corpus independently whenever the need arises. This can be confirmed by the following quotes.

Interviewee 9: *In general, my attitude is positive. It was interesting but sometimes boring. But it can definitely help to improve our grammar and vocabulary.*

Interviewee 6: *My attitude (towards working with the language corpus) is positive, as it comprises a big number of language samples, which we can find in just seconds. I will continue using COCA if I need to construct a sentence or study the use of a word.*

14. Will you continue using the language corpus independently?

Except for one comment that reported that it would be a lie to answer yes, all the other responses confirmed that they were continuing and would continue to turn to corpora in the future. A key motivation for further corpus consultation appears to be the richness of language data and the various tools to navigate through the corpus, study the language from different angles, and gain a more comprehensive view of the meaning, use, form, and function of a particular language item.

Interviewee 2: *Yes, I will continue using the corpus, not very often, but whenever I feel that I need more examples to understand the issue better.*

Interviewee 6: *Yes, I am using COCA now and will continue using it when I need to construct sentences or investigate the use of a word or a grammar item.*

15. How would you describe an effective language learner?

The quotations reported below represent the patterned data related to the interviewed informants' perceptions of an effective language learner. As can be observed, they had a clear understanding of an effective language learner. They stated that an effective language learner is someone who sets goals and aims to achieve them - who devotes much time to language learning and is hard working. They also emphasized the importance of grammar and vocabulary learning, which require everyday improvement on the part of the learner. Effectiveness was also described in terms of high interest, awareness of the native language and the target language, and the ability to help others, to learn from others and by yourself.

Interviewee 6: *Effective learning is in the strive for accomplishing the set goal, in teachers' support, in devoting much time to studying and applying the language.*

Interviewee 5: *An effective learner is someone who works hard, who knows his or her mother tongue well, who is curious, has the ability to help others and learn from others.*

Interviewee 4: *This is a good question; I think everyone should have the chance to find his or her own individual way of learning.*

4.9 Conclusion

This study took the position that if DDL is to take a more mainstream position as an approach in language pedagogy, there is a need to explore its role as a response to some unresolved debates in instructed SLA, as discussed in Chapter Two. Therefore, the study, which employed a mixed-method experimental longitudinal design, conducted comparative evaluation between DDL and conventional instruction and gained primary empirical evidence on the role of DDL in the grammar development of pre-intermediate working professionals in the Armenian context. The study also examined the contribution of cognitive strategies of DDL to long-term retention of knowledge, the impact of direct corpus work on self-directed learning, and the learners' attitudes towards corpus-based discovery learning, promoted by DDL. As presented, the evaluation data was both quantitative and qualitative obtained through pre-, post-, progress-, delayed post-tests, the LAP form, and semi-structured student interviews, and

analyzed according to the ethical standards outlined in Chapter Three. Similar to the practice of grammar points, the tests measured the learners' grammatical performance through grammar tasks testing the grammar items discretely, through error correction and free writing as parallel tasks to see if the grammar knowledge gains were also mirrored in less controlled activities.

In the first stage, the pre-test was administered to ensure identical conditions for both groups before the integration of DDL instruction and to secure comparability of data to answer the research questioned mentioned above. The progress tests assessed the attainment of short-term immediate explicit knowledge, and the post-test provided product-oriented data that determined the impact of the new treatment on the learning outcome accounting for explicit knowledge after the corpus-based instruction, thus answering the first research question. Descriptive statistical analysis of the averages and variances of the pre-test and post-test results for each group and between groups revealed little difference for the control group and increased learning outcome for the experimental group, this implying that the experimental group outperformed the control group due to the DDL treatment. To gain a more definitive answer in relation to whether or not the difference in the mean values between the two groups could be ascribed to the new treatment and not to chance, a cross-analysis of Mann-Whitney U-test and Wilcoxon t-test were conducted, which added to the credibility of the descriptive statistical examination suggesting that the DDL instruction had statistically significant contribution to the immediate learning outcome. Subsequent quantification of the difference between the samples through the assessment of the relative size and magnitude of the effects for the above-discussed comparisons allowed us to go over the use of statistical significance. It facilitated the interpretation of the substantive significance of the result indicating the significant contribution of DDL as a grammar development resource and making it more meaningful to state that the significant difference in the learner performance was due to direct computer-based DDL and not due to chance. Driven by the intention to more closely examine the areas in which the possible differences could be detected, the mean values of each section of the tests were calculated for both groups. The computations recorded increased results in all the three sections for the experimental group; this once again was in line with the finding that the DDL treatment enhanced the learners' grammar knowledge and noticing skills, which was also mirrored in error correction and free writing tasks. While the post-test measured the learning outcome after the whole DDL instruction, the progress tests were meant to assess a shorter term impact of DDL on explicit knowledge after the

introduction of 3-4 grammar points, which was necessary for observations of performance changes between short terms and for further calculations of gains and losses in the long term. It was recorded that both the conventional and DDL instruction increased the learners' short-term declarative knowledge; however, the mean values of each section of the seven progress tests were higher for the experimental group than for the control group. More in-depth insights into the differences were gained when identifying the lexico-grammatical aspects that benefited more from DDL instruction at a declarative level. This beneficial effect was also reflected in the error correction section with a higher number of errors identified and corrected by the experimental group and in the free writing section with a higher number of target items used by the learners; this implied that the inductive approach of DDL and indirect corrective feedback, which promoted noticing, discovery, and self-correction through corpus consultation, contributed to the attainment of more accuracy in both controlled and free tasks.

To elaborate on the first research question and unfold the contribution of cognitive strategies to long-term implicit knowledge, the delayed post-test was administered three weeks after the post-test. The descriptive statistical computations of the averages and variances of the delayed post-test results demonstrated increased learning outcome in favor of the experimental group, suggesting that the latter was able to retain more knowledge due to corpus-based experience. The subsequent comparison of the delayed post-test data against the post-test and pre-test results, intending to understand the rate of changes in gains and losses during this interval, indicated that the cognitive stimulation required in DDL enabled the experimental group to gain more explicit knowledge and retain it in a long term with a few losses. Conversely, the contribution of the conventional grammar instruction was less in the acquisition and retention of language knowledge, hence a higher drop rate in a long term. Deeper insights into the changes in mind and action were gained by calculating the rates of gains and losses in percentages in separate areas from test to test, which reinforced the above finding interpreted in favor of the experimental group. The control group was able to record high rates of gains in explicit short-term knowledge but little was internalized to become implicit; however, the experimental group having been empowered to mobilize more mental resources to self-discover the grammar rules and self-correct errors through their honed noticing skills, was able to retain more information as part of the long-term procedural memory.

In the following phase, it was necessary to revisit the investigation of the degree of interface between explicit and implicit knowledge to identify those language teaching points that are more or less likely to benefit from DDL. Detailed investigation was carried out into the learners' performance on each grammar item on the way from declarative explicit knowledge to proceduralized implicit knowledge, as measured by the pre-, progress-, post-, and delayed post-tests, respectively. The summarized findings suggested that (1) those grammar patterns that underwent more cognitive intervention received higher scores in the long term than the ones that were accompanied by direct explanations. (2) The first entails that the knowledge of those items that were processed with less mental work either because of less exposure to authentic corpus input or irrelevance of discovery work, were not easily accessed after the delay, thus challenging the security of high retention rates. (3) These findings are related to the observation that it was mainly the grammar items at the collocational border that secured retention in the long-term memory. (4) Another relationship detected in the transfer of explicit knowledge to implicit knowledge was that most of the grammar points that initially scored high on the progress tests demonstrated high retention rates in the delayed outcome. Statistical basis was obtained for all these statements by measuring the strength and direction of the correlations between the variables as indicators of the constructs of short-term explicit and internalized implicit knowledge. It was concluded that the initial emphasis should be placed on the attainment of a high degree of explicit knowledge through the operationalization of mental resources, which appears to increase the likelihood of the transfer of consciously learnt knowledge to intuitive automatized knowledge and to facilitate the access to long-term memory.

As DDL interlinks with learner autonomy, another issue under investigation was the potential of DDL to foster autonomous learning skills, hypothesized in the second research question. The LAP form, profiling the four key constructs of learner autonomy, administered for both groups with a confidentiality agreement and by an independent party, provided answers on the contribution of DDL to learner autonomy. The analysis of the distribution of the mean values indicated more supportive tendency for the experimental group on the continuum of learner autonomy scale ranging from resistant behavior to independent skills. The further analysis of each separate component revealed more specifically where the possible differences in the groups' responses could lie. The biggest difference was observed in the action-oriented component, followed by cognitive/metacognitive component, this suggesting changes in action and mind supporting self-regulated learning. Affective-motivational component ranked the third,

where the experimental group demonstrated more positive position, and a slight difference was calculated for the social component.

Semi-structured student interviews were conducted in the experimental group with participation consent at the end of the treatment to address the third research question, which was concerned with finding out the learners' attitudes, hidden from the quantitative data, towards the hands-on corpus experience. It was aimed particularly at exploring the learners' engagement in the learning process, the change in their attitudes towards their own learning, the development of their learning skills, and the ways of demonstrating autonomous abilities in working with concordances. Summarized analysis of the patterned data resulting from the responses on each issue was provided in this chapter. In Chapter Five, the four broader themes (DDL as a grammar development resource; DDL for cognitive stimulation; DDL and its challenges; DDL for independent learning), deductively generated through pattern identification will be discussed within pre-defined frameworks to gain deeper insights into issues under investigation.

Chapter Four provided an account of the results of the multidimensional investigation obtained through the research methods introduced in Chapter Three. Chapter Five will provide a discussion of the results, cross-referencing the findings from various research methods and possible alignments between DDL and contemporary learning theories of Constructivism and Socio-Cultural Theory, as well as theories of SLA that serve as epistemological ground for this study.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

What prompted this study was the hypotheses that the integration of DDL into the conventional classroom would enhance learners' language learning performance in grammar, foster independent learning skills, and contribute to the acquisition of long-term knowledge, thus addressing some of the gaps related to the integration of DDL for teaching grammar at lower levels of language proficiency outside the academic setting and in the Armenian context. To investigate these hypotheses, a multidimensional and longitudinal mixed-method study was set up, as described in Chapter Three, with an experimental design that conducted comparative evaluation between conventional and DDL-enhanced grammar instruction at pre-intermediate level, whose difference was, respectively, in the deductive and inductive learning approaches, requiring different degrees of conscious care to meet the end. The following research questions were formed:

4. To what extent can DDL in an Armenian context improve pre-intermediate learners' knowledge of English written grammar items?
5. To what extent can DDL foster learner autonomy in discovering grammar knowledge through corpus consultation?
6. What are the learners' attitudes towards working with corpora to discover the grammar points and improve their own writing?

This chapter consists of the introduction section and three broad sections with their sub-sections. This first section introduces how the chapter will be structured. The following sections are devoted to the discussion of the primary evidence obtained from the various research methods of the current investigation. The discussion is conducted against the backdrop of the literature on Constructivism and usage-based model of SLA, reviewed in Chapter Two, as an epistemological stance for the study. Thus, the second section focuses on research question 1 and discusses the results of the pre-, post-, and progress tests, which demonstrated the extent to which the learners were able to improve their declarative grammar knowledge immediately after the introduction of each grammar point and immediately after the whole corpus-based treatment. The following subsection focuses on the analysis of the delayed post-test results, which revealed the impact of inductive data-driven learning on long-term retention of

knowledge and the areas where certain losses, gains, and retention rates were detected after a three-week delay, as well as the language areas that were more amenable to DDL. In the third section, the findings from the quantitative data on learner autonomy are dealt with, thus contributing to research question 2. Finally, the qualitative findings of the student interviews are discussed under four broader themes that emerged from the analysis and align well with the research questions, as demonstrated in Appendix S.

5.2 Research Question 1

The first research question was: *To what extent can DDL in an Armenian context improve pre-intermediate learners' knowledge of English written grammar items?*

5.2.1 Pre-Test and Post-Test

To answer this question, a comparative evaluation was conducted between the conventional instruction and DDL treatment. The difference in instruction was between the deductive and inductive learning approaches, when the control group received direct explanations of rules and direct corrective feedback on their writing and the experimental group constructed this grammar knowledge through induction of lexico-grammatical patterns and improvement of their own writing, encouraged by indirect corrective feedback and facilitated by hands-on corpus work.

Conventional vs. DDL-enhanced EFL Classroom

In both the conventional and DDL classrooms, the learners received formal language instruction, where conscious learning took place through studying language, and input was utilized as intake for learning. This resulted in the development of grammar and production of target-like output for the groups. As stated by Schmidt (1990), "Intake is the part of the input that the learner notices" (p. 139). Conscious awareness of the language forms under study facilitates language learning (Schmidt, 1990), speeds up the learning process, increases the proficiency level (Doughty and Williams, 1998b), develops learners' understanding of the forms to notice them in further input, which facilitates the acquisition of the target forms (Ellis, R., 1990). However, as indicated by the analysis of the evaluation data in Chapter Four, the contribution of DDL was more significant than that of the conventional instruction. This can be related to certain key principles characterizing these two approaches. In the

conventional Armenian classroom, the learners received language learning with the focus on the external, explicit, and direct processes, when the teacher teaches students how to reproduce already known answers to previously posed questions, where materials are primarily textbooks, and supplementary resources. This non-DDL “traditional” group received what is considered the normal traditional classroom. DDL-enhanced classroom provided a constructivist and socio-cultural environment where the focus was both on the internal and external processes of the learner, when knowledge is constructed, analyzed, understood, shared, verified, and applied. Moreover, learners in the conventional classroom become reactive beings, passive learners, and recipients of knowledge transmitted by the teacher, accumulated, memorized, and repeated back. Conversely, DDL, which exposes learners to descriptive rather than prescriptive language, helps them to become capable of approaching problems, to manipulate the language, and to generate hypotheses. Here, learners can become proactive beings, engaged in the subjective, active, and autonomous learning process, where knowledge is constructed through self-discovery and dialogue with others. As Boulton (2010) refers to this difference, it is in the adaptive behavior of the learner, who engages with the meaningful activity of detecting regular patterns for knowledge construction instead of the artificial intellectual activity of applying given rules. This study showed that the learners who were engaged in constructivist learning were able to achieve better performance in most areas.

Both the control group and the experimental group were provided explicit instruction, which enlisted selective conscious attention to language input. The difference between the groups was in the means of attending to input, which required different degrees and manner of cognitive processing and different degrees and manners of adjustment of attentional biases, resulting from L1. Taking control of the two types of form-function instruction – conventional and DDL - which differed in recruiting different degrees of cognitive care, it appeared that the stimulation of conscious processing capacities by DDL assisted the learners to consolidate more form-function mappings and retain more novel constructions, as evidenced by the substantial target-oriented L2 gains. This outcome is in agreement with N. Ellis’ (2005) statement about form-focused instruction, in general, that the success of L2 acquisition is largely determined by physical salience, learner attention, and instructional focus. Furthermore, as Ellis, N. (2005) explains this phenomenon, the subsequent implicit processing of the explicitly presented construction can update the statistical tallying of its frequency of usage and probabilities of form-function mapping. A more detailed discussion on usage-

based learning will be run in the following section, which more closely discusses those areas where the possible differences could lie.

Grammar Development

The first section of the pre- and post-tests assessed the learners' knowledge of the target items discretely. As discussed above, with regard to grammar teaching, this study employed explicit instruction for both the control group and the experimental group, which involves 'some sort of rule being thought about during the learning process' (Dekeyser, 1995, p. 380). While some proponents of formal language instruction claim that implicit knowledge can be acquired when grammatical forms are attended to incidentally in meaningful communications (Doughty, 2001; Long, 1988), others explain that explicit knowledge can be proceduralized through controlled practice and converted to implicit knowledge when attention is intently directed from meaning to form to raise metalinguistic awareness (Housen and Pierrard, 2005). Raised awareness is required to recognize linguistic forms in meaningfully contextualized situations (Ellis, N., 2005; Leow, 2001). However, the focus of this study is not the dichotomous strand of implicit/explicit grammar teaching, but the construct pair of inductive and deductive learning of explicit grammar instruction. The control group, having received deductive grammar instruction, during which 'rules are presented before examples are encountered' (Dekeyser, 1995, p.380), was able to enhance its grammar knowledge by 6% between the pre- and post-tests (see Figure 4.1). This figure was higher, 22%, for the experimental group, which experienced inductive learning, when examples are encountered before rules were inferred. This finding could be ascribed to the explicit inductive learning, aided by DDL.

As noted earlier, an important factor in facilitating L2 acquisition is consciousness-raising, particularly through noticing, self-discovery, and sufficient input. DDL promises valuable potential for developing learners' multi-literacies and cognitive strategies, particularly raising their awareness of lexico-grammatical patterning (O'Keeffe and Farr, 2003). Learners get multiple exposures to a particular language item made salient in the corpus input, which increases the likelihood of the item to be noticed by the learner and engage in knowledge construction (Cobb, 1997; Collentine, 2000; Flowerdew, 2015). Thus, in the DDL classroom, the learners were exposed to descriptive insights into written grammar, noticed lexico-grammatical patterns that make up the systematicity of language, thus raising their consciousness of language. This allowed them to discover language through sufficient exposure to grammatical

forms and systematize it for themselves. This can be substantiated by Carter and McCarthy's (1995) argument that the inductive approach moves learners from consciousness-raising to a higher stage of drawing conclusions about lexicogrammatical points and develops their skills of noticing such features throughout language learning.

Another important factor is the frequency of exposure to language patterns. Since learning is statistical (Ellis, N., 2005), there was a need to increase the frequency of the target input through instructional manipulation, in this case through a language corpus. The promotion of statistical learning was expected to facilitate the abstraction of rules through higher order of cognitive processing, in line with the usage-based model of language acquisition. Thus, based on the learning outcome, as measured by the post-test, it could be suggested that the corpus helped increase the learnability of items by selectively increasing their pervasiveness, which has an important role in strengthening form-function contingency. As highlighted by Perez-Paredes et al. (2020), the classroom experience that mirrors a 'microcosm of meaning' from the real world can, ideally, assist the learner to arrive at prototypicality due to the complete form-function mapping. Thus, multiple exposures created a 'reality' that seems to have assisted in making the target function of the construction prototypical and increased the reliability between form-function mappings, thus contributing to the learnability of the construction. Getting exposed to multiple corpus instances of a particular form-function connection, with diverse frequencies, collocational and colligational patterns, the learners were encouraged to draw on their top-down skills and abstract micro-prototypes, or prototypes within prototypes, unifying the instances of that mapping.

In the corpus-based language environment, the learners were engaged in active exploration and self-discovery of linguistic items through teacher's guidance, meaningful student interaction to solve problems by comparing their inferences, and a balanced approach of noticing and practice. The results of this experience give more confidence to suggest that the inductive approach had a greater impact on the attainment of grammar knowledge than the deductive instruction. This outcome is in line with the findings of a number of empirical studies on DDL that report more gains in grammar knowledge due to the inductive approach (Abdul-Ameer, 2019; Hong, 2010; Huang, 2014; Smart, 2014; Moon and Oh (2018). However, as suggested by Ellis, R. (2016), to be able to understand the contribution of both deductive and inductive learning approaches to the acquisition of knowledge, there is a need to go beyond the question as

to which is superior and measure their effects on the long-term retention of knowledge, which will be discussed in the following sections.

Error Correction

The second area where the difference was observed between the groups' performance on the post-test was the error correction section. According to the analysis of the results on this section, it became evident that the control group and the experimental group enhanced their test results by 13% and 34%, respectively (see Figure 4.1). This means that the experimental group was able to detect and correct a higher number of target errors than the control group. This finding mirrors the results on the grammar section, where the experimental group demonstrated a significantly better grammar performance. It suggests that the latter was able to develop both their grammar knowledge and noticing skills, encouraged by the corpus consultation for the discovery of grammar rules, as well as for the correction of errors to improve their own writing. Related to noticing, Boulton and Cobb (2017) note that it can be enhanced by exposing learners to multiple patterned examples made salient in authentic corpus input. It can be suggested that salience, being an essential prerequisite for noticing, can be both the starting point and the outcome of learning. This means that learning can start by making the target linguistic features within constructions salient to provide the possibility what to focus on and to enhance one's noticing and awareness and can continue backwards by recognizing the relevant features on one's own, as evidenced by the increased learner performance on the error correction section of the post-test. A more detailed explanation on how the learners' error correction skills were improved will be provided in the following discussion focusing on writing. Another finding was that not all error types can be corrected equally successfully; in most cases the learners were able to detect and correct the types of errors that represented constructions at a collocational border, such as *quantifiers much, many, few, little, comparisons with as many/much ... as, too, enough*, expressing purpose with infinitive and gerund, and others. Similar findings were documented by a number of researchers (Chang and Sun, 2009; Crosthwaite, 2017; Dolgova and Mueller, 2019; Tono et al., 2014) reporting that the success of error correction is largely determined by the type of error. The above finding can also be supported by Johns's (2002) claim that DDL seems to be best suited for language items at a collocational border between lexis and grammar.

Writing

The current study, as described in Chapter Three, applied direct and indirect approaches of the written corrective feedback. The control group practised writing through the model of mechanical accuracy receiving the correct form for the error, while the experimental group received indirect feedback with errors underlined to be corrected through concordance consultation. In essence, this model promoted the possibility for “a revision of cognition itself that stems from response” (Freedman, 1985). As a result, the experimental group was able to use more target items correctly than the control group showing a two-fold improvement in the free writing section between the pre-test and post-test, from 26,3% to 76,3%, respectively, while the control group was able to achieve a 36% increase, from 23,7% to 60% (see Figure 4.1). The evidence that the experimental group outperformed the control group gives confidence to ascribe the increased learning outcome to the DDL-enhanced experience.

Literature today reports conflicting findings related to the effects of explicit and implicit feedback, as discussed in Chapter Two. However, based on the above presented results, this study gives preference to indirect feedback. This agrees with the findings of other studies illustrative of the benefits of indirect feedback, suggesting that learners’ engagement in problem-solving and reflection can enable learners to improve their writing independently and lead to more accuracy (Chang, 2014; Ferris, 2011; Gaskel and Cobb, 2004; O’Sullivan and Chambers, 2006; Poole, 2016; Sun and Hu, 2020; Yoon and Jo, 2014). The employment of a language corpus, as a searchable database of authentic and comprehensive language, allowed the experimental group to move beyond the mechanical accuracy and give a second opinion to their intuition. It encouraged them to make their own judgments in checking the grammaticality of their writing and fill in the gap between their first and second opinions, thus increasing their role in the self-construction of knowledge. As Ferris and Hedgcock (2005) explain, the learner arrives at a final written product through the development and discovery of meaning by going through recursive, non-linear cognitive processes of pre-writing, drafting, feedback, revising, and editing.

