INDIVIDUALIZED SECOND LANGUAGE VOCABULARY LEARNING THROUGH A COLLABORATIVE MULTIMEDIA PLATFORM: A DESIGN-BASED RESEARCH

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Gökhan Özkan

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DECLARATION OF ORIGINALITY

I, Gökhan Özkan, certify that

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ABSTRACT

Individualized Second Language Vocabulary Learning Through A Collaborative Multimedia Platform: A Design-Based Research

Incorporation of computer-assisted language learning applications into learning environments through collaborative learning management systems embedded in a hybrid/native mobile app is the subject of this research to apply, evaluate, and improve adult English as Foreign Language (EFL) learners' digital language learning experiences. This design-based research aims to disseminate the best practice of existing digital services by turning them into a progressive web app (PWA) to be used as a solution to a specific learning environment. Prior to the dissemination step of the research, an exploratory context analysis study was carried out to inform the learning environment (Phase I) in the analysis step. Following that, worldwide language learning apps and platforms were examined, analyzed, and mapped within the scope of international projects to form the pattern of the features of the recent worldwide digital language learning solutions (Phase II). In the design step, a set of studies was conducted to utilize the most effective method considering the parameters of the learning environment where research is carried out. Firstly, the effectiveness of individualized second language vocabulary learning strategy aid through prompts, instead of conventional comprehension exercises, was examined. In addition, research fostering the strategy use by prioritizing the cognitive steps as facilitators was designed to address the critical gap of considering individualized variables in e-learning solutions. In the development stage of the research, the concept of digital language learning and adult EFL learners was introduced to a

transformative solution of an innovative hybrid learning environment existing in all digital platforms (Phase III). Lastly, the implementation of the designed tool was compared to conventional methods that have been used in the learning environment and it was found out that the individualization of second language vocabulary learning in e-learning environment was effective when cognitive steps were taken into account and e-learning principles were applied (Phase IV). It was found out that the learners in the experimental group were able to improve their ability to self-regulate their vocabulary learning process, as well as their learning motivation and sense of self-efficacy by utilizing the designed tool.

Keywords: *Design-Based Research, Educational Digital Transformation, Progressive Web App, Vocabulary Learning, Instructional Design*

ÖZET

İşbirlikli Çoklu Ortam Platformu Aracılığıyla Sunulan Bireyselleştirilmiş İkinci Dil Sözcük Öğrenimi: Tasarım Temelli Araştırma

Bu araştırmanın konusu hibrit/yerel bir mobil uygulamaya yerleştirilmiş işbirlikçi öğrenme yönetim sistemleri aracılığıyla bilgisayar destekli dil öğrenme uygulamalarının öğrenme ortamlarına dahil edilmesi ve Yetişkinler için Yabancı Dil Olarak İngilizce (EFL) öğrencilerinin dil öğrenimini tasarlanan dijital araçlar ile uygulamak, değerlendirmek ve geliştirmektir. Bu eğitsel tasarım temelli araştırma, belirli bir öğrenme ortamına çözüm olarak kullanılmak üzere progresif bir web uygulaması (PWA) çözümüne dönüşerek mevcut bir dijital hizmetin en iyi uygulamasını yaygınlaştırmayı amaçlamaktadır. Araştırmanın yaygınlaştırma adımından önce, analiz adımında öğrenme ortamına dair durumları belirleyebilmek için keşifsel bir bağlam analizi çalışması yapılmıştır (Faz I -Analiz aşaması). Buna ek olarak, dünya çapındaki yeni dijital dil öğrenme çözümlerinin özelliklerinin örüntüsünü oluşturmak için uluslararası projeler aracılığıyla dünya çapındaki dil öğrenme uygulamaları ve platformları incelenmiş, analiz edilmiş ve haritalandırılmıştır (Faz II – Analiz Aşaması). Eğitsel aracın geliştirilme sürecinde öğrenme ortamının parametreleri göz önünde bulundurularak en etkili yöntemden faydalanabilmek için bir dizi çalışma yürütülmüştür. İlk olarak, geleneksel okuduğunu anlama alıştırmaları yerine yönlendirmeler yoluyla bireyselleştirilmiş ikinci dilde sözcük öğrenimi strateji yardımının etkinliği incelenmiştir. Daha sonra, e-öğrenme çözümlerinde bireysel değişkenlere ek olarak etkililiğin artırılması amacıyla bilişsel aşamaların da göz önünde bulundurulduğu dil öğrenme stratejilerinin kullanımını teşvik eden bir tasarım test edilmiştir. Buna ek olarak, araştırmanın geliştirme aşamasında, dijital dil öğrenimi ve yetişkinlerde İngilizce