As the current study centers on the importance of noticing, it also attempts to recognize the importance of the degree of explicitness that facilitates noticing of lexico-grammatical items in the language input. Research is inconclusive, conflicting, and scant with respect to the superiority of any type of feedback, as discussed in Section 2.5.3. Some researchers argue that providing correct answers explicitly can improve

learners' writing and performance in further tasks (Bitchener and Farris, 2012). It can help learners produce the correct answer immediately (Chandler, 2003), and can be advantageous for low-level learners or those with ill-formed explicit or implicit knowledge (Shintani and Ellis, 2013). According to the analysis of the results on the writing section, it can be assumed that the errors corrected directly by the teacher on the control group cohort were left unattended due to the conventional instruction. The DDL approach used with the experimental cohort, in contrast, allowed the learners to notice and fill in the gap between their erroneous utterances and the target forms independently, and test their own hypotheses in search of a correct form through a language corpus (Ellis, R., 2005). This is in line with one of the highlights in Crosthwaite's (2020) study, suggesting that 'less is more', which means that more indirect written corrective feedback can be associated with increased corpus consultation, while more direct feedback conditions result in negating the need for corpus use. Receiving indirect corrective feedback on writing and doing error correction tasks increased the salience of the taught input to be paid more attention to and aided the learners to notice their erroneous production, thus preparing them to be more observant in attending to new instances of language use and testing their own hypotheses. Thus, the higher level of repair in uptake contributed to the higher increase in learning outcome. This finding appears to be incompatible with the claim that any form of corrective feedback might promote pseudo-learning or at best self-editing and revision skills rather than true accuracy (Truscott, 2007). Moreover, the study recognized the concern that while self-editing their own writing, learners might fail to check the accuracy of their hypothesized corrections (Hyland and Hyland, 2006; Sheen, 2007). To avoid the leveling off of the potential advantage of the additional cognitive effort, the experimental group was engaged in problem-solving learning and reflecting upon existing knowledge guided by the teacher. In this regard, Crosthwaite (2020) suggests that, for successful L2 error resolution, teachers need to carefully consider whether their written corrective feedback allows for meaningful engagement with corpora to occur.

This study showed that both direct and indirect corrective feedback had a positive impact on the results; however (and in line with Crosthwaite, 2020), the higher degree of explicitness of direct correction did not allow the control group to engage in cognitive processing, hence the lower increase in the learning outcome. Moreover, paradoxically, the lower level of explicitness in feedback enhanced the salience of linguistic features because it called for more attention and more cognitive processing for repair. An important point to emphasize here is that while factors that make the feature

salient are necessary (for example, the surprise factor, the frequency, the feedback, the sociocultural factor, the absence of the structure in L1, the semantic complexity or morphological regularity, they are not sufficient for effective learning. The opposite manifestation of each of these factors, such as the commonality factor, the infrequency, the presence of the particular structure in L1, the semantic simplicity, or morphological irregularity might also be potential factors contributing to salience. For example, at advanced proficiency levels, the attention driven to the stimulus is top-down coming from the learner, as an unusual language point can become salient for the learner because of its infrequency (Gass, 1988). In contrast to this, at lower learning levels, the stimuli being equally unusual may stop being ‘unusual’ and may not stand out as salient for the learner. Therefore, there appears to be a need, as practised by this study, to make the physical properties of language input under study prominent to attract the learner’s physical or sensory attention and encourage inductive abstraction of constructions thus triggering the learner’s psychological or perceptual attention. Thus, for the salience to be effective and facilitate L2 acquisition, it has to be supported by subsequent higher order processing. In other words, it is important to focus not only on how to make a language feature prominent but also on the ways in which it is further processed to become entrenched. This can be supported by Leeman’s (2003) statement that noticing is affected not by the salience of a form, but by a number of factors, such as task conditions, developmental readiness, individual differences, among others, which determine the degree to which learners direct their cognitive resources to features in the input. In the current treatment with the experimental group, the grammar items were made salient both bottom-up by physically presenting them in the KWIC (key word in context) format, which attracted attention, and top-down by cognitively activating the learners’ attention to the stimulus, thus promoting perceptual salience. The conspired effect of this physical and perceptual salience is believed to have facilitated and accelerated the learning of the target constructions.

The aim of the corrective feedback is not only to contribute to short-term improved accuracy, but also to facilitate long-term L2 acquisition (Bitchener, 2009). There is a belief that profound learning processes are more likely to foster internalization and long-term retention of linguistic knowledge (Bitchener and Knoch, 2010; Ferris and Roberts, 2001), and the extent to which they contributed to grammaticality will be discussed in Section 5.2.3.

The analysis of the differences between the pre- and post-test data adds to the belief that language corpora, characterized by the dimensions of flexibility of use, objective and descriptive presentation of language, cognitive challenges scaffolded through a gradual shedding of assistance from the teacher, can enhance learning and teaching. It also provides evidence that language corpora should not be used alone in language instruction as they cannot inform all the real-world problems, but should complement other teaching practices. To get more understanding of the impact of corpus-based instruction on the learnability of language constructions, the following section will discuss the evaluation of the intermediate progress tests and elucidate the ways language aspects can be more efficiently introduced through language corpora at an initial declarative level within the process of learning.

5.2.2 Progress Tests

Declarative or explicit knowledge is necessary for developing procedural or implicit knowledge (Dekeyser, 2001). The processes that learners traverse in L2 acquisition start from external scaffolded attention leading to internally motivated attention, which promotes explicit learning and explicit memory, thus resulting in the automatization of knowledge and abstraction (Ellis, N., 2005). However, the arguments as to which type of instruction caters to implicit knowledge is not unproblematic, as discussed in Section 2.5.1, and whether cognitive strategies of DDL can contribute to long-term retention of knowledge will be the focus of the discussion in the next section. It is worth mentioning O’Keeffe’s (2021) argument that DDL learning starts with declarative knowledge when explicit noticing of form is promoted through repeated exposures to it, thus, ideally, leading to implicit learning. Initially, it is important to discuss how declarative knowledge can be enhanced through a corpus-based instructional model, as evidenced by the immediate progress test results.

Seven intermediate progress tests were administered to measure the learners’ grammar knowledge after each unit of introducing grammar points, and the evaluation of the results was meant to reveal the extent to which both the conventional and DDL instruction could develop the learners’ short-term explicit knowledge. Although the difference in the performance between the groups was not significant, implying that both types of instruction improved the learners’ explicit knowledge, the experimental group benefited more from the corpus work, as documented by slightly higher mean

values of learning outcomes on each section of all the seven tests (see Figure 4.2). It is concluded that higher learner performance was the result of the adopted constructivist model of learning and the enhanced language input the learners were exposed to. The choice of this environment was based on the paradigmatic stance of this study, including the theory of constructivism and the usage-based model, and ensuing pedagogical motivation for using certain interventions to enhance language learning and retention. Both conventional and DDL instruction were explicit directing the learners' attention to explicitly attend to and detect stimuli, shifting learning towards declarative memory, where learning happens more rapidly (Poldrack and Packard, 2003; Ullman, 2016). As the progress test results demonstrated, the learners from both groups were successful in learning the target language features in the short term. Even a single exposure to a stimulus can allow for rapid learning of information in the declarative system, although there is a need for multiple exposures for the information to become long-established (Ullman and Lovelett, 2018). However, the more successful outcome of DDL instruction suggests that since explicit instruction initiates learning through declarative memory, the role of the declarative memory becomes crucial in further processing of knowledge. Therefore, the application of DDL as a learning approach that will increase declarative knowledge more than others should become a priority. This can be supported by Ullman and Lovelett's (2018) claim that declarative memory, which underlies learning, should be crucial for all learned linguistic knowledge, at the word and multi-word level. This entails that increase in attention and awareness of target items can result in increased explicit knowledge, which is expected to depend on declarative memory (DeKeyser, 2015; Rosa and Leow, 2004).

As recorded by the progress tests, the contribution of the constructivist model of learning and the enhanced input of DDL instruction to declarative knowledge was greater than that of the conventional instruction. In the DDL treatment, declarative memory was enhanced through the stimulation of noticing and raising awareness of linguistic features, and procedural memory was triggered by mobilizing deeper cognitive mechanisms for discovering rules. More specifically, the grammar items under study were made salient in a bottom-up manner by physically presenting them in the KWIC format in the corpus which, it is assumed, attracted more attention. Multiple exposures to the target input and identification of frequencies were expected to enhance form-function contingency within constructions. Furthermore, promotion of noticing skills was likely to have enabled a shift or reduction of attentional biases. As a result, the experimental group was able to gain more advantage of the language input. Thus,

the treatment took control over such crucial factors as salience, contingency of form-function associations, and learned attention, which are reported to affect the learnability of constructions (Wulff and Ellis, 2018). While raising bottom-up attention through input enhancement was an essential step for learning, it was also necessary to cognitively activate learners' top-down attention to the stimuli through ensuing input processing curated by the teacher. This was achieved through the five-step guided learner experience, described in Chapter Three, which included forming hypotheses through inductive corpus-driven tasks, sharing hypotheses in groups, verifying the validity of hypotheses with the teacher, practicing the language point in a follow-up controlled exercise, and producing the language item through follow-up activities. The conspired interplay between the language input enhanced through physical salience to facilitate noticing and cognitive learning tools mobilized through perceptual salience driven by the constructivist model of inductive learning evidently facilitated and accelerated the abstraction of the target constructions. As O'Keeffe (2021) puts it, knowledge construction is a process-oriented activity, which draws on cognitive skills associated with inductive learning.

The extent to which the learnability of different constructions was affected by DDL was also noted through the progress tests (and other tests). In other words, even though the DDL treatment for all the grammar items was the same, the immediate outcome indicating the attainment of declarative knowledge appeared to be different for different items. The grammar sections on which both groups received almost the same results, included grammar points such as *indirect questions, be going to vs. will, modal verbs for necessity and suggestion, two-part verbs, requests, real conditional if, and expressing agreement with so and neither*. This implies that both types of instruction equally affected the attainment of the mentioned grammar points. These are the areas which received the lowest scores from the experimental group. The areas in which the experimental group scored higher than the control group ranged from *past simple statements, negatives, and questions, used to, quantifiers for countable and uncountable nouns, comparisons with as...as, expressing wish, past simple vs present perfect, Participle 1 and Participle 2, relative pronouns for people and objects, and modals for permission, prohibition, and obligation*, which could suggest that DDL instruction was more effective in studying these grammar items. The highest contribution of DDL could be detected in relation to *infinitives for giving suggestion, expressing purpose with infinitives and gerunds, verbs following prepositions, present simple passive and past*

simple passive, past continuous vs. past simple, and present perfect continuous, as evidenced by the big difference in the mean scores between the groups.

To understand the reasons behind the successes and challenges in learning certain grammatical constructions, it is worth discussing the effects of salience, form-function associations, and learned attention, which are reported within usage-based perspective of L2 learning, discussed in Chapter Two, to affect the learnability of language items (Wulff and Ellis, 2018).

The analysis of the above results shows that those grammar items that received lower scores are in most cases the ones that were not practically possible to be made salient through the corpus because of their multi-word constructions beyond collocational border to a whole sentence. In other words, they are difficult to retrieve or isolate through a corpus. This is assumed to challenge further input processing not allowing the learners to be exposed to frequencies and multiple instances, to induce patterns through individual statistical processing, and to reach the prototypical meaning of the target construction. Fewer top-down processing skills seem to have been employed. This finding can further be supported by the fact that similar results on these grammar items were demonstrated in the conventional classroom, where the input was not made salient and the instructivist model of learning attracted less cognitive effort. The opposite effect could be observed while analyzing the target items that had recorded higher scores. The salience of these items was enhanced through corpus solutions, which likely promoted cognitive processing means to achieve the end – inductive abstraction of rules leading to higher performance of rules. Psychological research suggests that more frequently experienced constructions as form-meaning pairs are acquired earlier and processed more easily (Ellis, R., 2012). While it is true that learning largely hinges on the frequency of construction usage, it is also true that frequency does not always result in acquisition (Wulff and Ellis, 2018), and not all input becomes intake (Corder, 1967). What this study underscores, based on the above findings, is the higher degree of cognitive effort, which can be attracted by enhancing noticing opportunities for learners. In the same vein, there is a theorized belief that the likelihood of being perceived and subjected to cognitive processing is higher for salient items, which as a result are more readily learnt than less salient cues (Ellis, N., 2006c; Rescorla and Wagner, 1972).

The difference in the scores can also be explained by the difference in the levels of form-function complexity, which creates different degrees of learnability and requires different levels of schematization (Wulff and Ellis, 2018). The linguistic

features that received higher scores show less complex associations between and within constituent constructions, which presumably assisted in reaching prototypicality for these constructions. In most cases, the items ranged from one-word to three-word constructions between lexis and grammar. The effect of prototypicality is demonstrated by the higher accuracy in learner performance on these constructions. Conversely, the lower performance was attracted by the language features that demonstrated more complex form-function associations. It should also be noted that among the highly scored items, there were also a few constructions with complex mappings between the form and the function. While these complex associations did not lend themselves to being made salient physically in the concordance lines, their salience was likely to be enhanced due to the surprise value resulting from the infrequent and unusual properties of the constructions - among these were *the present perfect continuous, expressing wish, or passive structures*. Either the physical properties of a stimulus or the surprise factor when expectations are violated can make the stimulus outstanding or salient (Gass et al., 2018).

Another reason behind the low scoring with regard to certain constructions seems to be the weaker reliability of form-function contingency. The instances of cues with single interpretations, such as *quantifiers for countable and uncountable nouns, verbs following prepositions, relative pronouns*, among others, appear to be learnt more easily than those with multiple interpretations, such as *expressing agreement with so and neither, or be going to vs. will*, which are likely to create ambiguity. This finding can be substantiated by the proposal of some SLA researchers that acquisition and processing of a form is determined by its reliability as a predictor of an interpretation (Gries and Ellis, 2015; Gries and Stefanowitsch, 2004; MacWhinney, 1987).

Learners come with their knowledge of L1 that is biased in terms of attention, and this learned attention could apparently affect the learnability of the input. For example, while in English *two part verbs* are used with pronouns between the parts, in Armenian the position of pronouns is not fixed. *Indirect questions* in English require a fixed structure where a subject is followed by a predicate, whereas in Armenian it is acceptable to mix the places of all the words in a sentence due to the rich inflectional system. Another example can be the use of *expressing agreement with so and neither*, which in Armenian is expressed as '*I too*' in responding to both positive and negative statements. Thus, the learners' prior knowledge of L1 cue-outcome associations could have challenged them to accept the new associations; these were the mappings that did not overlap with their L1 experiences in any way, thus resulting in negative L1 transfer,

before they could make adjustments in their L1 schematized expectations. The comparison of the L2 cue-outcome mappings that scored higher with their L1 mappings revealed a greater degree of overlap, suggesting that L1 attentional expectations facilitated the learning of these constructions. This finding is in line with the arguments that the learner's schematized repertoire of L1 both converges with and diverges from the L1 environment (Perez-Paredes et al., 2020). Attentional biases shade experiences in L2 both positively and negatively, by increasing sensitivity to language cues in one case and reducing it in another (Jarvis and Pavlenko, 2008). While the influence of other factors remains to be elucidated by further research, the associated pattern of results is quite compelling. The understanding that could be drawn from these analyses was that the low scored constructions were those that were characterized by complex form-function associations, did not receive salience, and underwent negative L1 transfer; whereas the high scored target items represented less complex associations, stronger reliability of form-function contingency, received more salience, and benefited more from L1 attentional biases, thus stimulating subsequent cognitive processing and becoming more learnable.

These analyses add credibility to license the conclusion that it is not the raw frequency or the raw salience, or the learned attention, but the converged effect of all these factors and the higher degree of cognitive care to arrive at prototypicality that can enhance the learnability of language stimuli in declarative memory. Whether all the grammar items in declarative memory were proceduralized respectively, what changes took place in the attained declarative knowledge on the way to internalization, and to what degree it was retained for a long term or lost will be the focus of the following discussion.

5.2.3 Delayed Post-Test

There is agreement among researchers that implicit knowledge or automaticity is the necessary condition for acquiring second language competence (Doughty, 2003; Graus and Coppen, 2016; Han and Finneran, 2014; O'Keeffe, 2019). Drawing on different theories of L2 acquisition, a number of studies have been conducted to measure the impact of various grammar teaching approaches. However, there is no consensus regarding the effectiveness of a particular grammar teaching approach (e.g. form-focused versus meaning-focused) in facilitating the automatization of taught knowledge. This uncertainty lies behind the ongoing interface debate, as discussed in Chapter Two. Since around the 1980s, the emphasis has shifted from deductive to

inductive learning, and this can be aided by DDL. One of the aims of this study was to gain insights from a pedagogical perspective into the contribution of cognitive strategies of DDL to long-term retention of knowledge, as measured by the delayed post-testing, thus identifying the role and place of DDL in the interface debate, as well as providing a more comprehensive answer to research question 1.

According to the analysis of the delayed post-test results, which was administered after a three-week interval, it became obvious that the experimental group performed better than the control group, thus suggesting that the former was able to retain more knowledge due to DDL (see Table 4.8). To move beyond this tentative finding, a comparison was carried out between the three tests (pre- post-, and delayed), which was more illustrative of the rates of change in learner action and thought. Thus, briefly interpreted, the gain rate between the pre-test and post-test was 2.5 times as high for the experimental group as for the control group, and the loss rate between the post-test and delayed post-test was twice as low for the experimental group as for the control group (see Table 4.9). This could be explained by the fact that both the conventional and DDL grammar instruction equipped the learners with conscious metalinguistic knowledge retrieved from declarative short-term memory, as measured by the progress tests and post-test. Since the experimental group had more gains and fewer losses of knowledge than the control group, it could be suggested that the inductive hands-on concordancing not only provided more explicit knowledge but also enabled the experimental group to proceduralize more taught knowledge and retain it longer-term before the delayed measurement. This finding can fit in between the strong and weak interface positions, which emphasize the relationship between explicit and implicit knowledge. In other words, explicit knowledge is seen to lead, at some stage, to automatization, whereby the learnt forms can become part of the user's long-term memory and fluent sub-conscious functionality (O'Keeffe, 2021). Derived from Cognitive Psychology and instantiated by Noticing Hypothesis, this relationship starts from conscious learning and the development of cognitive skills, such as noticing (Schmidt, 1990). The argument of this finding can further be substantiated by Han and Finneran (2014) explanation that in conscious learning, first learners acquire declarative or know-what knowledge, followed by procedural or know-how knowledge, which is finally internalized as spontaneous, effortless, and fluent knowledge. The interaction between declarative and procedural knowledge is likely to interface from explicit learning to implicit learning, from external to internal, from conscious learning to subconscious knowledge, thus leading to automatization (O'Keeffe, 2019). In this

respect, the role of the delayed post-testing was crucial as it provided a better insight into the issue under investigation.

To obtain deeper insights into this finding, it was also interesting to calculate the rates of the gains and losses in percentages in separate areas from test to test (see Table 4.9). The comparison of the post-test data against the delayed post-test results on grammar revealed that the loss of the knowledge for the control group constituted nearly half of the gain, while that for the experimental group was only one-seventh of the gain, this implying that the latter was able to proceduralize six times as much knowledge in the long run. In the error correction section, the experimental group was able to retain 30% out of the 33.8% of the gained accuracy rate, while the control group lost as much as it had gained, 12.5%. The explanation behind this finding can be related to a few factors. Firstly, the learners experiencing DDL were able to raise their consciousness of lexico-grammatical patterns, through sufficient exposure to language items in the corpus, before being expected to proceduralize them. Secondly, by raising awareness they had the opportunity to explore and assimilate knowledge, thus becoming linguistically more competent. “Learners reconcile their new findings with their current interlanguage, that is ‘notice the gap’ between their understanding of the use and usage of a particular feature, and examples of its use by native speakers” (Mishan, 2004a, p. 38). This allowed them to self-discover or induce L2 grammar points by recruiting such cognitive skills, as noticing, concept-forming, hypothesis-testing, and constructed their explicit, “conscious” knowledge for controlled use. These mental processes seem to have further facilitated the long-term retention of knowledge, as evidenced by the delayed post-test. This finding can be supported by the belief that cognitive effort, which is absent in rule-based instruction and is required by DDL, when learners are exposed to multiple patterned examples made salient in authentic input necessary for noticing (Boulton and Cobb, 2017), is a reliable factor for retention (Hulstijn and Laufer, 2001).

Similarly, the benefits of DDL could be attested in the writing section, where the loss rates for the control group and the experimental group constituted -16.3% and -3.8%, respectively. Being active participants in the writing process, supported by the process-oriented approach, dealing with indirect error correction aided by the inductive approach of DDL, the experimental group succeeded in constructing their own meaning from their own experiences. Since increased cognitive work, advocated by constructivism stemming from Cognitive Psychology, leads to more learning gains, this

way is more likely to create conditions necessary for language acquisition to take place (Cobb, 1997). This means that before focusing on the transfer of knowledge from the conscious to subconscious level, we should be concerned with the increase in the gains of explicit knowledge in a constructive way. This will lead to fewer losses, hence internalization and retention of more L2 knowledge, and DDL can be instrumental here. The support of this finding can be found in a core underpinning of a usage-based model of language acquisition, which views the interface between explicit and implicit knowledge not in the transfer of one type to another, but in the possibility that the construction of explicit knowledge can assist in the proceduralization of knowledge (Ellis, 2015; Tyler and Ortega, 2018). Within this perspective, as O’Keeffe (2021) remarks, DDL becomes closer to the weak interface position when it is used in a discovery learning format, where learning takes place through explicit and implicit noticing of form, through multiple encounters, which, over time, can lead to implicit learning.

Another insight provided by the analysis of the delayed post-test results was identification of those language areas that are more likely to benefit from DDL instruction at procedural level (see Table 4.12). The comparison of the delayed post-test results against the progress test results revealed 73.3% overlap between the grammar items associated with high achievement rates in immediate testing and those associated with high retention rates in delayed testing. Otherwise stated, most of the declarative knowledge that initially scored high became part of procedural knowledge. Among them are: *past simple, used to, quantifiers, comparisons, present perfect vs past simple, expressing purpose with infinitive and gerund, infinitives for giving suggestions, verbs followed by gerund, participle 1 and participle 2, relative pronouns, and modals for permission, prohibition, and obligation*, for which DDL allowed for cognitive engagement at collocational level. These are the areas that represented less complex associations, stronger reliability of form-function contingency, received more salience, and benefited more from L1 attentional biases, thus stimulating subsequent cognitive processing and becoming more learnable at the declarative stage, as discussed in Section 5.2.2. The remaining 26.7% which did not retain the initial high performance after a delay appeared to be those constructions whose success was attributed to be the result of surprise or novelty value. The latter appeared not to have a contribution to procedural memory, and, consequently, mental adjustments did not take place in the long term (as evidenced by the delayed post-test results).

As regards the design of corpus-driven activities connected with the other language points, such as *indirect questions, expressing wish, be going to vs will, two-part verbs, requests, real conditional, expressing agreement, passive voice, past continuous vs past simple, and present perfect continuous*, it appeared to be difficult to make the discovery of language knowledge feasible due to the extension beyond the collocational border. These are the low scored constructions in the declarative phase that were characterized by complex form-function associations, did not receive salience, and underwent negative L1 transfer. As discussed in the previous section, these are areas that seem to be less straightforward in terms of form-meaning mapping, when there is a complex interrelationship between form and meaning, and in some cases, where the form may be more complex. The complex form-meaning relationship, as well as the extension of the constructions beyond collocational border, did not allow the learners to notice and abstract patterns or create a prototype of the construction, thus reducing the level of cognitive engagement. In the meantime, the developmental level of their L2 schemata did not serve a sufficient base to compare the new encounters against and adapt their mental model to fit the novel situation. The observations above were substantiated by the *r* coefficient values evaluating the association between the progress/post-test mean gains and the delayed post-test outcome, as presented in Chapter Four. The results were interpreted as a strong positive correlation between these two variables (at a statistically non-significant level between the immediate progress tests and delayed post-test, and at a statistically significant level between the post-test and delayed post-test). This once again suggested that the higher amount of explicit knowledge is constructed through cognitive intervention, the higher rate of retention and, hence, the higher rate of acquisition is achieved. While grammar is a promising area for DDL work, it should also be noted that more efficiency of corpus work is achieved at lexico-grammatical collocational border, when the meaning maps more straightforwardly with the pattern. Hence, a careful selection of lexico-grammatical patterns needs to be factored in for cognitive stimulation to become possible and for DDL to serve efficiently. Consistent with this, it is worth noting Johns' (2002, p. 109) remark that it is between syntax and lexis that DDL methods seem to be more effective.

Studies that explore the relationship between input enhancement and cognitive effort are few; however, it was concluded that there is interaction, and the issue still requires further investigation (Gass et al., 2018). Based on the primary evidence of this study, it can be explained that those stimuli whose prominence was enhanced through corpus-based solutions, allowing the learners to deal with the pervasiveness of data,

notice the target items in meaningful form-function-use relationship, identify frequencies (Perez-Paredes, 2020), engage in deeper cognitive processing, and arrive at prototypicality of constructions, were more readily proceduralized and retained in long-term memory. This was evidenced by the delayed post-test. Thus, learning started with the promotion of top-down prototypicality and ended with the arrival at top-down prototypicality. Within this inductive approach of DDL, declarative knowledge was enhanced through the stimulation of noticing and raising awareness of linguistic features, followed by mobilization of deeper cognitive mechanisms for discovering rules. The conspired efforts of input enhancement and cognitive simulation appear to have led to better storage and retrieval of grammar knowledge. It seems to suggest that grammar instruction should tend to focus on the enhancement of explicit knowledge through the reliance on cognitive strategies of learning.

The study suggests that learning grammar is an active process that derives knowledge from experience, and this can be aided greatly by DDL. In addition to all this, as Cobb (2005) presents, in DDL, learners construct knowledge by grappling with raw data, which not only empowers them to retain more information, but also transfer their skills to novel situations and prepares them well for independence. Thus, the pedagogically core aim of DDL is to foster independent acquisition of language knowledge (O’Keeffe, 2021). The extent to which DDL can foster learner autonomy and be anchored in constructivism will be the center of the discussion that follows.

5.3 Research Question 2

The second research question was: *To what extent can DDL foster learner autonomy in discovering grammar knowledge through corpus consultation?*

5.3.1 Learner Autonomy

The ways that DDL can be linked to the concept of learner autonomy are one of the foci of this study. The data on the development of autonomous learning skills was obtained from the Learner Autonomy Profile (LAP) Form, administered with a confidentiality report; it aimed to provide an answer as to the extent to which data-driven learning could foster learner autonomy as measured by the constructs and components of learner autonomy. The analysis of the results from the LAP Form, as presented in Chapter Four, revealed a supportive attitude towards independent learning on the part of the experimental group, while the control group demonstrated attitudes

ranging from neutral to positive (see Figure 4.5), indicating that the DDL environment contributed to the development of independent learning skills. This suggests that autonomy is not a ready-made product, a personal quality, or an article of faith; it is achieved in the environment of cognitive and metacognitive strategies, motivation, attitudes, and knowledge about language learning, curated by the teacher. Firstly, it is apparent that a language corpus is a self-access tool that exposes learners to authentic language use and provides answers to their language-related issues, both lexicogrammatical and stylistic. Awareness of the available instruments and experience of working with them can translate into the ability and readiness to take more control over one's own learning (Holec, 1981). Secondly, the recruitment of top-down skills of inducing, hypothesizing, and generalizing driven by noticing skills develops learners' ability to discover and construct their own meaning. "Learner autonomy is increased as students are taught how to observe language and make generalizations rather than depending on a teacher who states rules for them" (Conrad and LeVelle, 2010, p. 548). The outcome of the analysis is consistent with the idea that through active involvement in the management of their own learning, which starts inside the classroom, learners change from a position of being teacher-dependent to a position of being an independent learner (Benson, 2001).

These explanations refer to all four components of learner autonomy (action-oriented, cognitive-metacognitive, affective-motivational, and social), where the action-oriented component illustrated the biggest difference between the groups' responses (see Table 4.12). This was due to the DDL experience when the learners addressed to the language corpus to find answers to their questions, correct their own mistakes, and improve their own writing, that is manage their own learning. Along with these abilities, the responses as regards this component also referred to the learners' ability to apply different learning tools and strategies, to select and evaluate learning materials, to study independently to improve their grammar, and to choose to learn something outside the classroom, which were associated with higher mean values for the experimental group than for the control group. While this study agrees with the belief that the development of autonomy in DDL is due to the central attention given to the enhancement of "learners' ability 'to puzzle out' how the target language operates from examples of authentic usages" (Odlin, 1994, p. 320), it also stresses that the treatment needs to shift from research- to pedagogically-oriented process, underpinned by a certain degree of teacher mediation, carefully designed teaching materials, and a learning model that would promote inductive abstractions of grammar rules. As Tyler and Ortega (2018)

sum up the arguments of usage-based researchers, learning environments need to provide opportunities for inductive or deductive abstraction of constructions instead of the rehearsal of arbitrary connection between form and meaning.

The second difference that was observed in relation to the development of autonomy was in the cognitive-metacognitive component. This component provided evidence on the enhancement of the learners' awareness of their own learning, as well as their analytical, evaluative, and reflective skills in favor of the experimental group. It indicated a higher degree of contribution for DDL than for the conventional instruction in the enhancement of such mental skills underpinning autonomy, as analysis, inferencing, drawing conclusions, making decisions, comparing, recognizing, evaluating, valuing, and being aware. In Conrad and LeVelle's (2010) words, "Learner autonomy is increased as students are taught how to observe language and make generalizations rather than depending on a teacher who states rules for them" (p. 548). In this environment, the focus is not only on form-use-meaning mappings, but also on learning which is individual in terms of experience, but all-human in terms of available similar cognitive mechanisms for any learning. In usage-based approaches, which hold a wider perspective on learning than traditional approaches, L2 constructions emerge and are learnt as a result of individual statistical processes of dynamic interplay between exposure to input and mental processing tools (Perez-Paredes et al., 2020).

Moreover, the experimental group was more intrinsically motivated and more positively positioned towards their own learning than the control group, as evidenced by the responses to the affective-motivational construct, which measured such crucial factors for learning as the learners' willingness and readiness to do more individual work to achieve better results, to participate in learning more difficult things, to improve independent language learning skills, among others. The DDL environment seems to have increased the learners' confidence by exposing them to real language input that they will encounter outside the classroom, enhanced their consciousness of descriptive language use, empowered them by equipping with the necessary corpus learning skills and knowledge for independent use, enhanced their awareness of and experience in individual learning processes and strategies to notice, discover and build language knowledge, thus increasing their motivation to undertake more independent language-related work. An important motivational aspect in corpus-based solutions is the opportunity and experience to make abstractions of lexico-grammatical patterns. By drawing on semantic networks, learners will be able to mobilize higher level top-down

processing skills, instead of rehearsing arbitrary form-function connections, which will assist them to abstract the unifying concept of all the manifestations of use – prototypicality (Tyler and Ortega, 2018).

The affective-motivational component of learner autonomy was followed by the social component with a slight difference in the groups' responses in relation to the cooperation with others, learning in pairs or in groups, as well as learning with others and from others. The lowest value for the contribution of DDL was detected in this social component of learner autonomy, and this could be explained by the fact that both the conventional and data-driven instruction incorporated interaction in pairs and in groups. However, the difference could be interpreted as the result of the scaffolded social dialogue that aimed to verify the learners' hypotheses and arrive at the right knowledge. All the findings above accord with the belief that by transferring the linguist's analytical procedures into the language classroom, learners will be able to raise awareness of language patterns, enhance language learning strategies (Perez-Paredes, 2010), and refine more complex cognitive processes (O'Sullivan, 2007; Lee et al., 2019).

The study was also interested in understanding the strength and direction of the relationship between the learning outcome and learner autonomy. The correlation calculated between these two variables was interpreted as statistically not significant but positively associated. It can be implied that the development of autonomous learning skills, characterized by affective-motivational, action-oriented, cognitive-metacognitive, and social components, can complement the acquisition of English as a second language. Similar positive findings were reported by a number of studies (although few because of the long-term nature (Flowerdew, 2012) and the difficulty to quantify autonomy (Boulton, 2012)), related to the contribution of DDL to learning outcome and learner autonomy (Chen, 2017; Dung, 2016; Qoura et al., 2018; Sah, 2015; Smirnova, 2017). Moreover, in terms of knowledge proceduralization, the development of self-regulated learning skills through corpus-based experience will, ideally, allow learners to independently turn to language input in corpora and get sufficient exposure to language items, which will lead to grammaticalization of language knowledge.

All these findings are illustrative of the key role of DDL in fostering self-regulated learning, which is a highlighted provision of the Common European Framework of Reference for Language (CEFR). As a result of the shift in teacher and learner roles, where part of the responsibility is delegated to the learner, the latter

becomes empowered with heuristic skills, which go beyond general learning ability, and it is due to this empowerment that he or she can return to the corpus again whenever the need arises. Related to this, Aston (2001) stresses that the most appealing part of language corpora is their potential for autonomous learning, when part of the teacher responsibility is shared with learners. Consequently, both the teacher and the learner attempt to find the best answers to questions, which evolves into learner empowerment, fundamental to the development of learner autonomy. It is due to this sense of empowerment that the learner returns to the corpus for more input in the future (Little, 1999). Moreover, the findings support Carter and McCarthy's (1995) proposal of a teaching framework, including three Is (Illustration, Interaction, and Induction), when planning for a DDL-based environment fostering autonomy, which results in the development of the capacity of *noticing* – a necessary prerequisite for further language learning. As Gilquin and Granger (2022) argue, through various DDL activities, which encourage inductive learning by observing corpus data, making inferences, and formulating rules, learners become more active, more involved, and, ultimately, more autonomous. Thus, it is the teacher's responsibility to raise learners' awareness of the benefits of the new technology whose key elements in relation to language learning are awareness raising, reflection, and learner empowerment. Teachers should also help them develop strategies for employing the new technological tools and create the opportunity for learners to use them to make learning more active, more motivating, and more learner-centered – this will assist them in adopting autonomous learning skills, which will guarantee lifelong learning (Avetisyan et al., 2017). To understand the learners' attitudes towards the new data-driven treatment, the following section will now turn to the discussion of the student interviews.

5.4 Research Question 3

The third research question was: *What are the learners' attitudes towards working with corpora to discover the grammar points and improve their own writing?*

5.4.1 Semi-Structured Student Interviews

This section reports on the qualitative data gathered through face-to-face semi-structured interviews with the experimental group (on their consent form, the participants indicated their consent to be interviewed), in order to follow up on specific information from the LAP questionnaire and reveal the learners' attitudes towards

working with corpora to discover the grammar points and improve their own writing. The discussion will be grouped into four thematic subsections, which very often overlap: DDL as a grammar development resource; DDL for cognitive stimulation; DDL and challenges; and DDL for independence. These are the themes that deductively emerged from the identification of patterned data within pre-defined frameworks, thus providing deeper insights into issues under investigation.

DDL as a Grammar Development Resource

The respondents' responses were similar in terms of attaching an important role to grammar in studying the language and achieving high proficiency both productively and receptively. As they reported, grammar helps to better understand and construct language, as well as improve language knowledge continuously. By far the most common responses were related to the role of grammar in professional settings for effective communication with foreign experts from the nuclear field. Similar positive attitudes were observed towards writing in English, and it was the link between studying grammar and meeting professional goals that was most frequently mentioned.

Reflecting on their experiences in corpus work, the informants described the language corpus as a useful resource for improving grammar knowledge and confirmed its positive impact on the development of their grammar knowledge. Many comments referred to the frequency information, the multiple examples with the target item, the concordances as a new way of noticing the key word in context. Although the corpus does not provide explicit explanations of grammar rules and is not a conventional tool for learning, as reported by them, it provides opportunity to explore the language in different usages. They acknowledged the benefit of concordancing in that, despite being tiring and time-consuming, it exposed them to multiple language samples, particularly collocations, which facilitated the retention of target forms. In general, they were supportive of the corpus-driven activities, especially of their experience of inducing grammar rules by themselves. Writing and error correction, as parallel tasks, were part of the practice to encourage the learners to correct their own mistakes, and part of the assessment to reveal the reflection of the attained grammar knowledge in less controlled learner performance. In relation to this, the majority of the respondents framed the influence of corpus consultation in a positive light. A commonly expressed explanation of their success was that they were exposed to multiple samples of language use, which

enabled them to make judgments on the correct use, form, and meaning of the language issue to be corrected by themselves. Most significantly, this experience was reported to have led to better retention of instructional input. This was also documented by their higher grammar performance on the immediate and delayed tests, measuring short-term and long-term knowledge gains, respectively, as well as by higher mean values associated with the action-oriented component of the learner autonomy profile form, as discussed in Chapter Four. Cross-referring to the discussion in Section 5.2, it can be stated again that language corpora bring the replications of the typicalities and possibilities of real language use into the classroom by exposing learners to multiple instances of language chunks in contexts, as language constructions (Perez-Paredes et al., 2020). The corpus-based treatment took control over such crucial factors as salience, contingency of form-function associations, and learned attention, which are reported to affect the learnability of constructions (Wulff and Ellis, 2018), leading to increased learning outcome.

DDL for Cognitive Stimulation

The respondents agreed that in most cases they were able to make generalizations about the uses of the target grammar items under study and appreciated the follow-up practice of verifying the validity of their hypotheses through dialogue with the class and the teacher. The key in their account to succeeding in the induction of the grammar rules appears to have been the multiplicity of examples in concordance form. A comment worth mentioning here is that the corpus helped not only discover the rules but also discover more contexts where the target form is or can be used. There was some variation in the respondents' preferences regarding the direct explanation of rules and discovering rules. Some of them explained that explicit rules make learning faster, while others recognized the attractiveness of cognitive engagement in making meaning, stating that the discovered information could be acquired, retained, and retrieved more easily. Similarly, some preferences for using grammar books were linked with the easy and time-saving work, which is encouraging in terms of pursuing further corpus-based work if the aim is to secure effective learning. Some acknowledged the importance of cognitive work promoted by corpus-based activities, and some others viewed them as mutually complementary. The preferences were also conditioned by the efficiency of corpus work, which facilitated the discovery of rules, but not in all cases. This suggests and supports the findings discussed in Section 5.2 that DDL cannot be beneficial for all language areas and, therefore, it should be applied as a complement to other teaching

practices. According to the learners' views on language awareness, as another long-term benefit of DDL, COCA helped them raise awareness of various aspects of language, as they navigated through multiple authentic contexts and were able to notice things that they were unable to previously or otherwise notice. Thus, it can be suggested that the enhanced input in interaction with the higher degree of cognitive effort can benefit the acquisition of the target items. As previously discussed, corpus-based awareness-raising activities engage learners with language, challenge them cognitively to compare, analyze, and construct their own generalizations (Lightbown and Spada, 2013). Learning is construction of knowledge (Benson, 2001) and inductive learning, supported by DDL, enables learners to notice the real language use in the form of enhanced concordance input and discover lexico-grammatical patterns by themselves (Braun, 2005; O'Keeffe et al., 2007; Romer, 2006).

The long-term gains demonstrated by the delayed-post-test are the outcome of what the participants' experienced above, which once again highlights that learning should start with noticing. Another reflection of these experiences is the cognitive-metacognitive component of the LAP form – the second highly scored component influenced by DDL instruction, after the action-oriented component. Noticing is necessary for the input to become intake, and the relationship between explicit and implicit knowledge starts with noticing. The two cognitive processes that define the level of noticing and mediate input and L2 development are attention and awareness (Schmidt's, 1990). Corpus-based solutions help to increase this level by enhancing the salience of the target points in concordances, multiplying the instances of exposures, identifying frequencies, thus enhancing form-function contingencies. This appears to allow learners to systematize language in most cases, arrive at prototypical meaning, and assimilate knowledge by mobilizing their top-down processing strategies. The interaction between the explicitly salient input and the implicitly functioning cognitive skills is likely to facilitate the proceduralization of knowledge. "L2 constructions emerge and are learnt as a result of individual statistical processes of dynamic interplay between exposure to input and mental processing tools." (Perez-Paredes, et al., 2020).

DDL and its Challenges

The interviews also aimed at uncovering the attractions and challenges of concordancing for the learners. Among the attractions of DDL, reported by the interviewees, were the opportunities to construct their own answers, compare them with others' findings, and check them against the teacher's explanations, which gave them

more confidence and, most importantly, facilitated the retention of knowledge. This suggests that the 5-step model, implemented in the classroom, appears to be successful as a language learning method in terms of increasing learners' motivation and engagement in the learning process. Many comments outlined the frequency information, the multiple examples with the target item, the concordances as a new way of noticing the key word in context. They also mentioned their increased confidence resulting from the knowledge and skills in using corpus tools for self-correction purposes or further language-related solutions. They explained that despite the fact that the corpus does not provide any grammar rule or explanation directly, they were able to very often make generalizations on the use of a certain grammar point due to rich corpus data. The key in their account of succeeding in the induction of the grammar rules appears to have been the multiplicity of examples in concordance form. There was also reference to collocations, which were easier to remember. The informants' responses can suggest that DDL instruction enabled them to retain the target points in most cases; this is in line with the finding, discussed earlier, that the form-function mappings that represented less complex associations between constructions and underwent more cognitive processing were the areas that benefited more from DDL.

However, this new experience was not without challenges – concordancing was time-consuming; sentences were sometimes too long; and many texts were not relevant to their language proficiency level. Similar observations were discussed by Timmis (2015), who identified the risk of 'drowning with data' when faced with hundreds of concordance lines, many of which may contain irrelevant or obscure lexis. Therefore, he suggests being selective and omitting the inaccessible. To minimize the irrelevancy effect, this study, similarly, exposed the learners to selectively enhanced input, curated by the teacher. With respect to reading lengthy concordance lines, O'Keeffe et al. (2007) point to the need to get into the habit of reading from the middle outwards rather than from left to right. Another obvious pitfall was the large amount of time required for corpus discovery activities when focusing on even a single word. However, the biggest challenge that influenced the learnability of the taught knowledge was reported to be the constructions that ranged beyond collocational border, which made it difficult to engage in further cognitive processing and abstract patterns. This observation confirms the findings of the quantitative analyses, discussed in Section 5.2, which hold that the constructions that were less straightforward in terms of form-function mapping did not receive sufficient salience in the corpus-based environment and the reduced level of cognitive engagement did not benefit the acquisition of these structures.

DDL for Independent Learning

The experiment made it clear that a great deal of autonomy was required on the part of the learner and increased autonomy is one of the benefits of DDL. Even though the learners experienced difficulty in the beginning of DDL, they valued independent work through a corpus, as it served a reference against which they could discover correct forms, check their own meaning and improve their own work. Key in their comments was that they now know where to refer to when the need for self-correction arises – a platform against which they can compare and improve their own work – as well as how to correct their own mistakes due to the extensive practice. The attainment of corpus skills and knowledge is also highly scored in the action-oriented component of the LAP form.

The respondents agreed that in most cases they were able to make generalizations about the uses of the target grammar items under study and appreciated the follow-up practice of verifying the validity of their hypotheses through dialogue with the class and the teacher. There was also mention of how the corpus helped not only discover the rules but also discover more contexts where the target form is used. Some learners reported that they are in favor of first trying to arrive at some understanding about the grammar item by themselves and then checking the correctness of their conclusions, as it seems to facilitate the retention of knowledge. While some others did not mention their preferences explicitly, the reference to time constraints, and, therefore, the ease of direct supply of rules, appear to suggest that they acknowledge the benefits of discovery learning and would undertake it unless their time was limited. The reference to the multiple examples, various contexts, and discovery learning, appears to amount to the conviction that the learners were able to improve their noticing skills and raise their knowledge about language by exploring the forms and functions of the language system. This kind of reflection appears to suggest that the pedagogical practice of DDL provided language learning opportunities that benefited the enhancement of learners' consciousness about descriptive language. This analysis confirms the impact of DDL on the cognitive-metacognitive component, which ranked the second highly scored construct in the LAP form, and adds more evidence to the finding, discussed in Section 5.2, that proceduralization of the grammar points associated with high retention rates was determined by higher order cognitive processes.

The significant issue appeared, unsurprisingly, to be the large amount of time spent on the search for a piece of information, which resulted in reduced motivation. However, this does not suggest that their motivation is diminishing because of the

corpus practices themselves; while this new experience was reported to be motivating and effective, as also evidenced by the quantitative data, it can be impacted by the time factor. Even though in the LAP form the affective-motivational component ranked the third in terms of being influenced by DDL, it showed a higher value for the experimental group than for the control group. Their positive attitude and willingness to continue using the language corpus were more related to their feeling of being empowered. Lee and Swales (2006, p. 71) characterize this advantage as ‘decentering’ because: (i) it allows non-native speakers a chance to make their own discoveries of what is done in the language, instead of relying on native-speaker intuitions or grammar/style book; (ii) it typically involves texts from a variety of different writers/speakers, instead of just one native-speaker teacher standing at the front of the classroom. In other words, it is decentered away from the native-speaker and away from any one individual person or grammar book or stylistic convention. A key motivation for further corpus consultation appears to be the richness of language data and the various tools to navigate through the corpus, study the language from different angles, and gain a more comprehensive view of the meaning, use, form, and function of a particular language item.

Finally, the interviewees’ understanding of an effective language learner was inspiring in terms of securing the use of DDL for effective learning. Their definition of effectiveness was associated with high interest, awareness of the native language and target language, and the ability to help others, to learn from others and by yourself. Thus, learners should receive the opportunity to explore and assimilate knowledge, as well as autonomy to learn and use what they are developmentally ready to learn and to use.