öğrenimi kavramlarına katkıda bulunabilecek ve tüm dijital platformlarda mevcut olabilecek yenilikçi ve dönüştürücü bir hibrit öğrenme ortamı hazırlanmıştır (Faz III – Geliştirme Aşaması). Son olarak ise, geliştirilen dijital çözümün etkililiği öğrenme ortamında halihazırda kullanılan geleneksel yöntemlerle karşılaştırışmış ve ikinci dilde sözcük öğreniminde bilişsel basamaklar dikkate alındığında ve e-öğrenme kuralları uygulandığında etkili olabileceği tespit edilmiştir (Uygulama-Faz IV). Deney grubundaki öğrenicilerin tasarlanan aracı kullanarak sözcük öğrenimi sürecinde öz düzenleme becerilerini, motivasyonlarını ve öz-yeterlik duygularını geliştirebildikleri tespit edilmiştir.

Anahtar Kelimeler: *Tasarım Temelli Araştırma, Eğitsel Dijital Dönüşüm, İleri Web Uygulaması, Sözcük Öğrenimi, Öğretim Tasarımı*

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Learning is an evolutionary process

that may give rise to revolutionary results.

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ABBREVIATIONS

ANX	Anxiety
API	Application Programming Interface
ARCS	Attention, Relevance, Confidence, Satisfaction
CALL	Computer-Assisted Language Learning
CALLA	Cognitive Academic Language Learning Approach
CLIL	Content and Language Integrated Learning
CMS	Content Management System
COST	European Cooperation in Science and Technology
DBR	Design-Based Research
DLL	Distance Language Learning
EFL	English as Foreign Language
ELLs	English Language Learners
ESP	English for Specific Purposes
FLLL	Foreign Language Learning Anxiety
GLOB	Global Reading Strategies
ID	Individual Difference
IMMS	Instructional Materials Motivation Survey
JoLs	Judgement of Learning
L2	Second Language
LE	Learning Environment
LLS	Language Learning Strategies
LMS	Learning Management System
MALQ	Metacognitive Awareness Listening Questionnaire
MARSI	Metacognitive Awareness of Reading Strategies
MCK	Metacognitive Knowledge
METARESTRAP	Metacognitive Reading Strategy Training Program
MOT	Motivation
NNES	Non-Native English Speakers
PROB	Problem-Solving Strategies
PWA	Progressive Web App
QR	Quick response
SE	Self-Efficacy
SILL	Strategy Inventory for Language Learning
SitCog	Situated Cognition
SLA	Second Language Acquisition
SLL	Second Language Learning
SRL	Self-Regulated Learning
SSBI	Styles and Strategies-Based Instruction
SUP	Support Reading Strategies
TOEFL	Test of English as a Foreign Language
VMN	Virtual Mobility Network
VOA	Voice of America

CHAPTER 1

PROBLEM STATEMENT

1.1 Introduction

Learners varying in their own phylogenesis and ethnogenesis have individual learning processes and cognitive and affective needs, and these variations place them in different genera in the classroom and society for different aspects. In this framework, the question of how such variables as learners' prior knowledge, cultural background, attitudes, and rate of learning need to be considered in the instructional design process emerges as an essential issue. Instructors, in this sense, face overcoming the difficulties of social heredity, given that they undertake the responsibility of creating change for learners. Nonetheless, educational practice by instructors has long been applied in a conventional style for which the current mechanics of teaching and learning processes are taken for granted in implementation. This requires a change in instructional design, and instructors need to think about how students' background, knowledge, attitudes, and learning speed affect their learning in the classroom. This is important because teaching methods have traditionally been applied in a standard way, ignoring learners' differences among students. To better understand the students, the instructional design process needs to be changed. (McKenney & Reeves, 2018).