5.5 Conclusion

This chapter discussed the findings obtained from the various research methods of the main investigation. The discussion was run within the constructivist paradigm and usage-based model of language learning, adopted by this study as its theoretical and pedagogical stance. As O’Keeffe (2020) puts it, “We need to engage with theories of learning and models of second language acquisition if we are to move beyond driving text-based data at learners in the hope that some of it will stick in their subconscious store.” It provided answers to the three research questions related to the impact of DDL

on the learners' grammar performance, the contribution of DDL to independent learning skills, and to the learners' attitudes towards the hands-on corpus work.

The triangulated analyses of the issues under investigation allowed the study to suggest that the focus on enhancing declarative knowledge through deeper cognitive manipulation should be prioritized. Learning rule-governed grammar should start in declarative memory where it is learned more quickly. Learning is shaped by instructional input and experience, which suggests that learning should be shaped by enhanced input and increased cognitive effort. This study made an attempt to prove this interaction at a lower level of language learning explaining that those stimuli whose prominence was enhanced through corpus-based solutions allowing the learners to deal with the pervasiveness of data, notice the target items, identify frequencies, engage in further cognitive processing, and create prototypical meaning of constructions, were more readily proceduralized and retained in long-term memory. These were the target points that were associated with less complex form-function mappings, in most cases at the collocational border. In the inductive DDL approach, declarative knowledge was enhanced through the stimulation of noticing and raising awareness of linguistic features, and proceduralization was tapped by mobilizing deeper cognitive mechanisms for abstracting patterns. The conspired effort appears to have led to better storage and retrieval of grammar knowledge. It seems true to suggest that grammar instruction should tend to focus on the enhancement of declarative memory that underlies explicit knowledge through the reliance on procedural memory that underlies meta-knowledge. Otherwise stated, having the opportunity not just to study grammar constructions but to study them through the discovery of underlying compositional rules will enable the achievement of long-term retention, as well as foster independent acquisition of knowledge. The link or consolidation perceived and experienced between knowledge and meta-knowledge is likely to facilitate the implicit progression of knowledge automatization. As Ullman and Lovelett (2018) note, "After sufficient experience with the language, procedural memory-based grammatical processing likely tends to take precedence over analogous declarative knowledge, resulting in increasing automatization of grammar." These analyses emphasize that it is not the raw frequency or the raw salience, or the learned attention, but the converged effect of all these factors and the accompanying higher degree of cognitive care to arrive at prototypicality that can enhance the learnability of language stimuli and assist in the internalization of knowledge more efficiently. This type of departure from declarative stage is likely to promise a safer and long-term arrival at procedural stage.

CHAPTER SIX

CONCLUSION

6.1 Introduction

To address the research questions introduced in Chapter Three, the present study was set up to investigate the contribution of DDL in an Armenian context to learner performance in grammar, independent learning skills, and attitudes towards using DDL. The underlying assumption was that the implementation of inductive hands-on corpus work at lower levels of language learning would increase learners' grammar knowledge, facilitate the internalization of knowledge, and foster self-regulation and positive attitude towards this new treatment.

The following research questions were formulated:

7. To what extent can DDL in an Armenian context improve pre-intermediate learners' knowledge of English written grammar items?
8. To what extent can DDL foster learner autonomy in discovering grammar knowledge through corpus consultation?
9. What are the learners' attitudes towards working with corpora to discover the grammar points and improve their own writing?

This chapter consists of five sections. It begins by presenting the pedagogical implications of the findings, thus attempting to feed back to Second Language Acquisition. The following sections focus on the limitations and delimitations of the study and provide suggestions for further studies. Finally, certain generalizations are pointed out as concluding remarks.

6.2 Pedagogical Implications: Feeding Back to SLA

6.2.1 Effective Learning Environment

Different educational goals require different approaches to teaching and learning. If the goal is to create a society of consciously alert humans, who have the adaptive expertise to face uncertainty, then we need to create a conceptualized system of a learner-knowledge-community-centered environment. DDL can be one such micro-environment where the components of learner, knowledge, and community are coordinated and mutually support one another.

- 1) The departure point of learning should be individuality, emphasized by the learner-centered setting. Learners come to the classroom as individuals each with unique knowledge, skills, attitudes, and beliefs. Therefore, the learning environment should provide opportunity responsive to these factors and recognize the importance of inner processes as the starting point. This can be achieved by creating a problem-solving setting, as in DDL, which welcomes observation, suggestion, reflection, and conversation in relation with the problem. This allows for the construction of knowledge on the personal conceptual background and promotion of regular adjustment of thought, which are key prerequisites for cognitive development. As this study shows, in the DDL-enhanced classroom, when learners engage in cognitive conflict and test their perceptions through discussion, they are able to build bridges to new understandings.
- 2) In order to function effectively, awareness of one's own thinking skills and strategies has to be complemented by the knowledge-centered dimension, which enables the organization and retention of knowledge that supports the subsequent transfer of knowledge for development. This raises the crucial role of the learning input and tasks, as evidenced by this study, which enable learners to make meaning both cognitively and meta-cognitively, rather than memorize information. Moreover, if the direction of thinking is top-down, when learners are able to see knowledge in holistically, they are more likely to develop skills of generalization and sense of applicability.
- 3) Psychological processes underlying the nature of learning also suggest the community-centered dimension of a learning environment, when students learn with each other and from one another. Because this allows learners to make mistakes and correct them through social dialogue, it also stimulates willingness to explore new situations. If they are willing to strive for new information, there will be no limitations to exploring and uncovering truths (Lantolf et al., 2015).

If any learning environment is to become effective, it needs to follow directly the nature of thinking – how we think in order to learn something or what natural mental resources we employ when we learn something. Thus, DDL is an inductive approach to explicit instruction where the three-dimensional environment of *learner-, knowledge-, and community-centeredness* can be effectively maintained. It creates an environment

where these three dimensions intersect starting from individuality and ending with independence.

6.2.2 Teachers and Learning

Teachers play a key role in enhancing learning in the classroom, and knowledge about learning applies not just to learners, but also to teachers, whose preparation has to be aligned with advanced learning principles and resonate with language learning needs. As already noted, many corpus-based studies have been carried out but language corpora have not been integrated into mainstream teaching practices. Among the reasons mentioned by Reppen (2022) and Zareva (2017) are that many teachers lack the training and resources to accomplish this task or that teachers who would like to incorporate language corpora into their instruction are often overwhelmed by the task of locating appropriate corpora or designing activities for their students.

Initially, teachers need to enhance their understanding of all the psychological processes of learning grounded in theory and continually gain skills and knowledge of effective teaching practices through shared experiences, professional trainings and self-development. The shift from the instructivist to a constructivist environment starts from the acceptance of the change in teacher and learner roles and adjustments in the degree of teacher mediation, as experienced in this study, which will bring a new perspective to L2 grammar teaching in Armenia. This can be assisted by the introduction of educational technology to classrooms, which gives teachers license to experiment and tinker (U.S. Congress, office of Technology Assessment, 1995). With the use of language corpora, authority, and agency is redefined – learners take control over their own learning, and the teacher supports them with his or her expertise, where knowledge construction becomes an endeavor of intense cognitive motivation and genuine interaction. Experts know not only what to teach but also how to teach. Thus, corpus skills will potentially allow teachers to enhance their language knowledge and confidence in observing the descriptive insights of the real world of language use in corpora and develop inquiry procedures. These skills will also allow them to design a three-dimensional environment with the focus on the learner, the knowledge, and the community, geared toward the mutual construction of knowledge. (Appendix G will briefly acquaint teachers with all the corpus tools and their functions for DDL instruction).

This study also implies that teaching is an intellectual activity that is flexible and adaptive, and teachers need to be in the continual cycle of coordinated research, theory, and practice, since the understanding of being intellectually educated has become synonymous with possessing rudiments of mental discipline. The teacher's role is no longer to teach every piece of information, but to cultivate effective working habits and methods of inquiry and reasoning to solve various problems, which can be assisted by DDL. They need not invent new learning principles that do not resonate with the nature of thinking but direct the naturally endowed learning resources resulted from the conscious mind. They should recognize that a learning environment affects the functioning of the mind, which is specific and grows through meaningful organization of knowledge. "In the hands of one who is not intelligently aware of individual capacities and of the influence unconsciously exerted upon by the entire environment, even the best of technical methods are likely to get an immediate result only at the expense of deep-seated and persistent habits" (Dewey, 1910, p. 46).

It is also important for teachers to be able to mediate between learners' needs and corpus input, between the possible dimensions of operationalization of DDL to contextualize learning. Acquisition of knowledge cannot be taught directly; therefore, teachers need to create opportunities for learners to achieve the 'what' through 'how' and 'why'. The combination of means and causal definitions that secure the continuity of mind between facts and causes will guarantee reliable knowledge. These two conditions will change the state of mental inertia to the state of mental drive thus raising faith and interest in further explorations. This type of experimental attitude on the part of the learner, as well as the teacher, promoted by corpus-based instruction, will enable them to become more intellectually enriched and independent.

6.2.3 Learners and Learning

With the advances in technology, learners are expected to play a new and more responsible role, which turns them from inert consumers of knowledge to active creators of their own knowledge. Effective execution of this role is possible with in-depth understanding of a number of factors explained by cognitive science in relation to the development of knowledge. Learning takes place in the interaction between learners' competencies, learning environment, and interpersonal support. It should firstly be noted that conceptual development cannot result from mere accumulation of knowledge, but from reorganization of the mind due to certain processes. Aligning the key findings

of cognitive psychology with the methodology of DDL, the following parallels can be highlighted in relation with the learner and his or her learning.

- Predisposition to learn – DDL creates an environment where learners are naturally predisposed to learn and actively engage in making meaning.
- Building on existing knowledge – Considering learners’ ability to reason with their existing knowledge as a strength, DDL provides prospective learning, where learners do not merely receive information but use their conceptual background to make inferences.
- Understanding is motivating – A problem-solving environment promotes persistence for success and understanding, as these are motivating in their own right (NRC, 2000). In the DDL classroom, learners are curious to solve language problems to achieve understanding and motivated to seek new challenges.
- Cognition about cognition – Learners need to develop knowledge about their own learning capabilities and processes – metacognition – which is one of the developmental processes necessary for planning and monitoring success and correcting errors. This is supported by DDL through the promotion of learners’ cognitive strategies.
- Catalyst for direction – Development takes place through assistance and mediation. In the DDL classroom, the complexity of corpus information is regulated, learners’ attention is directed, their experiences are structured, and their inferences are tested – all of which is required for development – thus, maintaining their curiosity and willingness. Moreover, through assistance learners’ incorrect perceptions can be mediated, thus connecting their current understanding to new knowledge.
- Adaptive learning – If learning is measured by merely memory of facts, then many instructional approaches become similar. If the perspective of measurement shifts to the ability for transfer, then instructional differences become obvious (NRC, 2000). Measuring DDL from this perspective, it can be stated that learners receive transferrable cognitive and technical skills that can be applied to new situations for solving problems, this being an indicator of flexible adaptation. The latter can be achieved through a number of practices: intentional practice, which seeks feedback; meaningful learning, which requires cognitive

processing rather than rote memorization; enhanced input, where multiple instances facilitate the extraction of patterned features that make up the structure of language, and the development of more flexible understanding of real language use that can have a broader application. Thus, all the essential tools for making sense of the world are inherently designed in humans; education needs to be concerned not with creating new ones, but with providing the key to operating them effectively.

6.2.4 Materials Design for Hands-on DDL

The language corpus is not only an effective teaching tool but it also aligns well with the learning principles discussed above. The learning outcome largely depends on the representation of knowledge in certain learning tasks and, therefore, the design of hands-on corpus activities has to be done with care to avoid the conditions when learning becomes too easy or too difficult or impossible. The corpus-driven tasks, applied in the current project, proved to be effective in terms of resulting in improved learner performance. In general terms, the tasks departed from the learning principle of knowing something, rather than knowing nothing. They engaged the learners with their own understanding, assisted them to build on it, and promoted social interaction to correct any misperception. More specifically, the tasks (see Appendices H and I), derived from the conditions that promote understanding, reflected the following guided procedures:

- Observe input – the representation of linguistic features in multiple contexts allows learners to identify and generalize the relevant linguistic features more easily and raise awareness of their use in a more general way.
- Form hypotheses individually – Learners come to the classroom with unique understanding and resources. To enable them to build on their prior experience, they need to go beyond information and engage with their own understanding and hypothesize their new perceptions about the structure of language individually. This kind of self-regulation enables them to gain control of their learning processes.
- Verify the validity of hypotheses – Development of understanding takes place when hypotheses are checked for correcting inaccuracies and changing misconceptions, which result from prior knowledge, which can either contribute

to or hinder correct perceptions. This can be done through interaction, which leads to the transfer of less-organized to well-organized knowledge structures that experts share.

- Follow-up and practice – Learners produce the language items through various follow-up activities, including gap-filling, multiple choice, matching, transforming, error correction, which seek feedback and assessment.

The amount of time spent learning and the mastery of the content knowledge are the two main indexes of expert status (NRC, 2000). Being equipped with a rich repertoire of learning tools, with raised awareness of their own learning processes and capacities, with honed noticing as a habit of thinking and confidence in their mental ability, learners will be ready to strive for expertise.

6.2.5 Grammar, Error correction, Writing

As human beings, when there are not ready-made answers, our natural longing for an answer or a solution is stimulated. The current study adds to the growing research evidence that this type of learning environment can have beneficial effects on learners' grammar at lower levels of language learning.

This study challenges prescriptive grammar, draws attention to lexico-grammatical patterns and discusses the differences in contribution between ready-made answers and problem-solving corpus-driven tasks for learning. Ellis, R. (2006) defines grammar teaching as involving any technique that can help learners internalize grammatical forms either by developing metalinguistic knowledge or by processing it in comprehension and/or production. As presented in Chapter Two, a number of studies have been conducted to measure the impact of various grammar teaching approaches. However, there is no consensus regarding the effectiveness of a particular type of grammar teaching in facilitating automatization of taught knowledge because of the spirited interface debate, as already discussed. This study attempted to engage with this debate and revealed that the contribution of the DDL approach is significant not only in developing learners' grammar knowledge as measured by the immediate performance but also in facilitating the proceduralization of the learnt knowledge as measured by their delayed learning outcome. The large effect sizes and magnitude recorded for the experimental group added to the confidence that learners are able to improve their language performance significantly due to the inductive grammar teaching and indirect

error correction practices of DDL. The enhancement of these two areas, along with noticing and other cognitive skills, had a positive impact on learners' overall language learning performance, thus signifying the role of DDL as a grammar development resource. Further observations led to an insight that those grammatical features that were subjected to more cognitive processing secured higher retention rates, and the high degree of explicit knowledge resulted in a high rate of internalization and recall, which was substantiated by calculating the correlation between these two variables. It was suggested that the construction of a high amount of explicit knowledge through cognitive intervention could be a significant predictor of a high rate of knowledge acquisition and retention. The pedagogical implication is that before being concerned with proceduralization of knowledge, we need to be concerned with self-construction and co-construction of knowledge. It is vital firstly to focus our teaching on a high degree of explicit knowledge gains, most importantly, through cognitively challenging processes, aided by DDL, which seems to increase the magnitude of the probability of internalizing more knowledge. The grammatical features that were associated with high retention rates appeared to be constructions with less complex form-function associations. The complex form-meaning relationship, as well as the extension of the constructions beyond collocational border, made it difficult to increase their salience, which did not allow the learners to notice and abstract patterns or create a prototype of the construction, thus reducing the level of cognitive engagement. This leads to another implication that while grammar is a promising area for DDL work, it should also be noted that more efficiency of corpus work is achieved at the lexico-grammatical collocational border, when the meaning maps more straightforwardly to the pattern. Hence, careful curation of lexico-grammatical patterns needs to be factored in for cognitive stimulation to become possible and for DDL to serve efficiently. This indeed lends weight to the importance of the role of the teacher in mediating the use of DDL (O'Keeffe, 2021).

The importance of noticing should not be underestimated, and its definition should go beyond merely paying attention. Noticing, which can be more readily promoted by DDL, should be perceived as a habit of thinking that mobilizes our natural mental resources, aligning with learning principles and stimulating an attitude of persistence for organizing knowledge. Thus, noticing should be both the starting point and the outcome of learning. To increase the level of noticing, pedagogy should be concerned with the enhancement of input. This can be achieved through corpus-based manipulations by making the language items under study salient, providing multiple

exposures, strengthening the reliability of form-function contingencies, and shifting attentional biases. With regard to salience, as one factor of explicit instruction, and its non-static role across the ages, as concluded by Goldscheider and DeKeyser (2001), it can be stated that the adult participants of this study greatly benefited from the increased salience of the grammatical items through corpus consultation. Thus, DDL is one technological solution supporting increased explicit learning and enhanced salience of input, whose importance increases for adult learners especially. Moreover, the learning outcome is determined by the means of attending to input - different degrees and manner of cognitive processing and different degrees and manners of adjustment of attentional biases, resulting from L1, can lead to different outcomes. Not only will input enhancement increase noticing skills but it will also make the target language points more learnable, and ultimately operationalize top-down processing skills. While raising bottom-up attention through input enhancement is an essential step for learning, it is also necessary to cognitively activate learners' top-down attention to the stimuli, through ensuing input processing, curated by the teacher. Thus, for salience to be effective and facilitate L2 acquisition, it has to be supported by subsequent higher order processing. In other words, it is important to focus not only on how to make a language feature prominent but also on the ways in which it is further processed to become entrenched in the mind of the learner. This leads to an understanding, as noted earlier, that it is not the raw frequency or the raw salience, or the learned attention, but the converged effect of all these factors and the higher degree of cognitive care to arrive at prototypicality that can enhance the learnability of language stimuli in declarative memory. Learnability of stimuli can also be enhanced through the indirect corrective force of response to error, as practised by this study. This implies that a higher degree of explicitness of direct correction may not allow learners to engage in further cognitive processing, thus leaving the error unattended and resulting in a lower increase in the learning outcome, whereas, paradoxically, a lower level of explicitness can enhance the salience of linguistic features, calling for more attention and more cognitive processing for repair. A higher level of repair in uptake can contribute to a higher degree of intake. And the language corpus is a platform where learners can fill in the gap between their erroneous utterances and the target forms independently and test their hypotheses in search for a correct form. The pedagogical implication in this regard is that grammar instruction should tend to focus on the enhancement of declarative knowledge, which underlies explicit knowledge, through the reliance on cognitive strategies, which, in

turn, underlies meta-knowledge. This consolidation is likely to facilitate the implicit progression of knowledge automatization and longer-term retention.

6.2.6 Learner Autonomy

The promotion of autonomy, which is one of the literacies of the digital era, has become the ultimate goal of any education system (Perez-Paredes, 2021). This can be greatly supported by technology, which, if appropriately used, can extend the possibilities of long-held teaching techniques and offer new possibilities. DDL, as one technology-based approach to learning, brings the real language use into the classroom, offers new tools and scaffolds to support learning, expands opportunities for feedback, reflection, and revision, as well as teacher learning. As a result, the learner takes on more responsibility for their learning not only inside the classroom but also outside of it. As this research shows, DDL contributed to the learning constructs that define learner autonomy. Thus, the biggest contribution was observed in the action-oriented component of learner autonomy. This means that the hands-on corpus work had the most influence on the development of the learners' ability to turn to language corpora and use corpus tools to answer language-related issues, to correct their own mistakes and improve their grammar and writing independently, and, in general, manage their own learning. The second component of learner autonomy that benefited from DDL was cognitive and metacognitive construct. This offers a pedagogical implication that the inductive approach of DDL to grammar instruction and indirect corrective feedback on writing can play an essential role in raising learners' awareness of their own learning and in enhancing their analytical, evaluation, and reflective skills. The analysis of the affective-motivational component revealed that the new pedagogical intervention, namely DDL, can enhance learners' intrinsic motivation and position them more positively towards their own learning. It should be noted that equipping learners with corpus tools cannot guarantee more control over one's learning; this should be accompanied with the training of thought, which will enhance personal credibility to consult the corpus whenever the need arises.

To elaborate on the role of DDL in promoting self-regulation, it should be emphasized that DDL expands learners' learning possibilities, thus broadening their outlook and their sense of the impact of their own activities. It breaks the boundaries of compulsive learning, thus engineering learning with long-term goals. It allows learners

to serve their personal needs and goals and not just the classroom requirements as immediate learning objectives. It is time to look at our learners as consultants and not as obedient students. It is time to nourish their pursuit of knowledge outside the boundaries of the curriculum, with the sense of ownership of the learning process in their own hands. The acquisition of knowledge should be encouraged rather than imposed, it should be a new possibility rather than a repetition.

The development of learner autonomy is a cognitive and an affective development, which assumes behavioral and psychological changes. This involves three main aspects of control – the development of capacity, increase in awareness of oneself as a learner, and willingness and ability to manage and reflect on one's own learning (Benson, 2001). DDL allows for the development of these aspects. Learner autonomy starts with teacher autonomy; hence investing in the evolution of teachers is of utmost importance. To encourage teachers to promote learner autonomy, they need to be provided with enhanced teaching contexts and more technological teaching resources (Avetisyan, 2006). Teacher autonomy, which is far beyond transmitting information, involves a combination of a number of capacities, including expertise, technological literacy, scientific attitude of mind, joyfulness, and inspiration, which will allow them to turn any possibility into a powerful tool for learning.

6.2.7 Positive Attitude

Learning has to be a positive experience. The qualitative analysis of the semi-structured student interviews revealed the development of the learners' positive attitude towards the corpus work to discover the grammar points and improve their own writing. DDL experience was described as an effective approach for the development of grammar, for cognitive stimulation, and for independent learning. Among the attractions of DDL, reported by the interviewees, were: 1) the opportunity to explore the language in various usages; 2) the richness of the language samples with the target item; 3) cognitive engagement in making meaning; 4) noticing things that they could not otherwise notice; 5) construction and comparison of their own findings, which gave them more confidence, and the feeling of being empowered; 6) the long-term opportunity of the corpus work as a useful reference for further independent work. As mentioned earlier, this new experience was not without challenges. Some of these were related to the considerable amount of time, although infrequently, spent on

concordancing to discover a single language item, lengthy sentences, obscure lexis, and irrelevance to the language proficiency level in a few certain cases. These can be overcome by conscious and cautious mediation on the part of the teacher – designing activities that provide contextualized guidance. With regard to the challenges relating to the time required for teacher training, learner training, and corpus-driven material design, we can overcome them by simply accepting them. If we are to facilitate language acquisition, we need to address the challenges hands on rather than choosing to avoid them. Furthermore, positivity can be nurtured when there is proportionate relation between the potential dimensions of the continuum of DDL.