Planned change and organized evolution of learners' cognitive processes are herein at stake through educational practice. Nevertheless, not the theoretical contribution but the implementation of individualization of learning variables has thus far been ignored. As a result of this, conventional instruction methods have been applied in schools for decades despite the existence of a vast amount of literature

addressing this gap. Underlying principles of mass production in schools might be about the economically feasible feature of the schools/classrooms. The point, however, seems to be more for taking advantage of classrooms as social learning platforms by considering the delicate process of the analysis of learner variables. As a result of technological advancements and evolving theories regarding digital learning experiences, the ability to individualize and adapt instruction to the needs of individual learners has become increasingly feasible within traditional educational practices.

In understanding the cognitive steps in learning, the studies carried out so far have shed light on dichotomous perspectives of learning: (i) orders and (ii) disorders. Orders, in this sense, are optimal points for facilitated learning and the right route to follow in cognitive development, concept making and/or learning in short. Disorders, on the contrary, refer more to the frequent undesirable variables in learning processes than only to disabilities such as dyslexia, dysgraphia and dyscalculia that may hinder learners' processing of declarational or procedural knowledge. One of the most significant current discussions in the literature of educational sciences emerges around this topic. A major problem with this way of building up knowledge is that there has not been much agreement on the ranking of the importance of the topics so far. This would prevent researchers and lecturers from considering learner variables in their implementation processes. Individualization of instruction, contrary to controversial topics in education, must be considered an important issue that deserves more scholarly attention (Piniel & Csizér, 2013). Therefore, the goal of the current research is to determine the dynamics of a better implementation of tailoring instruction, in particular vocabulary learning instruction, specific to cognitive and

affective needs through design-based research (DBR) aligned with the principles of learning sciences.

The discourse between Vygotsky and Piaget in the realm of pedagogical implementation serves as a noteworthy illustration of differing perspectives on the mechanisms of change through learning, originating from the same fundamental principle: the ontogenetic development of language and the realization of concepts, which Chomsky (1963) posits as a defining characteristic of human communication and distinguishes it from any other known system of animal communication. Considering this, Vygotsky (1962) attached more importance to directed variables that mostly stem from society, or, in other words, to ethnogenesis, whereas Piaget's suggestions emerged around the understanding of phylogenesis (Messerly, 1996). The takeaway message from this discussion to current research is the origin of the human language and its focal point to utilize as an important parameter. To illustrate these asynchronous tenets in an equation to explain the intended meaning, let "μ" denote the cluster of meaning, "A" for variables regarding autism emphasized by Piaget, and "D" for directed variables emphasized by Vygotsky: $\mu \equiv \Sigma(A_n+D_n)$. The discussion between Vygotsky and Piaget emerges around the frequency of "A" or "D" variables. For Vygotsky, it is clear that $D_n>A_n$ is way more observable than the contrary case that would be foreseen by Piaget. It is noteworthy to state that Vygotsky has no objection to the existence of variables related to developmental stages but finds it insufficient to explain meaning-making (μ). Given that the combination of the variables is valid, and some proportion of each variable apply people to some extent, the question of the effect of iterative behavior, as in the Einstellung effect (National Research Council, 2000), is not at stake due to complex cognitive processes. The formed equation focusing only on the orders is insufficient

to explain how meanings are acquired, or in other words, the ontogenetic cognitive and linguistic development. As a matter of fact, more variables need to be explored and analyzed in order to understand the primary focal point and the hindrances for learning to occur. The current study seeks to remedy these hindrances by analyzing the literature on learning and cognition and guiding learners to acquire possible potentials that would facilitate their learning.