The DDL-enhanced classroom offers many opportunities to cultivate positivity in learning. It uses the prior personal language experience to empower the present experience for future discoveries or solutions, thus basing learning on the past, present, and future. This is essential for feeling and thinking positively towards addressing challenges in learning and life, in general. Positivity, born out of the above-described processes, will encourage the learner to be active, rather than to postpone the search for a solution, thus accelerating the learning process and turning a learning possibility into reality.

6.3 Main Contributions of This Study

The main contributions of this study are as follows:

- This study is the first of its kind that looks at DDL in the context of Armenia.
- It is one of the few studies that examine the application of DDL to work-based learning (rather than university-based where participants are often language majors).
- It adds to the much needed body of work on DDL focusing on lower levels.
- It answers calls for better research design in DDL through the use of delayed post-tests (Boulton and Cobb, 2017).
- Since the overwhelming focus in research is on the role of DDL in the acquisition of lexis or a particular grammar item, this study responds to the need for research into a wider range of grammatical points and identification of language areas that would benefit more from DDL.
- It makes important links between DDL and theory. Many studies only look at DDL in terms of whether it works (effect size). Few examine the nature of learning.

- This study made links to LA, noticing, input enhancement and, at a broader level, usage-based learning.
- The study took a discerning look at the link between form and function and the outcome of DDL so that it exposed a need for careful curation. It challenges the notion that DDL is effective for all teaching points in a grammar syllabus.
- It also addressed the lack of empirical support for the effects of DDL in fostering learner autonomy (Flowerdew, 2015) – an affordance of DDL interlinking with SLA.
- The adopted comprehensive methodology allowed this study to cover many angles through its many instruments exploring the journey from the declarative stage of learning to proceduralization to long-term knowledge retention to learner autonomy.

6.4 Limitations of This Study

This study pursued an experimental design where the participants were divided into a control group and an experimental group, whose total number was 18. A larger participant number would provide more confidence in making more solidly grounded generalizations from the findings of the study. The creation of a learner corpus would allow for more in-depth error analysis to be carried out and uncover more areas where the difference in contribution between the conventional instruction and DDL instruction could lie. Administration of the LAP form measuring learner autonomy pre- and post-DDL instruction, rather than between the groups, would provide better insights into the changes and differences in learner action and mind related to the development of the constructs of autonomy throughout the treatment. Another limitation can be observed with regard to the semi-structured student interviews - a bigger sample size of the interviewees would probably enable us to reveal more challenges and concerns about the hands-on corpus work with the aim of providing more suggestions for addressing them. In addition, their views might not be representative of all language learners undertaking DDL instruction. Regardless of the cross-referenced analysis of the evaluation data, the breadth and depth of this study cannot be considered perfect as certain neuro-scientific avenues of research were not comprehensively explored either due to the technological limitations or time and space constraints. Interdisciplinary research design, including experimentation, would provide better understanding related

to the cognitive processes underlying DDL. The study is also limited to one cohort of students in one site. It was carried out in a professional setting with adult workers (taking language classes in the workplace), and research results might be affected by such variables, as learner characteristics, setting, and language proficiency level. Generalizability of the claims made by the study may also be constrained by the investigation of limited language areas taught at a pre-intermediate level.

6.5 Suggestions for Further Research

Further research could address these limitations and build on the findings of this research. A replication of the study involving a larger number of participants could achieve stronger generalizability of data. A second delayed post-testing could be administered to ensure the degree of the contribution of DDL to long-term implicit knowledge. It would be worthwhile to conduct investigations that control a wider range of variables, such as age, different levels of language proficiency, a wider range of grammar points, and different backgrounds. Further research could also focus on the difference in performance between receptive and productive tasks resulted from DDL instruction. Another consideration might be the analysis of the use of corpus-based textbooks and their comparable effectiveness in learners' outcome. To ensure the successfulness of language corpora as a reference for autonomous work, studies could monitor and evaluate the continued consultation with corpora both by learners and by teachers, or explore learners' and teachers' use of concordancing and their ability to apply the corpus skills and tools to their new searches and their reaction to corpus linguistics techniques. Still another suggestion might be the identification of the language features that are troublesome for teaching and learning in a conventional classroom and the measurement of the impact of the DDL approach in facilitating the acquisition of these items. Identifying which language patterns work best and why in DDL is also an area that needs to be researched (e.g. O'Keeffe, 2020).

Future interdisciplinary research involving neurolinguistics analysis would enhance our understanding of the cognitive processes that mediate learning and the relationship between cognitive competence and affective-motivational factors that are responsible for facilitating and accelerating the acquisition of a second language. Moreover, extensive evaluation research needs to be conducted to determine the matches and mismatches of corpus use with the learning principles and the transfer of

learning. Researchers could also engage with the preconceptions and misconceptions of teachers about the learning processes, as well as the efficacy of teacher education on corpus linguistics. More could be done in terms of communicating research findings to language practitioners so as to change understanding and improve perceptions of DDL in practice. If we want language corpora to become integrated into mainstream teaching, research, practice, and communication have to be in a continual cycle of coordination and improvement. This needs to be done in the interest of identifying problems of inquiry and addressing them in partnership so as to ensure as close an alignment of the DDL approach with natural learning principles as possible.

6.6 Concluding Remarks

Within the field of Applied Linguistics and second language acquisition, the emphasis has shifted from deductive to inductive learning where the concept of ‘noticing’ language patterns is promoted. This type of student-centered self-discovery of lexico-grammatical patterns can be aided greatly by data-driven learning. This involves learners investigating real language use through computers (Johns, 1986; O’Keeffe et al, 2007; Mukherjee, 2006; Braun, 2005). My doctoral project investigated the difference between the direct explanation and discovery learning and demonstrated the positive impact of the inductive learning environment on the development of grammar knowledge and autonomous learning skills.

An important part of this study was the learner-centered ‘therapy’ of DDL. The lead role was taken by the learners who were believed to be capable of working through their own experiences, with minimal support to arrive at certain knowledge or performance. Instead of relying simply on intuition, or the authority of others, or blind belief, the learners had the opportunity to navigate their own world of complex processes. As language explorers, they turned to corpora as objective evidence to support their own claims. The opportunity to test their hypotheses against the real language use and the ability to decipher and interact with the language enabled them to move from an intuitive level to an objective perception of their own selves and the language surrounding them. In this type of inductive approach, hypotheses served as a bridge between unawareness and awareness and assisted in modifying and defining knowledge through practical observations. The awareness about how knowledge is

generated made the learners more confident, independent, and empowered them to change from consumers of knowledge to creators of knowledge.

In addition to creating knowledge, an essential part was the retention of this knowledge. For information to be retained, it has to be processed to move from the short-term to long-term memory, from conscious to subconscious storage in the brain. This experiment showed that the traditional instruction with direct explanation did not allow the learners to transmit all the learnt language knowledge beyond the short-term workbench. With the help of deep processing, elaboration, and organization, triggered by the enhanced input and cognitive challenge, involved in DDL, more information was internalized for passive and longer-term storage. It is posited in this study that the information being encoded made the knowledge proceduralization easier, the storage in the long-term stronger, and the retrieval more reliable.

“Do you need an explanation or do you want to discover it by yourself?” If you agree with the explanation given by someone, the only choice you have is to believe it. If you discover it by yourself, only then does the opportunity to know and to understand become real and an everyday reality. In doing so, it aligns with my deep-held belief that education needs to be mindfully accorded with the nature of thinking. And, therefore, discovery, which demands the skills of noticing and paying enough attention, will allow us to open doors of knowledge and satisfy the need for the achievement of our fullest potential.

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APPENDIX A



Investigating Language Corpora as a Grammar Development Resource Information Letter

Name:
Position:
Company Name:

Dear

I am writing to enquire about conducting some research at *Company's Name* in the academic year of 2018 with the participation of the students taking English classes. I would be grateful if you would sign the consent form after reading the following information.

The Project and Its Purpose

The age of Read/Write Web has brought new concepts and transformations into language development and has given rise to technology-based approaches to learner autonomy. The purpose of this experimental study is to find out how Data-Driven Learning (DDL) (investigating real language use through computers) can improve learners' knowledge of grammar and writing, contribute to learners' independent learning skills and their attitudes towards working with a corpus (an electronic collection of texts) to discover the grammar points and improve their own writing.

The Principal Investigator

My name is Lilit Avetisyan and I am a Doctoral student at the Department of Structured PhD in Applied Linguistics at Mary Immaculate College, University of Limerick. This study is part of my thesis under the supervision of Dr. Anne O'Keeffe and Dr. Joan O'Sullivan.

The Benefits of the Research

This study will provide useful information for language educators as to how language corpora can increase learners' motivation and confidence, interest in discovering the language, develop their independent learning skills, and enhance the language learning process.

The Participant

The participants will receive 4-month instruction that will integrate traditional instruction and a language corpus where they will explore and discover grammatical points and improve their own writing. They will take pre- and post-tests. The pre-test will assess their language skills before the integration of the new method into language classroom, and the post-test will determine the effect of the new method on their learning. At the end of the experiment, they will complete a Learner-Autonomy-Profile form, which will assess their independent learning skills, and participate in a student interview.

Ethical Considerations:

Right to Withdrawal, Anonymity and Confidentiality, Storage of Materials

The participation is voluntary. Learners have the right to withdraw from the research at any stage without consequence, and this right will be respected. In accordance with Mary Immaculate College research ethics procedures, all the data will be anonymized, coded, and stored on a password protected computer accessible only by the researcher. The data will be retained indefinitely as required by the researcher and then safely destroyed.

Contact Details

If at any time you have questions about this study, my and my supervisor's contact details are as follows:

Principal Investigator: Lilit Avetisyan **Supervisors:** Dr. Anne O'Keeffe, Dr. Joan O'Sullivan
E-mail: Lilit.avetisyan@mic.ul.ie **Email:** Anne.O'Keeffe@mic.ul.ie, Joan.O'Sullivan@mic.ul.ie
Telephone: (+374 99) 507027 **Telephone:** 061 204957

This research study has received Ethics approval from the Mary Immaculate College Research Ethics Committee (MIREC). If you have any concerns about this study and wish to contact an independent authority, you may contact:

Mary Collins, MIREC Administrator, Research and Graduate School, Mary Immaculate College, South Circular Road, Limerick, Telephone: 061-204980, E-mail: mirec@mic.ul.ie

APPENDIX B



**Investigating Language Corpora as a Grammar Development Resource
Informed Consent Form**

Name:
Position:
Company Name:

Dear

As outlined in the **Information Letter**, the purpose of this experimental study is to find out how Data-Driven Learning (DDL), as one technology-based approach to language learning, can improve learners' knowledge of grammar and writing, contribute to learners' independent learning skills and their attitudes towards working with corpora to discover the grammar points and improve their own writing.

Please read the following statements before signing the consent form.

Dear Mary Immaculate Research Ethics Committee,

I have read and understood the Information Letter. I am fully aware of all the procedures, risks, and benefits associated with the study.

The purpose of this letter is to inform you that I give *Lilit Avetisyan* permission to conduct the research titled *Investigating Language Corpora as a Grammar Development Resource at the Company's Name*. This also serves as assurance that the requirements of Mary Immaculate College research ethics procedures are followed in the conduct of this research.

Sincerely,

Company Manager's name: _____

Company Manager's signature: _____

Date: _____

Principal Investigator's name: _____

Principal Investigator's signature: _____

Date: _____



Investigating Language Corpora as a Grammar Development Resource

Experimental Group Participant Information Letter

The Project and Its Purpose

The age of Read/Write Web has brought technology-based approaches to language learning. The purpose of this experimental study is to find out how Data-Driven Learning (DDL) (investigating real language use through computers) can improve learners' knowledge of grammar and writing, contribute to learners' independent learning skills and their attitudes towards working with a corpus (an electronic collection of texts).

The Principal Investigator

My name is Lilit Avetisyan and I am a Doctoral student at the Department of Structured PhD in Applied Linguistics at Mary Immaculate College, University of Limerick. This study is part of my thesis under the supervision of Dr. Anne O'Keeffe and Dr. Joan O'Sullivan.

The Benefits of the Research

This study will provide useful information for language educators as to how language corpora can increase learners' motivation and confidence, interest in discovering the language, develop their independent learning skills, and enhance the language learning process.

The Participant

You will receive 4-month instruction that will integrate traditional instruction and a language corpus where you will explore and discover grammatical points and improve your own writing. You will take pre- and post-tests. The pre-test will assess your language skills before the integration of the new method into language classroom, and the post-test will determine the effect of the new method on your learning. At the end of the experiment, you will complete a Learner-Autonomy-Profile form (which will assess your independent learning skills) and participate in a student interview.

Ethical Considerations:

Right to Withdrawal, Anonymity and Confidentiality, Storage of Materials

Your participation is voluntary. You have the right to withdraw from the research at any stage without consequence, and this right will be respected. In accordance with Mary Immaculate College research ethics procedures, all the data will be anonymized, coded, and stored on a password protected computer. The data will be kept indefinitely as required by the researcher and then safely destroyed.

Contact Details

If at any time you have questions about this study, my and my supervisor's contact details are as follows:

Principal Investigator: Lilit Avetisyan	Supervisor: Dr. Anne O'Keeffe, Dr. Joan O'Sullivan
E-mail: Lilit.avetisyan@mic.ul.ie	E-mail: Anne.O'Keeffe@mic.ul.ie , Joan.O'Sullivan@mic.ul.ie
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This research study has received Ethics approval from the Mary Immaculate College Research Ethics Committee (MIREC). If you have any concerns about this study and wish to contact an independent authority, you may contact:

Mary Collins, MIREC Administrator, Research and Graduate School, Mary Immaculate College, South Circular Road, Limerick, Telephone: 061-204980, E-mail: mirec@mic.ul.ie



Investigating Language Corpora as a Writing Resource Informed Consent Form

Dear Participant,

As outlined in the **Experimental Group Participant Information Letter**, the purpose of this experimental study is to find out how Data-Driven Learning (DDL), as one technology-based approach to language learning, can improve learners' knowledge of grammar and writing, contribute to learners' independent learning skills and their attitudes towards working with corpora to discover the grammar points and improve their own writing.

Please read the following statements before signing the consent form.

1. I have read and understood the experimental group participant information letter.
2. I understand what the project is about, and what the results will be used for.
3. I am fully aware of all of the procedures involving myself, and of any risks and benefits associated with the study.
4. I know that my participation is voluntary and that I can withdraw from the project at any stage without giving any reason.
5. I am aware that my results will be kept confidential.

Participant's name: _____

Participant's signature: _____

Date: _____

Principal Investigator's name: _____

Principal Investigator's signature: _____

Date: _____



Investigating Language Corpora as a Grammar Development Resource Control Group Participant Information Letter

The Project and Its Purpose

The age of Read/Write Web has brought technology-based approaches to language learning. The purpose of this experimental study is to find out how Data-Driven Learning (DDL) (investigating real language use through computers) can improve learners' knowledge of grammar and writing, contribute to learners' independent learning skills and their attitudes towards working with a corpus (an electronic collection of texts).

The Principal Investigator

My name is Lilit Avetisyan and I am a Doctoral student at the Department of Structured PhD in Applied Linguistics at Mary Immaculate College, University of Limerick. This study is part of my thesis under the supervision of Dr. Anne O'Keeffe and Dr. Joan O'Sullivan.

The Benefits of the Research

This study will provide useful information for language educators as to how language corpora can increase learners' motivation and confidence, interest in discovering the language, develop their independent learning skills, and enhance the language learning process.

The Participant

You will continue receiving usual language instruction. You will take pre- and post-tests. The results of the tests will be compared with the test results of the experimental group.

Ethical Considerations:

Right to Withdrawal, Anonymity and Confidentiality, Storage of Materials

Your participation is voluntary. You have the right to withdraw from the research at any stage without consequence, and this right will be respected. In accordance with Mary Immaculate College research ethics procedures, all the data will be anonymized, coded, and stored on a password protected computer. The data will be kept indefinitely as required by the researcher and then safely destroyed.

Contact Details

If at any time you have questions about this study, my and my supervisor's contact details are as follows:

Principal Investigator: Lilit Avetisyan
E-mail: Lilit.avetisyan@mic.ul.ie
Telephone: (+374 99) 507027

Supervisor: Dr. Anne O'Keeffe, Dr. Joan O'Sullivan
Email: Anne.O'Keeffe@mic.ul.ie, Joan.O'Sullivan@mic.ul.ie
Telephone: 061 204957

This research study has received Ethics approval from the Mary Immaculate College Research Ethics Committee (MIREC). If you have any concerns about this study and wish to contact an independent authority, you may contact:

Mary Collins, MIREC Administrator, Research and Graduate School, Mary Immaculate College, South Circular Road, Limerick, Telephone: 061-204980, E-mail: mirec@mic.ul.ie



Investigating Language Corpora as a Grammar Development Resource Informed Consent Form

Dear Participant,

As outlined in the **Control Group Participant Information Letter**, the purpose of this experimental study is to find out how Data-Driven Learning (DDL), as one technology-based approach to language learning, can improve learners' knowledge of grammar and writing, contribute to learners' independent learning skills and their attitudes towards working with corpora to discover the grammar points and improve their own writing.

Please read the following statements before signing the consent form.

1. I have read and understood the control group participant information letter.
2. I understand what the project is about, and what the results will be used for.
3. I am fully aware of all of the procedures involving myself, and of any risks and benefits associated with the study.
4. I know that my participation is voluntary and that I can withdraw from the project at any stage without giving any reason.
5. I am aware that my results will be kept confidential.

Participant's name: _____

Participant's signature: _____

Date: _____

Principal Investigator's name: _____

Principal Investigator's signature: _____

Date: _____

APPENDIX G

Corpus Training Tools



How to register

1. Go to <https://corpus.byu.edu/>
2. Click My account, then Register. Fill out the brief form (Name, Email Address, Password, Category Other), and Submit.
3. After you have submitted the form, you will receive notification email. Activate your corpus account from your email by clicking on the provided link.

How to work with corpora

We are going to work with Corpus of Contemporary American English – **COCA**

1. List – provides frequency information

1.1 For multiple examples of the word in context: Click the List, in the search box type the word, click Find matching strings, click the word, click for more context

1.2 For finding what words are used before the key word: Click the List, in the search box type * the word, click Find matching strings, click the word, click for more context

1.3 For finding what words are used after the key word: Click the List, in the search box type the word *, click Find matching strings, click the word, click for more context

1.4 For finding the parts of speech before the key word: Click the List, click POS and select the part of speech, in the search box type the word, click Find matching strings, click the word, click for more context

1.5 For finding the parts of speech after the key word: Click the List, in the search box type the word, click POS and select the part of speech, click Find matching strings, click the word, click for more context

1.6 For finding words with the same root: Click the List, in the search box type the word*, click Find matching strings, click the word, click for more context

1.7 For finding different forms of the word: Click the List, in the search box type [the word], click Find matching strings, click the word, click for more context

1.8 For finding synonyms: Click the List, in the search box type [=the word], click Find matching strings, click the word, click for more context

2. Chart – provides information about the use in 5 different registers (Spoken, Fiction, Magazine, Newspaper, Academic) and in different years

Click the Chart, in the search box type the word, click See frequency by section, click for more context

3. Collocates – provides collocations

Click the Collocates, in the search box type the word, in the collocation window select 4 left if you want to see the top 4 collocates before the word; select 4 right if you want to see the top 4 collocates after the word; click the collocate, click for more context

4. Compare – compares how 2 words are used (e.g. beautiful and handsome)

Click the Compare, enter beautiful in one search box and handsome in the next, set the collocation window 4 Left – 4 Right, click compare words; for more context click the numbers under W1 or W2

5. KWIC (key word in context) – helps us visualize the grammatical patterns in which a word appears

Click the KWIC, in the search box type the word, click keyword in context

Every time you perform a new task, click the Search, then click the Reset.

If you want to go back, click the Search.

ՀԱՎԵԼՎԱԾ Գ

Կորպուսի գործիքները

Թրեյնինգ



Ինչպես գրանցվել

4. Անցեք այս հղումով <https://corpus.byu.edu/>
5. Սեղմեք My account, հետո Register. Լրացրեք կարճ դիմումաձևը (Name/Անուն, Email Address/Էլեկտրոնային հասցեն, Password/Գաղտնեքան, Category Other/Կատեգորիա Այլ), և Submit/Ուղարկել.
6. Դիմումաձևն ուղարկելուց հետո դուք կստանաք ծանուցում ձեր էլեկտրոնային հասցեին: Ակտիվացրեք ձեր կորպուսի հաշիվը ձեր էլեկտրոնային հասցեից՝ սեղմելով տրված հղումը:

Ինչպես աշխատել կորպուսի հետ

Մենք աշխատելու ենք այս կորպուսի հետ՝ Corpus of Contemporary American English – **COCA**

1. **List** – տալիս է տեղեկություն բառի կիրառության հաճախականության մասին
 - 1.1 **Բառի կիրառության բազմաթիվ օրինակների համար**՝ սեղմիր List-ը, search box-ում տպիր բառը, սեղմիր Find matching strings, սեղմիր բառը, կրկին սեղմիր ավելի շատ համատեքստի համար
 - 1.2 **Գտնելու համար, թե ինչ բառ է նախորդում բանալի բառին**՝ սեղմիր List-ը, search box-ում տպիր * բառը, սեղմիր Find matching strings, սեղմիր բառը, կրկին սեղմիր ավելի շատ համատեքստի համար
 - 1.3 **Գտնելու համար, թե ինչ բառ է հաջորդում բանալի բառին**՝ սեղմիր List-ը, search box-ում տպիր բառը *, սեղմիր Find matching strings, սեղմիր բառը, կրկին սեղմիր ավելի շատ համատեքստի համար
 - 1.4 **Գտնելու համար, թե ինչ խոսքի մաս է նախորդում բանալի բառին**՝ սեղմիր List-ը, սեղմիր POS և ընտրիր խոսքի մասը, search box-ում տպիր բառը, սեղմիր Find matching strings, սեղմիր բառը, կրկին սեղմիր ավելի շատ համատեքստի համար
 - 1.5 **Գտնելու համար, թե ինչ խոսքի մաս է հաջորդում բանալի բառին**՝ սեղմիր List-ը, սեղմիր POS և ընտրիր խոսքի մասը, search box-ում տպիր բառը, սեղմիր Find matching strings, սեղմիր բառը, կրկին սեղմիր ավելի շատ համատեքստի համար
 - 1.6 **Նույն արմատով բառեր գտնելու համար**՝ սեղմիր List-ը, search box-ում տպիր բառը*, սեղմիր Find matching strings, սեղմիր բառը, կրկին սեղմիր ավելի շատ համատեքստի համար

1.7 Բառի տարբեր ձևեր գտնելու համար` սեղմիր List-ը, search box-ում տպիր [բառը], սեղմիր Find matching strings, սեղմիր բառը, կրկին սեղմիր ավելի շատ համատեքստի համար

1.8 Հոմանիշներ գտնելու համար` սեղմիր List-ը, search box-ում տպիր [=բառը], սեղմիր Find matching strings, սեղմիր բառը, կրկին սեղմիր ավելի շատ համատեքստի համար

2. Chart – տալիս է տեղեկություն բառի կիրառման մասին 5 տարբեր ժանրերում (խոսակցական, գեղարվեստական, ամսագրային, թերթային, ակադեմիական) և տարբեր տարիներին

Սեղմիր Chart-ը, search box-ում տպիր բառը, սեղմիր See frequency by section, կրկին սեղմիր ավելի շատ համատեքստի համար

3.Collocates – տալիս է բառակապակցություններ

Սեղմիր Collocates-ը, search box-ում տպիր բառը, collocation window-ում ընտրիր 4 left, եթե ցանկանում ես տեսնել առաջին 4 բառակապակցությունները բառից առաջ; ընտրիր 4 right, եթե ցանկանում ես տեսնել առաջին 4 բառակապակցությունները բառից հետո; սեղմիր բառակապակցությունը, կրկին սեղմիր ավելի շատ համատեքստի համար

4.Compare – համեմատում է 2 բառերի կիրառությունը (e.g. beautiful and handsome)

Սեղմիր Compare, ներմուծիր beautiful մի տեղում և handsome մյուսում, դիր collocation window 4 Left – 4 Right, սեղմիր compare words; ավելի շատ համատեքստի համար սեղմիր թվերը W1 կամ W2-ի տակ:

5.KWIC (key word in context) – օգնում է տեսնել քերականական օրինաչափությունները

Սեղմիր KWIC, search box-ում տպիր բառը, սեղմիր keyword in context

Ամեն անգամ նոր առաջադրանք կատարելիս` սեղմիր **Search**, հետո սեղմիր **Reset**. Եթե ցանկանում ես հետ գնալ, սեղմիր **Search**.

APPENDIX H



Sample Material for Hands-off DDL

Assignment: Prepositions with time expressions

1. Explore the concordance lines. What preposition is used with time?

I'll call you back **at 6 o'clock**. Get everybody together, all right?

I wake up every morning **at 6 o'clock** and I run 3 miles. I do 60 sit-ups and 80 push-ups.

So if you plan to eat **at 6 o'clock**, take the roast out of the fridge at about 2:30 p.m.

When I get home **at 6 o'clock**, I turn on the first half hour of The News Hour.

We all sat down to dinner **at 6 o'clock** sharp, and no business talk at the table.

2. Explore the concordance lines. What prepositions are used with parts of the day?

I like going **in the morning** to the pool at the university fitness center.

Eat maybe some grapes **in the morning** or something.

I woke up early **in the morning** and went to the grocery store.

I fell asleep at like three **in the morning** and had a dream.

we were sure to do all the exercises **in the morning** and after lunch.

And then we will go out **in the afternoon** and visit farms.

The event will start later **in the afternoon**. The event is free and open to the public.

I was in a car at four **in the afternoon** on the way to the airport.

Do you drink sugary, caffeinated sodas **in the afternoon** or evening?

In the morning I'd do everything in Spanish and **in the afternoon** I'd do everything in Portuguese.

American gymnast won a gold medal around 1:30 **in the afternoon** in the Eastern time zone.

Buy a large angry dog, don't go out **in the evening**, always park your car in a locked garage.

When I try to get the exercise done **in the evening** or tomorrow, it will be equally hard.

I left and decided to go back **in the evening**. On my way out, I bumped into my neighbor.

I used to practice **in the evening** after work but as much as I loved it.

Avoid coffee **in the evening** and make your room dark.

Next Thursday **at noon**, I will be talking about your "bestness" at onehealth.com

Winner will be announced on Twitter **at noon** on Sunday October 28th.

Some restaurants weren't open **at noon**. It was kind of inconvenient.

The Rev. will conduct a blessing of animals **at noon** for all who bring their pets.

They play against Cincinnati **at noon** on Sunday at Arrowhead Stadium.

The warm summer temperatures drop significantly **at night**, creating ideal conditions for ripening wine grapes.

I've started taking Benadryl **at night** to help me sleep.

We need the energy **at night** when the family is home.

We should not eat carbohydrates **at night** if we want to stay healthy.

When you're shooting **at night**, seek out lampposts or artificial light sources.

I even considered calling my cousin **at midnight** to see if she remembered it.

He knows you only drink coffee **at midnight**, when the moment is not right.

I saw the movie **at midnight** last night, and that's all I want to talk about today.

And now, **at midnight**, I want to bake cookies.

They need to knock on your door **at midnight**, if you cause problems for them.

3. Explore the concordance lines. What preposition is used with the days of the week?

The two high tides **on Sunday** will be the most dangerous ones, the flood warning noted.

I can't wait to get back to work **on Monday** and get ready for Wisconsin.

The crash **on Saturday** afternoon prompted a search for the driver.

It was shipped **on Friday**. It will get there with time to spare.

The Foreign Ministry said in a statement **on Tuesday**, "We have no desire for a confrontation".

Now complete the rules: (add prepositions)

..... 5 o'clock

..... the morning/afternoon/evening

.....noon/night/midnight

..... Monday/ Tuesday/Friday...../weekdays/weekends/weeknights

Based on your concordance searches, find and correct the mistakes

Time expressions: at, early, in, on, until

A: How's your new job?

B: I love it, but the hours are difficult. I start work on 7:30 am, and I work at 3:30.

A: That's interesting. I work the same hours, but I work on night. I start at 7:30 at the evening and finish at 3:30 at the morning.

B: Wow! What time do you get up?

A: Well, I get home early 4:30 and go to bed until 5:30. And I sleep at 2:00. But I only work in weekends, so it's OK. What about you?

B: Oh, I work in Monday, Wednesday, and Friday. And I get up late – around 6:00 am.

Sample Material for Hands-off DDL

Assignment: Demonstrative Pronouns

1. Explore the concordance lines. Find out what noun (singular or plural) is used after *'this'*.

The topic of **this year's** gathering is " Russia and the West: Back to the Future.

I think I'd try **this place** more often because the prices are good.

I couldn't find **this story** anywhere in print.

How about spending time to make **this world** better?

I also served in the military of **this country** to protect our rights as citizens.

2. Explore the concordance lines. Find out what noun (singular or plural) is used after *'these'*.

I'm not sure exactly what **these people** are doing.

We're exploring **these questions** to not only connect our actions with our motivations.

I wonder how **these results** compare to similar studies done by the EPA itself?

Look at why **these women** aren't getting the benefits of modern technology.

I can make **these things** just as artful as they should be.

3. Explore the concordance lines. Find out what noun (singular or plural) is used after *'that'*.

If we count only **that part** of the population, the market is still bigger than any European country.

But does it matter how **that money** was earned?

The truth is, **that word** only means " Intelligence services "

I want you all to just keep **that number** in your mind.

I made **that decision** based on a lot of factors.

4. Explore the concordance lines. Find out what noun (singular or plural) is used after *'those'*.

Our generation was the one who used **those books** -- and our children are still using them in many cases.

I'm sure I've seen **those pictures** before, or ones very similar.

It turns out that **those kids** who could wait often did better on tests and exams later in their lives.

He was one of a group of singers in **those days** that really left their mark on the opera scene in London.

So there's hundreds of **those stories** that haven't been told.

No complete the rule with *'this, these, that, those'*.

..... are used with singular nouns.

..... are used with plural nouns.

Circle the correct words.

1. A: Excuse me. How much are **this / these** shoes?
B: **It's / they're** \$ 279.
A: And how much is **this / that** bag over there?
B: **It's / They're** only \$ 129.
A: And are the two grey **one / ones** \$ 129, too?
B: No. **That / Those** are only \$ 119.
A: Oh! **This / That** store is really expensive.
2. A: Can I help you?
B: Yes, please. I really like **these / those** jeans over there. How much **is it / are they**?
A: Which **one / ones**? Do you mean **this / these**?
B: No, the black **one / ones**.
A: Let me look. Oh, **it's / they're** \$ 35.99.
B: That's not bad. And how much is **this / that** sweater here?
A: **It's / They're** only \$ 9.99.

Based on your concordance searches, find and correct the mistakes

Note: Some of the answers are correct.

This, that, these, those, one, ones

1. A: Excuse me. How much are that sunglasses?
B: Which ones? The black one?
A: No, the brown one?
B: Oh, it is \$50.
A: Wow! That's expensive.
2. A: How much is this sweater over there?
B: Which ones?
A: The red ones.
B: It's \$50.
A: That's not bad. Can I see it, please?
3. A: How much is this jeans over there?
B: Which one? Do you mean this?
A: No, the black one?
B: They are \$50. Do you want to try them on?
A: No, thanks anyway.

Sample Material for hands-off DDL

Assignment: Present Perfect

1. Explore the use of present perfect in the concordance lines.

Molly Lieber and Eleanor Smith **have been** collaborating since 2006.

In nearly 4 years nothing **has been** fixed and things have gotten worse.

just let us know what you **have done** to this point and we can give suggestions.

I know you **have made** radical changes to Nokia in the past two years.

Russia **has taken** a more active role in the Syrian civil war.

Our government **has become** our worst enemy.

I have spent many summers there and **have seen** lots of fires around Lake Chelan.

But over the past 10 days, people **have come** together to meet his needs.

This whole approach **has made** the children more receptive and responsive.

So far the Senate **has shown** itself to be part of the problem and not the solution.

2. Explore the use of negative present perfect in the concordance lines.

I live in a big city, and I **have not seen** one presidential commercial all year.

But you **have not been** very active in looking at the issue.

I'm just in shock. She **has not spoken** to any of us.

In the eleven years since, they **have not heard** anything better.

But he **has not left** his mansion in several years.

In fact, to be honest, I **have not read** nearly as much literature as I'd like

If there is a way up, we **have not found** it yet.

The police officer said he **has not received** a raise in six years.

I called him all night. And he **has not returned** my phone calls.

Mr. Kamaras says he **has not seen** Ms. Sall in months.

3. Explore the use of interrogative present perfect in the concordance lines.

Have you tried any of Alton Brown's cookie recipes?

What **has she studied** in the last three month?

Your wife, **has she got** any enemies?

I mean, **have you been** in a Home Depot lately?

How long **has he lived** in this city?

What have you learned and what **have you done** differently?

Rule: Write the formula of Present Perfect:

Positive

.....
...

Negative

.....

Question

.....

Complete the conversations with the present perfect of the verbs in parenthesis and short answers.

- A: Has Leslie called (call) you lately?
B : No, she (not call) me, but I
..... (get) some emails from her.
- A: you and Jan lunch yet?
B: No, we We're thinking of going to Tony's.
..... you (try) it yet? Come with us.
A: Thanks. I (not eat) there yet, but I
..... (hear) it's pretty good.

Complete the conversation using the present perfect or the simple past of the verbs in parentheses and short answers.

- A: you (see) the game last night? I
really (enjoy) it.
B: Yes, I It (be) an amazing game.
..... you ever (go) to a game?
A: No, I I never
..... (be) to the stadium. But I'd love to go! Maybe we can go
to a game next year.
- A: you ever (be to Franco's Restaurant?)
B: Yes, I My friend and I
..... (eat) there last weekend. How about you?
A: No, I But I (hear)
it's very good.
B: Oh, yes – it's excellent!

For and since. Circle the correct word.

1. I bought my car almost 10 years ago. I've had it **for/since** almost 10 years.
2. The Carters moved to Seattle six months ago. They've lived there **for / since** 6 months.
3. I've wanted to see that movie **for / since** a long time. It's been in theaters **for / since** March.

Based on your concordance searches, find and correct the mistakes.

Note some of the answers are correct.

Past simple vs present perfect; for vs since

1. A: Have you ever been in Europe?
B: Yes, I was. I was in Europe several times. In fact, I was in Europe last year.
2. A: Are you going to finish your work before you go to bed?
B: I already have finished it. I have finished my work two hours ago.
3. A: Have you ever eaten at Al's Steak House?
B: Yes, I have. I ate there many times. In fact, my wife and I eated there last night.
4. A: Do you and Erica want to go to the movie at the Palace Theater with us tonight?
B: No thanks. We already saw it. We seen it last week.
5. A: When are you going to write your report for Mr. Goldberg?
B: I already wrote it. I have written it 2 days ago and gave it to him.
6. A: Has Antonio ever had a job?
B: Yes, he had. He has lots of part-time jobs. Last summer he has a job at his uncle's store.
7. A: This is a good book. Would you like to read it when I'm finished?
B: Thanks, but I has already read it. I read it a couple of months ago.
8. A: What European countries did you visit?
B: I visited Hungary, Germany, and Switzerland. I have visited Hungary in 1998. I have been in Germany and Switzerland in 2001.
9. I have known this person since my childhood.
10. She has lived in this city for 1993.
11. I have been interested in English for I was a schoolchild.
12. I have been married since 15 years.

APPENDIX I



Sample Material for Hands-on DDL

Assignment: Quantifiers

1. Find out which noun (singular or plural, countable or uncountable) is used after 'many'. (List; write *many* in the search box, click POS and choose noun). Write down the top 10 examples. Choose 3 examples in context (sentences) from COCA and write them down.
2. Find out which noun (singular or plural, countable or uncountable) is used after 'much'. (List; write *much* in the search box, click POS and choose noun). Write down the top 10 examples. Choose 3 examples in context (sentences) from COCA and write them down.
3. Find out which noun (singular or plural, countable or uncountable) is used after 'few'. (List; write *few* in the search box, click POS and choose noun). Write down the top 10 examples. Choose 3 examples in context (sentences) from COCA and write them down.
4. Find out which noun (singular or plural, countable or uncountable) is used after 'little'. (List; write *little* in the search box, click POS and choose noun). Write down the top 10 examples. Choose 3 examples in context (sentences) from COCA and write them down.
5. Find out which noun (singular or plural, countable or uncountable) is used after 'enough'. (List; write *enough* in the search box, click POS and choose noun). Write down the top 10 examples. Choose 3 examples in context (sentences) from COCA and write them down.

Circle the correct answer to complete the rules.

We use much / many and few / little with countable nouns.

We use much / many and few / little with uncountable nouns.

We use enough with only countable nouns / only uncountable nouns / both.

To show problems:

We use many / too many; much / too much; few / too few; little / too little

We also use not enough.

To provide suggestions:

We use many / much / more; few / fewer; little / less

Now complete the exercise.

1. A: There's (too many / too much) traffic in this city.
There should be (fewer / less) cars downtown.
B: The problem is there (aren't / isn't) enough public transportation.
A: You're right. We should have (more / many) buses.
There (aren't / isn't) enough of them during rush hour.
2. A: How do you like your new neighborhood?
B: It's terrible, actually. There's (too many / too much) noise and (too few / too little) parking.
A: That's too bad. There (aren't / isn't) enough parking spaces in my neighborhood either.
3. A: Did you hear about the changes in the city center? Starting next month, there will be (much / more) bicycle lanes and (fewer / less) street parking.
B: That's good. There (are too many / is too much) pollution downtown. I'm sure there will be (fewer / less) accidents, too.
A: That's true.

Based on your COCA searches, find and correct the mistakes.

Many, too many, much, too much, few, too few, little, too little, more, fewer, less, enough

There are too much cars on our roads today and this leads to much problems. The biggest problem is pollution. The exhaust fumes from cars harm the environment. They release carbon monoxide, which destroys the atmosphere and, as a result, we have too many air pollution. Traffic congestion is another problem. Because we have few public transportation and too much cars on the streets, we very often g caught in traffic jams. The excessive number of cars creates another concern: road safety. Speeding and drunk-driving cause much accidents. There is not enough parking spaces, especially downtown. There are too little green places which could improve the air quality.

In order to tackle these problems, individuals and governments should ensure that public transport plays a much important role in modern life. To have less cars on the roads, the government should improve and provide much public transport services. We also need too many road safety campaigns to raise people's awareness about road safety. The government should build too many underground parking garages. Drivers should use many unleaded petrol. Individuals should reduce unnecessary journeys and share cars to work.

Sample Material for Hands-on DDL

Assignment: Comparisons: enough, as...as

1. Find out what part of speech is used before 'enough'. (List; * enough). Write down the top 20 examples. Read the examples in context and write down 2 sentences.
2. Find out what part of speech is used after 'enough'. (List; enough *). Write down the top 20 examples. Read the examples in context and write down 2 sentences.

Now complete the rule.

What parts of speech are used before and after 'enough'? Use 'noun' or 'adjective' to complete the rule.

..... enough

enough

3. Find out how 'as.....as' is used with adjectives. (List; as * as). Write down the top 20 examples. Read the examples in context and write down 2 sentences.
4. Find out how 'as.....as' is used with nouns. (List; as * * as). Write down the top 20 examples. Read the examples in context and write down 2 sentences.

Now complete the rule.

How is 'as as' used with countable nouns, uncountable nouns, and adjectives.

..... adjective

..... countable noun

.....uncountable noun

Read each situation and write sentences with enough.

Example:

1. This house is very small.
This house isn't big enough.
2. Our old apartment has only two rooms.
Our old apartment doesn't have enough rooms.
3. This room is very dark.
4. This street is very narrow.
5. This water is very polluted.
6. This house has only one garage.
7. We need more buses.
8. The city should build more parks.
9. You need more chocolate to bake the cake.

Rewrite the sentences using as....as.

Example:

1. My new apartment is smaller than my old one.
My new apartment isn't as large as my old one.
2. My new apartment has fewer rooms than my old one.
My new apartment doesn't have as many rooms as my old one.
3. This neighborhood is noisier than the old one.
4. Our street is safer than your street.
5. Our city has a lot of parks. Your city has, too.
6. Our city has fewer schools than your city.
7. This city has less transportation than the other.
8. My new apartment has a lot of privacy. The old one did, too.

Based on your COCA searches, find and correct the mistakes.

Note: some of the sentences are correct

Enough

1. I didn't run **enough fast** to catch the bus.
2. She is **enough old** to know better.
3. We have bought **enough milk**.
4. She was **prudent enough** to lock the car.
5. He was **stupid enough** to trust her.
6. Is it **enough warm** for you?
7. Have we got **money enough** for buying the tickets?
8. Many tablet computers are **small enough** to fit in your pocket.
9. We haven't got **enough chairs**.
10. We haven't got **blue paint enough**.

As... as, as many as, as much as

1. Oliver is as much optimistic as Peter.
2. Today it's not as windy as yesterday.
3. There are as much Chinese restaurants in New York as in Boston.
4. The blue car consumes as petrol as the black one.
5. The tomato soup was as delicious than the mushroom soup.
6. There are many flowers as possible in this garden.
7. Grapefruit juice is not as much sweet as lemonade.
8. I don't have as many time as you.
9. You can have as chocolate as you want.
10. You can't stay here many days as you want.
11. Nick is as brave as Kevin.
12. We could see as much interesting places as he had recommended us.

Sample material for hands-on DDL

Assignment: Used to

1. Find out what verb form is used after 'used to' (List; used to *)
Write down the top 5 examples.
2. Find out what time (past, present, or future) 'used to' refers to.
Read examples in the context.
3. Find out the question form of 'used to'.
4. Find out the negative form of 'used to'.

Now complete the rule by choosing the correct boldfaced answer.

'Used to' shows present habitual action / past habitual action, and is followed by the base form / -ing form of the verb.

Complete the sentences with the correct form of 'used to'.

1. I _____ my bicycle to work every day, but now I take the bus.
2. Tom _____ tennis after work, but now he doesn't.
3. What time _____ to bed when you were a child?
4. I _____ breakfast, but now I always have something to eat in the morning.
5. I _____ interested in sports, but now I am.

Assignment: Past Simple

1. Find out what verb form is used in the question 'Did you....?' (List; Did you *)
Write down the top 5 examples.
2. Find out what verb form is used in the negative sentence 'She did not.....'
(List; she did not *)
Write down the top 5 examples.

Now complete the rule.

The past simple questions are formed with Did +

The past simple negatives are formed with didn't +

Complete the conversations with the correct forms of the verbs.

1. A: _____ well last night? (sleep)
B: Yes, _____. I _____ very well. (sleep)
2. A: _____ you born in Brazil? (be)
B: No, _____. I _____ born in France. (be)
A: _____ in France? (grow up)
B: Yes, _____. I _____ in Paris. (grow up)
A: When _____ to Brazil? (move)
B: It _____ 10 years ago when I _____ 16 years old.
(be)
3. A: _____ to class yesterday? (go)
B: No, _____. I _____ home (stay)
because I _____ good. (not, feel)

Based on your COCA searches, find and correct the mistakes.

Past tense

A: Do you live around here?

B: No, I don't. I'm from Costa Rica.

A: Really? Did you born in Costa Rica?

B: No, actually, I am born in Santiago, Panama.

A: That's interesting. So where did you grew up?

B: I did grow up in Costa Rica. My family move here when I am little.

A: Did your family lived in the capital?

B: No, my family not lived in a city. We lived in a small town called Grecia.

A: Did you leave Grecia when you was young?

B: Yes, I didn't. I left it to went to college.

A: Where you go to college?

B: I went to college in San Jose, and I live there now.

Used to

A: Hey, Dad. What kind of clothes you used to wear – you know, when you were a kid?

B: Oh, we use to wear jeans and T-shirts – like you kids do now.

A: Really? Did Mom used to dress like that, too?

B: No, not really. She never didn't use to like wearing pants. She always used to wearing skirts and dresses.

Assignment: Past, Present, Future

1. Explore the simple past. (List; a few years ago). What are the ways to express simple past. Write down 2 examples in context.
2. Explore the present time. (List; these days). What are the ways to express the present time? Write down 2 examples in context.
3. Explore the simple future. (List; in a few days). What are the ways to express simple future? Write down 3 examples in context.

Complete the conversation with the correct form of the verbs in parentheses. Use the past, present, or future tense.

A: I saw a fascinating program last night. It talked about the past, the present, and the future.

B: What kinds of things did it describe?

A: Well, for example, the normal work week in the 20th century (be) 35 hours. Nowadays, many people (work) more than 40 hours.

B: Well, that doesn't sound like progress.

A: You're right. But on the show, they said that most people (work) fewer hours in the future. They also talked about the way we shop. These days, many of us (shop) online. In the old days, there (be) no supermarkets, so people (have to) go to lots of different stores. In the future, people (do) all their shopping online.

B: I don't believe that.

A: Me neither. What about cars? Do you think people (still drive) cars a hundred years from now?

B: What did they say on the show?

A: They said that before the car, people (walk) everywhere. Nowadays, we (drive) everywhere. And that (not change).

APPENDIX J



Pre-Test (100 points)

Name: _____

Date: _____

Part 1: GRAMMAR (80 points)

I. Yes/no questions and short answers with *be* (10 points)

- A: in your class?
B: No, They're in English 2.
- A: Hi! in this class?
B: Yes, I'm a new student here.
- A: That's the new student. from Puerto Rico?
B: No, He's from Costa Rica.
- A: you at home yesterday?
B: No, I I at my friend's house.
- A: Maria in work last week?
B: I think Maria and James absent.