The researcher visited researchers at the University of Lower Silesia to discuss the change mechanism to initiate this research and detect the possible gaps and possible missing points in the process of change. As a result, the intended function of the developed design was decided to lessen the negative effects of constraints and provide students with access to more facilitators during their learning process.

In the meaning-making process described by a formula for discussion between Vygotsky and Piaget, this study is based on Vygotsky's explanation that claims directed variables are more important than autism variables ($D_n > A_n$). Therefore, the study is more focused on detecting the gap and exploring the right variables to intervene. Similar to this illustration, the underlying structure of this study can also be illustrated in a formula for a cognitive change among learners where x is denoted for the current situation while x' for the expected outcome ($x \rightarrow x'$) and Δ is the symbol of change. The reason for using x' for the outcome is the assumption that learners are in the process of a continuous change due to their previous knowledge and/or conceptions towards the target subject. In addition, the η the represents the unknown but controllable and quantifiable barriers to learning processes ascertained from the literature. (Gill, 2006), and y is the learning object to be accommodated. The intervention is to eliminate the η effect due to its negativity,

and this is assumed to help learners construct meaning prior to providing the instruction (y) for the expected outcome (x'). Hence, the base of structural change is planned in this study as $[(x- \eta) + y] \rightarrow x'$. Inasmuch as the outcome of learning processes may not be as expected and a different version of x may occur at the end, (x') is denoted for this result.

Besides this, another starting point that does not refer to the desired outcome or be a tabula rasa about the subject may also result in "fossilization" (Selinker, 1972) or false beginners, especially in the learning of foreign languages. Therefore, in order to illustrate the underlying framework of this study, the aims, assumptions and methodology of change-making are indicated in the formula considering the disorders and barriers in learning processes. No slope coefficients of the variables are illustrated here, but Σ refers to an unknown number of coefficients.

$$\Delta \equiv [x' - [(x - \Sigma\eta) + y]$$

$\Delta \equiv$ Change by learning = x' (Product) - [(x- Ση) + y] (Process)

Table 1. The Formulated Illustration of Learning as a Process and a Product

Symbol	Equivalent	Variables
Δ	Change	Learning
x'	Learner processing the subject	Product
x	Learner's initial situation	Process
Ση	Hindrances and lack of affordances	
y	Instructional material/process	

In this illustration, the disorders in learning processes are symbolized with Ση, and they need to be identified elaborately. Drawing on the literature, for Ση; psychological barriers such as self-efficacy (SE), self-regulation (SRL) and motivation (MOT) are listed (Piniel & Csizér, 2013), while for facilitators, strategy

use in learning is denoted and emphasized (Oxford, 1990). The former includes various aspects of hindrances and congregates the variables as SE, SRL and MOT. All could be considered to refer more to the source of ethnocentrism (Cohen & Norst, 1989). Possible conditions that fit this profile include Anglophobia, or extreme anxiety due to cultural background. Psychological barriers (Ση) due to ethnocentric sources refer to ethnogenesis, whereas learning facilitators are eligible to make use of the phylogenetic features of the people. In this study, not only are the essential variables discussed and explained, but both obstacles and facilitators are also identified and considered as impact factors among the numerous variables. The fact remains that an eligible way of managing interventions could only be possible if the variables are congregated under themes. For instance, Vemuri, Ram and Kota (2013) listed the problematic areas in attitudinal problems for second language learning (SLL) as follows: Anglophobia, diffidence and shame, fear of syntax and vocabulary, sudden demand for speaking, the role of gender on the psyche, emotional interference, fear of failure, working short-term memory, and prejudice and biases. Contrary to the variety suggested by them, one of the prominent factors affecting acquisition was also mentioned by Krashen (1975; Bialystok, 1997), and that is the age of learners. Considering the differentiation of Krashen, in this study, the exact SLL process that occurs around college years is picked to eliminate the difference between second language acquisition (SLA) and SLL. To effectively address the various hindrances in Second Language Learning (SLL), the study applies the concept of cognitive thematization and focuses on the variables of Self-Regulated Learning (SRL), Self-Efficacy (SE), and Motivation (MOT). This is because these variables work together as a group and serve as comprehensive terms for many other variables (Piniel & Csizér, 2013). To be more precise, low or high SRL, SE and