II. Complete the conversations with the correct form of the verbs in parentheses. (15 points)

- A: I (have) good news! Dani (have) a new job.
B: How she (like) it?
A: She (love) it. The hours are great.
B: What time she (start)?
A: She (start) at nine and (finish) at five.
- A: What your sister (do) these days?
B: She (study) English.
A: Really? she (live) abroad?
B: Yes, She (live) in South Korea.
- My friend Omar (have) his own car now. Today, he (visit) his aunt. He (love) to listen to music, so the CD player (play) one of his favorite songs.
- A: you anything special last weekend?
B: I (buy) a new laptop. And I (get) some new clothes, too.
A: What clothes you (buy)?

- B: Well, I (need) some new boots. I
 (find) some great ones at the Department Store.
5. A: you the game last night? I really
 (enjoy) it.
 B: Yes, I It (be) an amazing game.
 you (go) to a game?
 A: No, I I never (be) to the
 stadium. But I'd love to.
6. A: you ever (be) to Franco's restaurant?
 B: Yes, I My friend and I (eat) there last
 weekend. How about you?
 A: No, I But I (hear) it's very good.

III. Circle the correct word. (8 points)

1. A: Can I help you?
 B: Yes, please. I really like **these / those** jeans over there. How much is
it / are they?
 A: Which **one / ones**? Do you mean **this / these**?
 B: No, the black **one / ones**.
 A: Let me look. Oh, **it's / they're** \$ 35.99.
 B: That's not bad. And how much is **this / that** sweater here?
 A: **It's / They're** only \$ 9.99.

IV. Put the frequency adverb in the correct place. (4 points)

1. What do you do on weekends? (usually)
2. I go fishing or hunting with my friends. (sometimes)
3. She can live in a crowded place. (never)
4. We go to the park in the evenings. (almost always)

V. Make questions with *how*. (10 points)

1. A:
 B: Not very well. But I love playing tennis.
2. A:
 B: New Zealand is about 2,000 km from Australia.
3. A:
 B: I train about six hours a week.
4. A:
 B: Not very often. I prefer aerobics to lifting weights.
5. A:
 B: I am not very good at chess.
6. A:
 B: I exercise twice a week.
7. A:
 B: Lake Baikal is 1,642 meters at its deepest point.
8. A:
 B: Alaska is 586,412 square miles.
9. A:

- B: It gets down to about 23 degrees Celsius.
10. A:
- B: It gets up to about 23 degrees Celsius.

VI. Use *much, many, few, little* (4 points)

1. There pollution in my neighborhood. It's not clean.
2. There parks. They are great for families.
3. There crime. It's a very safe part of the city.
4. How public transportation is there in your city?
5. There Laundromats. Most people have their own washing machines.

VII. Write the questions about the descriptions. (5 points)

1. A:
- B: He is tall and good-looking.
2. A:
- B: He is 5 feet 11.
3. A:
- B: No, he doesn't. He wears contact lenses.
4. A:
- B: He has dark brown hair.
5. A:
- B: He is 15.

VIII. Combine the sentences with the correct word in parentheses. (4 points)

1. Spring in my city is pretty nice. It gets extremely hot in summer. (and, but)
2. There are some great museums. They are always crowded. (and, however)
3. There are a lot of interesting stores. Many of them aren't expensive. (and, but)
4. My city is a great place to visit. Don't come in summer. (but, though)

IX. Add a/an or nothing, where necessary. (4 points)

1. Brasilia is extremely modern.
2. Santiago is pretty exciting city to visit.
3. Montreal is beautiful city, and it's fairly old.
4. London has really busy airport.

X. Complete the conversation with *can, can't, should, shouldn't*. (6 points)

- A: I decide where to go on vacation. I go to Costa Rica or Hawaii?

B: You Definitely visit Costa Rica.

A: Really? What can I see there?

B: Well, San Jose is an exciting city. You miss the Museo del Oro. That's the gold museum, and you see beautiful animals made of gold. You visit the museum on Mondays. It's closed then.

XI. Write responses to show agreement with these statements. (4 points)

1. A: I'm not a very good cook.
B:
2. A: I love French fries.
B:
3. A: I can eat very spicy food.
B:
4. A: I never eat bland food.
B:

XII. Complete the conversation with *would, I'd, I'll*. (4 points)

A: you like to order now?
B: Yes, please. have the shrimp curry.
A: you like noodles or rice with that?
B: Hmm, have rice.

XIII. Write questions with the words. Then write answers. (3 points)

1. Which desert / dry / the Sahara or the Atacama?
Q:
A:
2. Which island / large / Greenland, New Guinea, or Honshu?
Q:
A:
3. Which book / interesting / Farewell to Arms or the Picture of Dorian Grey?
Q:
A:

XIV. Read the messages. Ask someone to pass them on. (4 points)

1. Message: Patrick – We don't have class tomorrow.
.....
2. Message: Ana – Call me tonight on my cell phone.
.....
3. Message: Alex – The concert on Saturday is canceled.
.....
4. Message: Sarah – Don't forget to return the books to the library.
.....

XV. Use the correct form of the verb + infinitive. (4 points)

A: Hey, Steven. What (go, do) after graduation?

B: Well, I (plan, stay) here in the city for a few months.

A: Really? I (want, go) home. I miss my mom's cooking.

B: I (hope, earn) enough money for a new car and move to another place.

A: Where (like, live)?

Part 2: CORRECTION OF MISTAKES

Find and correct the 20 mistakes. (10 points)

There is a lot of different ways of communication nowadays such as letters, telephones and Internet, but perhaps the popularest one is a mobile phone.

In the past, people didn't had a chance to speak any time and everywhere. If they wanted to talked to someone, they visit him or send a letter.

In the present, people choose to use mobile phones for communication because they are very convenient. We can easily to take them everywhere, stay in touch always, play games, watch TV programs and take photos. My favorite activity is watching interesting movie every day.

However, my grandfather is against mobile phones because he think that radiation from mobile lead to cancer. But scientists didn't prove it yet. Since 2000, they do many experiments to understand the dangers of mobile phones. I believe it's a good idea having a mobile with you everywhere, even at school, because in case of emergency we can contact our parents. Besides, if we need some information or advise, we can get in touch always with our friends and parents.

There are some other means of communication which become extremely popular nowadays, for example, e-mail or instant messaging. Instant messaging is immediate than e-mail because they appear instantly. Thus, modern technologies offers people great opportunities for communication and many of people choose instant messaging as the better way of communication.

Part 3: WRITING

Write a composition: How can people stay healthy? (10 points)

APPENDIX K



Post-Test (100 points)

Name: _____

Date: _____

Part 1: GRAMMAR (80 points)

I. Questions and answers with *be* in the present and past. (4 points)

- A: Where you born?
B: I born in Brazil, but now I live in Italy.
- A: Do you want to watch a movie? you interested in comedies or horror films?
B: I more interested in romance.
- A: Maria and Sofia present at the meeting yesterday?
B: No, they because they busy.
- A: James at work last week?
B: Yes, he, but his boss

II. Complete the conversations with the correct form of the verbs in parentheses. (15 points)

- A: you (use to) to collect comic books when you were little?
B: No, I I (use to) have a big collection of cars.
- A: What video games you (play) when you were a kid?
B: I (not to play) video games. But now I play them all the time.
- A: Thanksgiving is a holiday when entire families (get) together. People (give) thanks for the good things in their lives, and everyone (eat) much more than usual. I remember last year when the whole family (come) to our house and my brother and I (bake) eight pies.
- I have noisy neighbors. I wish their music (not be) so loud.
- A: Hi Shane. How are things? What you (do)? I'd like to invite you to a soccer game tonight.

B: I'm sorry I can't come. I (prepare) for my Spanish exam.,
which is tomorrow.

6. A: What you (do) this weekend?

B: I am not sure. I'm really tired, so I probably (not do)
anything exciting. Maybe I (see) a movie on Saturday. How
about you?

A: We need some furniture, so my wife and I (buy) a
table and chairs.

7. A: I (try) a new Indian dish last night. you ever
..... (eat) Indian food?

B: No, I never (hear) of it. (be) it
delicious?

A: I (like) it a lot. In fact, I (visit) this
restaurant since October.

8. A: How long you (work out)?

B: Actually, I want to lose weight, and I
(exercise) at the gym for already 10 months.

9. A: How you (meet) your wife?

B: I (walk) my dog in the park when I
..... (see) her with her friends. And you?

A: While I (study) at the university, I
..... (meet) her at the cafeteria.

III. Choose the correct word in the parentheses. (5 points)

1. A: Did you hear about the changes in the city center? Starting next month,
there will be (more / too many) bicycle lanes and (fewer / less) street parking.

B: That's good. There (are too many / is too much) pollution downtown. I'm
sure there will be (fewer / less) accidents, too.

2. A: I like my house more than my apartment. The house is (enough big / big
enough) for my family, but the apartment is (too small / too much small). There
aren't (as many / as much) bedrooms there as in the house, and there isn't (as
many / as much) space for my work. The apartment is (as much bright / as
bright) as the house, but it doesn't have (enough windows / windows enough).

IV. Change the direct questions into indirect questions. (2 points)

1. When does the post office close?

Can you tell me

2. How often do the buses run?

Do you know

3. Where are the best restaurants in this city?
Could you tell me

4. Where can I buy souvenirs?
Do you know

V. Add modals for necessity and suggestion (5 points)
(must, should, have to, need to, don't have to, shouldn't, ought to, had better).

1. You get a passport to travel to another country.
2. You exchange the money in your country. You can do it after you arrive in the new country.
3. You buy a round-trip plane ticket because it's cheaper.
4. You forget your camera.
5. You take your student ID. It might get you discounts.

VI. Choose the correct answer from the parentheses. (4 points)

1. Please, turn down the music / turn down it.
2. Hang your clothes up / Hang up them.
3. The kitchen is dirty. Clean it up / Clean up it.
4. The trash is here. Please, take them out / take it out.

VII. Change these sentences to polite requests. (4 points)

1. Change the TV channel.
Can
2. Pick up your things.
Could
3. Don't leave the trash in the hallway.
Would you mind
4. Turn off your phone.
Would

VIII. Use infinitive or gerund form of the verbs in parentheses. (6 points)

1. You use a flash drive for (back up) files.

XII. Choose the correct adjectives. (5 points)

1. I find horror movies (boring / bored).
2. I think great books make (fascinating / fascinated) movies.
3. I got so (confusing / confused) by complicated storylines of a movie.
4. She seemed very (interesting / interested) in this actor's life.
5. It is (surprising / surprised) that he didn't want to join us.

XIII. Use who, which, that, whose. (5 points)

1. What's the name of a TV star does things to help society.
2. Can you name a film made you laugh a lot.
3. I prefer a boss is a good leader.
4. I need a room rent is not too high.
5. This is the story of the police officer life was saved by the thief.

XIV. Rewrite the sentence in different ways, using the words in parentheses. (5 p.)

She agrees with you.
e.g. (may) – It may mean she agrees with you.

1. (probably) –
2. (definitely) –
3. (might) –
4. (must) –
5. (maybe) –

XV. What do these international signs mean? (5 points)



1.
2.
3.
4.
5.
6.

Part 2: CORRECTION OF MISTAKES

Find and correct the 20 mistakes.

(10 points)

Read the interview between a journalist and Shi Guangsheng, which is the manager of Hong Kong Housing.

J: Good morning, Mr. Guangsheng. Would you mind to tell us about the company?

G: Sure. Hong Kong Housing a building company. It builds houses in Hong Kong since 2004.

J: Could you tell us how did you start the project “English Town”?

G: Well, we have started it in 2016. It is a new suburb in Shanghai, a city with a population of more than 15 million people.

J: Is it like a piece of England?

G: Exactly, much people in China are interested in buy an English house and live in an English town.

J: I never went to England but I’d really like to see their culture. What plans do you have connected with the project?

G: Currently, we build houses which made of stone and bricks. There will be few public transportation, and the area will be enough clean and quiet for a healthy life. In the near future, you see an English square with pigeons to feed, like in Trafalgar Square in London, English-style pubs, where you can to buy English beer for drink. People will spend a relaxed time with their friends and families. But they are not allowed to throw trash on the ground.

J: It might means they need to pick up it after they leave the square. And if they will break the rule, they will have to pay a fine.

G: Definitely. While I lived in London, I saw how people cared about the environment, and we expect the same here. We also want to build a shopping street where people can enjoy to taste traditional English food like fish and chips or Christmas Pudding.

J: This sounds exciting. I wish I can buy a house in “English Town”.

Part 3: WRITING

Write a composition: Communication in the past, present, and future. (10 points)

APPENDIX L



Delayed Post-Test (100 points)

Name: _____

Date: _____

Part 1: GRAMMAR (80 points)

1. Questions and answers with *be* in the present and past. (4 points)

- A: Do you want to watch a movie? you interested in comedies or horror films?
B: I more interested in romance.
- A: Where you born?
B: I born in Brazil, but now I live in Italy.
- A: James at work last week?
B: Yes, he, but his boss
- A: Maria and Sofia present at the meeting yesterday?
B: No, they because they busy.

2. Complete the conversations with the correct form of the verbs in parentheses. (15 points)

- A: Hi Shane. How are things? What you (do)? I'd like to invite you to a soccer game tonight.
B: I'm sorry I can't come. I (prepare) for my Spanish exam., which is tomorrow.
- A: What video games you (play) when you were a kid?
B: I (not to play) video games. But now I play them all the time.
- A: you (use to) to collect comic books when you were little?
B: No, I I (use to) have a big collection of cars.
- A: Thanksgiving is a holiday when entire families (get) together. People (give) thanks for the good things in their lives, and everyone (eat) much more than usual. I remember last year when the whole family (come) to our house and my brother and I (bake) eight pies.

5. A: I (try) a new Indian dish last night. you ever (eat) Indian food?
 B: No, I never (hear) of it. (be) it delicious?
 A: I (like) it a lot. In fact, I (visit) this restaurant since October.
6. I have noisy neighbors. I wish their music (not be) so loud.
7. A: How you (meet) your wife?
 B: I (walk) my dog in the park when I (see) her with her friends. And you?
 A: While I (study) at the university, I (meet) her at the cafeteria.
8. A: What you (do) this weekend?
 B: I am not sure. I'm really tired, so I probably (not do) anything exciting. Maybe I (see) a movie on Saturday. How about you?
 A: We need some furniture, so my wife and I (buy) a table and chairs.
9. A: How long you (work out)?
 B: Actually, I want to lose weight, and I (exercise) at the gym for already 10 months.

3. Choose the correct word in the parentheses. (5 points)

1. A: I like my house more than my apartment. The house is (enough big / big enough) for my family, but the apartment is (too small / too much small). There aren't (as many / as much) bedrooms there as in the house, and there isn't (as many / as much) space for my work. The apartment is (as much bright / as bright) as the house, but it doesn't have (enough windows / windows enough).
2. A: Did you hear about the changes in the city center? Starting next month, there will be (more / too many) bicycle lanes and (fewer / less) street parking.
 B: That's good. There (are too many / is too much) pollution downtown. I'm sure there will be (fewer / less) accidents, too.

4. Change the direct questions into indirect questions. (2 points)

1. Where can I buy souvenirs?
 Do you know
2. Where are the best restaurants in this city?

Could you tell me

3. When does the post office close?

Can you tell me

4. How often do the buses run?

Do you know

5. Add modals for necessity and suggestion (5 points)
(must, should, have to, need to, don't have to, shouldn't, ought to, had better).

1. You forget your camera.

2. You buy a round-trip plane ticket because it's cheaper.

3. You get a passport to travel to another country.

4. You take your student ID. It might get you discounts.

5. You exchange the money in your country. You can do it after you arrive in the new country.

6. Choose the correct answer from the parentheses. (4 points)

1. The kitchen is dirty. Clean it up / Clean up it.

2. Please, turn down the music / turn down it.

3. The trash is here. Please, take them out / take it out.

4. Hang your clothes up / Hang up them.

7. Change these sentences to polite requests. (4 points)

1. Turn off your phone.

Would

2. Pick up your things.

Could

3. Change the TV channel.

Can

4. Don't leave the trash in the hallway.

Would you mind

8. Use infinitive or gerund form of the verbs in parentheses. (6 points)

1. I am not interested in (make) new friends.

2. Make sure (not use) your cell phone while driving.

3. You use a flash drive for (back up) files.
4. Remember (clean) your computer screen and keyboard once a week.
5. She enjoys (watch) documentaries.
6. I use my computer (shop) online.
7. I don't mind (work) under pressure.

9. Complete the sentences with the correct form of the verbs in parentheses. (4)

1. You (feel) jealous sometimes if you (fall) in love.
2. If you (ride) a bike, you (lose) weight.
3. If she (start) exercising, she (not have) health problems.
4. He (speak) English better if he (study) harder.

10. Agree with short responses. (5 points)

e.g. A: I hate waiting in line. B: So do I.

- | | |
|---|----|
| 6. A: I am interested in designing clothes. | B: |
| 7. A: I have visited a lot of nice places. | B: |
| 8. A: I can't stand loud music. | B: |
| 9. A: I don't like reading about politics. | B: |
| 10. A: I love spending time with my family | B: |

11. Change the sentences from active to passive with by. (5 points)

1. Japan and Korea produce many electronic products.
.....
2. Jane Austin wrote Pride and Prejudice.
.....
3. The Chinese invented paper around 100 CE.
.....
4. The Egyptians built the Pyramids.
.....
5. People speak Mandarin in China.
.....

12. Choose the correct adjectives. (5 points)

1. She seemed very (interesting / interested) in this actor's life.
2. I got so (confusing / confused) by complicated storylines of a movie.
3. I find horror movies (boring / bored).
4. I think great books make (fascinating / fascinated) movies.
5. It is (surprising / surprised) that he didn't want to join us.

13. Use who, which, that, whose. (5 points)

1. Can you name a film made you laugh a lot.
2. I prefer a boss is a good leader.
3. What's the name of a TV star does things to help society.
4. I need a room rent is not too high.
5. This is the story of the police officer life was saved by the thief.

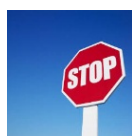
14. Rewrite the sentence in different ways, using the words in parentheses. (5 p.)

She agrees with you.

e.g. (may) – It may mean she agrees with you.

1. (probably) –
2. (definitely) –
3. (might) –
4. (must) –
5. (maybe) –

15. What do these international signs mean? (5 points)



Parking area



1.
2.
3.
4.
5.
6.

Part 2: CORRECTION OF MISTAKES

Find and correct the 20 mistakes.

(10 points)

Read the interview between a journalist and Shi Guangsheng, which is the manager of Hong Kong Housing.

J: Good morning, Mr. Guangsheng. Would you mind to tell us about the company?

G: Sure. Hong Kong Housing a building company. It builds houses in Hong Kong since 2004.

J: Could you tell us how did you start the project “English Town”?

G: Well, we have started it in 2016. It is a new suburb in Shanghai, a city with a population of more than 15 million people.

J: Is it like a piece of England?

G: Exactly, much people in China are interested in buy an English house and live in an English town.

J: I never went to England but I’d really like to see their culture. What plans do you have connected with the project?

G: Currently, we build houses which made of stone and bricks. There will be few public transportation, and the area will be enough clean and quiet for a healthy life. In the near future, you see an English square with pigeons to feed, like in Trafalgar Square in London, English-style pubs, where you can to buy English beer for drink. People will spend a relaxed time with their friends and families. But they are not allowed to throw trash on the ground.

J: It might means they need to pick up it after they leave the square. And if they will break the rule, they will have to pay a fine.

G: Definitely. While I lived in London, I saw how people cared about the environment, and we expect the same here. We also want to build a shopping street where people can enjoy to taste traditional English food like fish and chips or Christmas Pudding.

J: This sounds exciting. I wish I can buy a house in “English Town”.

Part 3: WRITING

Write a composition: Communication in the past, present, and future. (10 points)

APPENDIX M



Dear Participant,

Thank you for participating in the experiment.

Please complete the following form. All responses will be kept anonymous and confidential. If you would like to learn the results of this study, please provide your e-mail address below, and I will keep you informed.

If you have any questions or concerns about any aspect of this questionnaire, you can contact me and my supervisor:

Principal Investigator

Lilit Avetisyan

E-mail: Lilit.avetisyan@mic.ul.ie

Telephone: (+374 99) 507027

Supervisors

Dr. Anne O’Keeffe, Dr. Joan O’Sullivan

E-mail: Anne.O’Keeffe@mic.ul.ie, Joan.O’Sullivan@mic.ul.ie

Telephone: 061 204957

Thank you for your contribution and time.

Learner-Autonomy-Profile Form

Instructions: Please read each question and check (√) the boxes that apply to you. Your score can be any number on the scale from 1 to 5. A score of 1 means you will never perform the behavior. A score of 5 means you will always perform the behavior.

Questions	Never 1	Seldom 2	Some times 3	Often 4	Always 5
Affective and motivational component					
1. I want to do more individual work to achieve better results					
2. I want to participate in learning more difficult things					
3. I want to improve independent language learning skills					
4. I can motivate myself in a way that works for me					
5. I can control my feeling when I am learning					
Action-oriented component					
6. I can use a variety of materials and resources					
7. I can choose different methods and strategies					
8. I can choose to learn something when I am out of class					
9. I can select and evaluate learning materials					
10. I know how to use language corpora to complete a task or achieve a goal.					

11. I address to language corpora to answer my questions related to language issues					
12. I can study independently to improve my grammar knowledge					
13. I can correct my mistakes to improve my own writing					
14. I can manage my learning independently					
Cognitive and metacognitive component					
15. I can analyse structures and patterns in the foreign language and draw conclusions from my observations about the structure and use of the language					
16. I can analyse individual aspects of the foreign language and compare them with my first language or other languages I know					
17. I can analyze a communication in the foreign language and compare it with a corresponding situation in my first language in order to recognize culturally specific similarities and differences					
18. I can recognize my strengths and weaknesses as a learner and reflect on them.					
19. I can analyze my own needs					
20. I can evaluate my own language competencies					
21. I can evaluate materials and resources for language learning					
22. I can make decisions about selecting materials for my learning					
23. I can reflect on materials and resources which I have used					
24. I am aware of my personal growth as a language learner					
25. I value learning that I do on my own					
Social component					
26. I can learn with and from others					
27. I can work with a partner or in a group.					
28. When I work together with others I can, where applicable, modify my stance to reach a group decision.					
29. I can ask native speakers and competent non-native speakers or other learners to help me					
30. I can decide when I want to cooperate with others in order to structure my learning better					



Sample Questions for Semi-Structured Student Interviews

1. Do you enjoy studying grammar?
2. Do you enjoy writing in English?
3. How did COCA help you improve your knowledge of grammar?
4. How did COCA help you improve your writing?
5. Did COCA help you find grammar rules on your own?
6. Which do you prefer: discovering rules on your own or direct explanations of rules?
7. Did corpus-based activities motivate you to want to do more grammar?
8. Did COCA raise your awareness of the language?
9. What did you like about using concordancing?
10. What were the difficulties in working with COCA?
11. Do you prefer a grammar book or corpus-based grammar activities?
12. Can you correct your mistakes more easily to improve your own writing?
13. What is your attitude towards working with the language corpus?
14. Will you continue using a language corpus independently?
15. How would you describe an effective language learner?

APPENDIX O



Metadata of All Learner Participants

Experimental Group								
Code	Sex	Age	Nat*	L1	L2	L2	Edu cation	Role
Participant 1	M	28	Arm.*	Arm.	Russ.*B2	Eng* B1	Higher	Engineer
Participant 2	M	46	Arm.	Arm.	Russ. C2	Eng. B1	Higher	Manager
Participant 3	F	26	Arm.	Arm.	Russ. C1	Eng. B1	Higher	Engineer
Participant 4	M	40	Arm.	Arm.	Russ. C2	Eng. B1	Higher	Manager
Participant 5	M	40	Arm.	Arm.	Russ. B2	Eng. B1	Higher	Manager
Participant 6	M	42	Arm.	Arm.	Russ. C2	Eng. B1	Higher	Engineer
Participant 7	M	42	Arm.	Arm.	Russ. C2	Eng. B1	Higher	Manager
Participant 8	M	35	Arm.	Arm.	Russ. B2	Eng. B1	Higher	Engineer
Participant 9	M	45	Arm.	Arm.	Russ. B2	Eng. B1	Higher	Manager
Control Group								
Participant 10	M	32	Arm.	Arm.	Russ. B2	Eng. B1	Higher	Engineer
Participant 11	M	33	Arm.	Arm.	Russ. B2	Eng. B1	Higher	Engineer
Participant 12	M	30	Arm.	Arm.	Russ. C2	Eng. B1	Higher	Engineer
Participant 13	F	35	Arm.	Arm.	Russ. C1	Eng. B1	Higher	Engineer
Participant 14	M	45	Arm.	Arm.	Russ. C2	Eng. B1	Higher	Manager
Participant 15	M	42	Arm.	Arm.	Russ. C1	Eng. B1	Higher	Manager
Participant 16	M	38	Arm.	Arm.	Russ. C1	Eng. B1	Higher	Engineer
Participant 17	M	45	Arm.	Arm.	Russ. C2	Eng. B1	Higher	Manager
Participant 18	M	44	Arm.	Arm.	Russ. C1	Eng. B1	Higher	Engineer

Nat* - Nationality; Arm* - Armenian; Russ* - Russian; Eng* - English

APPENDIX P



**Complete Syllabus of Pre-Intermediate (B1) English Course
(Experimental Group and Control Group)**

	Topic	Grammar	Listening	Speaking	Reading	Writing
Pre-Test (Grammar; Error Correction; Writing)						
Week 1	People; childhood; memories	Past tense; <i>used to</i> for habitual actions	Listening to people talk about their past	Introducing yourself; talking about yourself; exchanging personal information ; remembering your childhood; asking about someone’s childhood	Reading about the life and work of this Hollywood star	Writing a paragraph about your childhood
Week 2	Transportation; transportation problems; city services	Expressions of quantity with count and noncount nouns; <i>too many, too much, fewer, less, more, not enough</i> ; indirect questions from wh-questions	Listening to a description of a transportation system	Talking about transportation and transportation problems; evaluating city services; asking for and giving information	Reading about new transportation problems	Writing an online post on a community message board about a local issue
Progress Test 1(Grammar; Error Correction; Writing)						
Week 3	Houses and apartments; lifestyle changes; wishes	Evaluations and comparisons with adjectives: <i>not ... enough, too, (not) as...as</i> ; evaluations and comparisons with nouns: <i>not enough..., too much/many..., (not) as much/many... as</i> ; wish	Listening to people talking about capsule hotels	Describing positive and negative features; making comparisons, talking about lifestyle changes; expressing wishes	Reading about ways to end bad habits	Writing email comparing two living spaces
Week 4	Food; recipes; cooking instructions; cooking methods	Simple past vs. present perfect; sequence adverbs: <i>first, then, next, after that, finally</i>	Listening to descriptions of foods	Talking about food; expressing likes and dislikes; describing a favorite snack; giving step-by-step instructions	Reading about how food affects the way we feel	Writing a recipe
Progress Test 2 (Grammar; Error Correction; Writing)						

APPENDIX P (continued)

	Topic	Grammar	Listening	Speaking	Reading	Writing
Week 5	Travel; vacations; plans	Future with be going to and will; modals for necessity and suggestion: <i>must, need to, (don't)have to; ought to, -'d better, should (not)</i>	Listening to travel advice	Describing vacation plans; giving travel advice; planning a vacation	Reading about how volunteer vacations work	Writing a letter with travel suggestions
Week 6	Complaints; household chores; requests; excuses; apologies	Two-part verbs; <i>will</i> for responding to requests; requests with modals and <i>Would you mind...?</i>	Listening to the results of a survey about family life	Making requests; agreeing to and refusing requests; complaining; apologizing; giving excuses	Reading about ways to ensure a positive response to requests for a favor	Writing a set of guidelines
Progress Test 3 (Grammar; Error Correction; Writing)						
Week 7	Technology; instructions	Infinitives and gerunds for uses and purposes; imperatives and infinitives for giving suggestions	Listening to people give suggestions for using technology	Describing technology; giving instructions; giving suggestions	Reading about the new hobby of geocaching	Writing email asking for specific favors
Week 8	Holidays; festivals; customs; celebrations	Relative clauses of time; adverbial clauses of time: <i>when, after, before</i>	Listening to a description of Carnival in Brazil	Describing holidays, festivals, customs, and special events	Reading about interesting customs and cultural events	Writing an entry on a travel website about a cultural custom
Progress Test 4 (Grammar; Error Correction; Writing)						
Week 9	Life in the past, present, and future; changes and contrasts; consequences	Time contrasts/ conditional sentences with <i>if</i> clauses	Listening to people talk about changes	Talking about change; comparing time periods; describing possible consequences	Reading about the signs of being in love	Writing a paragraph describing a person's past, present, and possible future
Week 10	Abilities and skills; job preferences; personality traits; careers	Gerunds; short responses; clauses with <i>because</i>	Listening to people talk about their job preferences	Describing abilities and skills; talking about job preferences; describing personality traits	Reading about how personality type affects career choices	Writing a cover letter for a job application
Progress Test 5 (Grammar; Error Correction; Writing)						
Week 11	Landmarks and monuments; world knowledge	Passive with <i>by</i> (simple past); passive without <i>by</i> (simple present)	Listening to descriptions of monuments	Talking about landmarks and monuments; describing countries; discussing facts	Reading about interesting museums	Writing a guidebook introduction

APPENDIX P (continued)

	Topic	Grammar	Listening	Speaking	Reading	Writing
Week 12	Storytelling; unexpected recent past events	Past continuous vs. Simple past; present perfect continuous	Listening to stories about unexpected experiences	Describing recent past events and experiences; discussing someone's activities lately	Reading about the rise of an unusual group of musicians	Writing a description of recent experience
Progress Test 6 (Grammar; Error Correction; Writing)						
Week 13	Entertainment; movies and books; reactions and opinions	Participles as adjectives; relative pronouns for people and things	Listening for opinions; listening to a movie review	Describing movies and books; talking about actors and actresses; asking for and giving reactions and opinions	Reading about the history of special effects	Writing a movie review
Week 14	Nonverbal communication; gestures and meaning; signs; drawing conclusions	Modals and adverbs: might, may, could, must, maybe, perhaps, possibly, probably, definitely; permission, obligation, and prohibition	Listening to people talk about the meaning of signs	Interpreting body language; explaining gestures and meanings; describing behavior; asking about signs and their meaning	Reading about proverbs and their meaning	Writing a list of rules
Progress Test 7 (Grammar; Error Correction; Writing)						
Week 15	Money; hopes; predicaments; speculations	Unreal conditional sentences with <i>if</i> clauses; past modals	Listening to people talk about predicaments; listening to a call-in radio show	Speculating about past and future events; describing a predicament; giving advice and suggestions	Reading an online advice forum	Writing a letter to an advice columnist
Week 16	Requests, excuses; invitations	Reported speech: requests and statements	Listening for excuses	Reporting what people said; making polite requests; making invitations and excuses	Reading about 'white lies'	Writing a report about people's responses to a survey
Post-Test (Grammar; Error Correction; Writing) (administered immediately after the treatment)						
Delayed Post-Test (Grammar; Error Correction; Writing) (administered three weeks after the treatment)						

APPENDIX Q



Example transcript showing interview sections in Armenian

Interviewer: Հ (Հարցազրույցավար)

Respondent: Պ (Պատասխանող)

<p>Հ: Ո՞րն էք նախընտրում՝ ինքնուրույն բացահայտել քերականական կանոնը, թե անմիջապես ստանալ բացատրությունը:</p>
<p>Պ4: Ես կնախընտրեի նախ բացահայտել կանոնը ինքս, ապա ստուգել, թե արդյոք իմ սահմանումները ճիշտ են: Բհարկե, ինչպես ասում են, դժվարը հայտնագործելն է և ոչ թե սովորել այն, ինչ հայտնագործվել է: Այնուամենայնիվ, երբ դու հայտնագործում ես, սովորում ես ոչ միայն այն, ինչը փնտրում էիր, այլև շատ այլ բաներ:</p> <p>Պ1: Ես անզլերենից այդքան էլ լավ չեմ և չեմ կարող շատ ժամանակ ծախսել կանոնների բացահայտման վրա աշխատանքիս պատճառով: Ընդհանուր առմամբ, հավանեցի քերականություն սովորելու այս մեթոդը. Այն օգնում է ավելի լավ հիշել ինֆորմացիան, բայց կարծում եմ ավելի օգտակար կլինի համալսարանի ուսանողների համար, ովքեր ավելի շատ ժամանակ ունեն իրենց դասերի վրա ծախսելու:</p>
<p>Հ: Ինչը հավանեցիք կորպուսային ուսուցումից:</p>
<p>Պ7: Իրականում, սա իսկապես նոր փորձ էր ինձ համար, երբ պետք է ինքս հայտնագործեի լեզուն: Բայց, իրոք, հավանեցի այն, քանի որ հետաքրքիր էր և արդյունավետ, հատկապես, երբ փոխանակում էինք մեր եզրակացությունները և հետո ստանում ճիշտ բացատրությունը: Ես լավ էի զգում, երբ իմ եզրակացությունները ճիշտ էին դուրս գալիս, և դա ինձ ավելի վստահ էր դարձնում:</p> <p>Պ2: Կարծում եմ՝ սա լավ հարթակ է լեզուն ուսումնասիրելու համար ոչ միայն դասարանում, այլև ինքնուրույն, երբ ունեն ազատ ժամանակ: Այն այնքան գործիքներ ունի, և յուրաքանչյուրն իր դերն ու նշանակությունը ունի, որը թույլ է տալիս ավելի խորապես լեզուն հասկանալ: Ցավոք, այս մեթոդը, ի նկատի ունեմ կորպուսի հետ աշխատելը տարածված չէ:</p> <p>Պ4: Հիմնականում, ես հավանեցի կորպուսի հետ աշխատելը: Այն իսկապես հարուստ ռեսուրս է՝ նախադասությունների, օրինակների, որը հնարավորություն է տալիս հասկանալ, թե իրական կյանքում, տարբեր իրավիճակներում ինչպես են գործածում լեզուն: Ինձ համար ամենաարդյունավետը բառակապակցություններն էին, որոնք ավելի հեշտ էր հիշել:</p>

APPENDIX R



Example transcript showing manually color coded interview sections in English

Interviewer: I

Respondent: R

DDL as a grammar development resource

DDL for cognitive stimulation

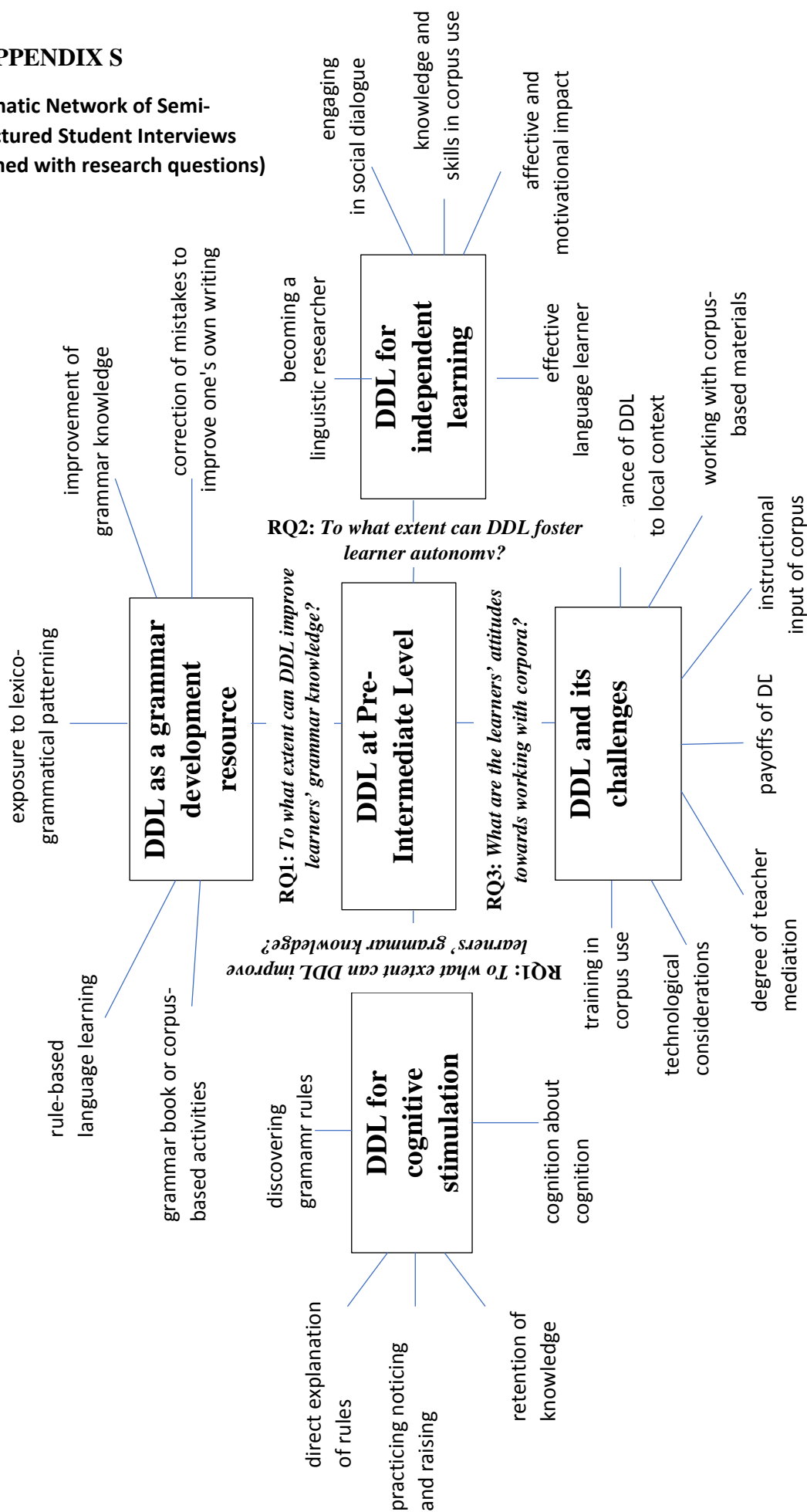
DDL and its challenges

DDL for independent learning

<p>I: <i>How did COCA help you improve your knowledge of grammar?</i></p>
<p>R9: <i>We are used to studying a language with the teacher and grammar books and at school and university we used to receive explanations immediately from the teacher. But COCA is a new way of improving the knowledge of grammar – you can find out not only the explanation of some language issue but also a lot of examples after studying the rule. This is a completely new experience but it is useful.</i></p>
<p>I: <i>Did COCA help you find grammar rules on your own?</i></p>
<p>R2: <i>Yes, it helped me a lot. It was especially interesting when my findings appeared to be correct. There is so much information about a single language item and so many examples that by exploring them, you can get an idea of how it is formed.</i></p>
<p>R3: <i>And I would like to add that I was able not only to discover the rules, of course sometimes succeeded and sometimes failed, but also to discover many contexts where this form is used.</i></p>
<p>I: <i>Which do you prefer: discovering rules on your own or direct explanations of rules?</i></p>
<p>R4: <i>I would prefer to first discover the rules by myself and then check whether or not my definitions are correct. For sure, as there is a saying, the difficult thing is to discover and not to learn what is discovered. However, when you discover, you learn not only what you are looking for, but many other things.</i></p>
<p>R1: <i>I am not very good at English and I can't spend much time discovering the rules by myself because of my work. In general, I liked this method of learning grammar; it helps remember the information better but it might be more beneficial for university students who have more time to spend on their studies.</i></p>
<p>R3: <i>Of course, it's easier to study with direct explanations of rules and it does not demand much time, but discovering rules on your own can be more interesting and you can remember the rules which are discovered in this way more easily.</i></p>

APPENDIX S

Thematic Network of Semi-Structured Student Interviews (aligned with research questions)





LESSON PLAN

(sample lesson plan integrating the 5-step guided DDL procedure)

Level: Pre-Intermediate

Time: 150 minutes

Number of students: 9

Age: 30-50

Topic: Time for a Change (resources: textbook “*Interchange*” and corpus-based materials)

Aids: marker, board, student worksheets

Assumptions: Students should know the basic vocabulary used in the activities. Students should be familiar with pair work to share their information with each other. Also, they should be able to work in groups to complete the description activity and share their information about their preferences.

Anticipated problems: Students may have difficulty with inducing the grammatical rules independently. This will be mitigated through teacher and learner support.

Learning objectives: Students learn positive and negative adjectives to describe houses and apartments; listen to opinions about houses and apartments; see evaluations and comparisons in context; explore the lexico-grammatical items related to comparisons and evaluations with adjectives and nouns through the corpus-based concordance input and induce the rules; practice the discovered ways to evaluate and compare using adjectives and nouns in controlled activities; develop skills in listening for main ideas and details related to changes; produce the new grammar knowledge in freer practice tasks - speak about their preferences for houses or apartments and write a descriptive email comparing their old home to the new one.

Step	Time	Procedure	Inter action	Objectives and outcomes
Warm-up	2min.	To prepare students for the lesson, teacher writes the topic of the lesson <i>A Time for a Change</i> on the board, and tells them that they are going to discuss their ideal home.	Teacher-student	This warm-up initiates the target area and helps students activate their prior knowledge and build expectations about the coming activities.
Vocabulary	15 min.	To have the necessary vocabulary to speak about the location, size, view, facilities, and features of their ideal home, teacher presents the activity where learners are expected to label positive and negative words. Students work individually to complete the task. Before teacher goes over the answers as a class, students compare them with their partners.	Student-student; Teacher-student	Students enrich their vocabulary necessary for evaluating and comparing houses and apartments in their reading, speaking and writing activities.
Reading	20 min.	Teacher asks the class if they prefer houses or apartments and why. Students discuss the issue in pairs. After this, the class reads opinions about houses and apartments and discusses the opinions they agree or do not agree with. Teacher goes around the class and monitors students' comparisons and evaluations but does not correct their language yet.	Students individually; Student-student;	Students practice their reading comprehension, see the content words in context, hence recycle and expand their knowledge of content vocabulary. They also see the target grammar structures in context.

Grammar	15 min.	<p>Teacher distributes corpus-based worksheets with concordance lines related to comparisons and evaluations with adjectives and nouns (<i>enough + noun, adjective + enough, too + adjective, too many/much + noun, as + adjective + as, as many/much + noun + as</i>) and asks the class to explore the concordance lines, discover and complete the grammar rules.</p> <p>(For direct computer-based work, this step can be assigned as homework before the class. Guided by the instructions in the worksheet and getting access to multiple instances of real corpus data, learners discover the grammar rules individually).</p>	Students individually	<p>Learners are exposed to multiple instances of the target grammar constructions. Noticing is promoted through the enhanced salience of the grammar points in the KWIC format. Learners induce the grammar rules individually through discovery learning. This relates to the first step of the 5-step guided DDL procedure – (1) forming hypotheses individually through inductive corpus-driven tasks.</p>
Grammar	10 min.	<p>Teacher asks students to share their hypotheses in pairs before they check their conclusions with teacher.</p>	Student-student; Student-teacher	<p>Students construct new knowledge through interaction. This happens by (2) sharing hypotheses in groups and (3) verifying the validity of hypotheses with teacher.</p>
Grammar	25 min.	<p>Teacher tells the class to complete the following activities related to the above grammar points. For the first exercise, students rewrite the sentences using <i>enough</i>. In the second part, they rewrite the sentences using <i>as...as</i>. Following this, based on their concordance searches, they find and correct the errors. Before eliciting students' answers, teacher tells students to compare their answers with their partners.</p>	Student-student; Student-teacher	<p>Students (4) practice the language points in follow-up controlled exercises. Pair work creates relaxing atmosphere and gives more confidence to students.</p>

Listening	15 min.	Teacher asks the class if anyone knows what a capsule hotel is. If not, he/she explains the meaning of the word <i>capsule</i> (a small container). Teacher tells the class that they are going to listen to a comparison between a hotel and a capsule hotel and do the follow-up activity. To encourage students' top-down listening skills, teacher encourages them to make predictions before playing the audio program. First students compare their answers in pairs and then check them with the teacher.	Students individually; Student-student; Student-teacher	Students check and practice their understanding of the new language items through receptive skills. They develop skills in listening for main ideas and details. Students (4) practice the target language points in follow-up exercises.
Speaking	20 min.	Teacher tells the class to look at the pictures and the ads about a modern house and an older apartment, divides the class into three groups and tells them to write as many comparisons and evaluations as possible following the discovered patterns. After writing, groups present their descriptions to each other. Teacher goes around the class and gives help as needed. For more practice with evaluations and comparisons, teacher elicits opinions and reasons from the class for their preferences related to renting the house or the apartment.	Student-student; Student-teacher	Students practice ways to evaluate and compare in freer production activities, as the fifth step of the DDL guided procedure: (5) producing the language item through follow-up activities. Authentic tasks make learning more fun and motivating. Group work encourages students to interact and negotiate meaning.
Writing	25 min.	Teacher tells the class to imagine that they have just moved to the apartment presented in the picture and write email to a friend comparing their old home to their new one. Teacher directs students' attention to the picture and elicits information about the apartment floor plan. As a class, students brainstorm ways to compare this apartment to their current home. Students exchange papers with another classmate and answer the question as to how their descriptions are similar or different. This activity can also be assigned as homework.	Students individually; Student-student; Student-teacher	Students practice their knowledge of comparisons and evaluations using adjectives and nouns in written production. This follows step (5) producing the language item through follow-up activities.