MOT affect each other, and such variables as Anglophobia are the cause of the results of these cognitive actions that may function as a hindrance in learning processes. The symbolized item (Ση) refers to them as both hindrances and lack of facilitators in Table 1, bearing in mind the assumption that learning could be facilitated by supports and scaffolds. To this end, the most optimal individualized instructional design needs to include all items inasmuch as it aims to analyze and cover all learning processes.

1.2 Statement of the problem

Individual difference (ID) variables emerge as predictors of academic achievement in second language learning (SLL) and have been reported as contributors to language learning success (Dörnyei, 2005). As stated by Krashen (1981), Larsen and Vigil's (1945; reported in Pimsleur, Mosberg & Morrison, 1962) study indicates that low and high achievers in SLL could be distinguished by anxiety and self-confidence levels, and the presence of motivation is a powerful predictor of language learning as it sets low affective filter. Besides this, to be utilized as a learning facilitator, "learning strategies are steps taken by students to enhance their own learning" (Oxford, 1990, p.1). In a recent meta-analysis of 61 strategy instruction studies, Plonsky (2011) reported an overall effect of strategy instruction, indicating that strategy instruction can be beneficial to second language (L2) learners" (Mizumoto, 2013). Assuming that the optimal point of SLL is the combination of effective learning parameters and decreasing negative effects of hindrances, this study considers language learning as the process of utilizing the most important variables for learners. Even though the studies identifying individual variables (i.e., motivation, language aptitude, personality, anxiety) and academic achievement have

proliferated, the constellation of these factors on a systemic level has not been examined elaborately enough (Piniel & Csizér, 2013). There is a significant lack of research in the literature regarding the systemic interaction of both hindrances and facilitators in the learning process. This study, therefore, aims to take cognizance of the cognitive variables of English language learners (ELLs) by providing learners with prompts and scaffolds in accordance with their cognitive and affective needs in their vocabulary learning process. This study employs a custom-design online learning platform to investigate the impact of various instructional cues and supports. That is to say; design choices are determined to ensure that learners have access to the most efficient means, the best possible resources, and the most relevant assignments possible for their vocabulary learning in the target language.

1.3 Purpose and research questions

The purpose of this research study was to examine the impact of second language vocabulary learning tasks tailored to learners' cognitive needs by utilizing language learning strategies in an e-learning environment. The set of questions guiding the study are as below:

i. Is there any significant difference between the vocabulary accomplishment scores of groups doing tasks based on the novel method developed for this design and those following the conventional method?

ii. How do individualized vocabulary learning tasks influence the affective variables such as self-efficacy and self-regulated learning capacity of L2 learners with intermediate proficiency levels?

Within the context of custom vocabulary instruction on an e-learning platform, the research questions are formed aiming three steps. The first is to identify

the problems of targeted learning environment, the second is to examine the impact of the interventions applied during research, and the third is to reveal the optimal learning variables specific to the experimental group. The vocabulary learning strategies that were followed for the research stem from the prominent learning theories and second language learning literature.

1.4 Assumptions

This study is based on the assumption that learners have varying differences both in their cognitive levels and learning styles and that learning is a process for which the instructors may guide and intervene. In addition, another assumption is that learners' performance may be increased by analyzing them in various aspects in order to alleviate the negative elements in their learning processes and employ the learning facilitators effectively. In addition, not only the prompts but also designed tasks in compliance with learners' cognitive and affective needs may contribute to academic achievement. These were the key conceptual ideas that the driving question of the study anchored. Lastly, it needs to be emphasized that this design-based research study is not elemental but systemic. Therefore, it naturally assumes that, rather than decomposing components of learning processes as in elemental research, considering them as systemic and dynamic is thought to be a better alternative as "context and behavior cannot be factored out" (Nathan & Sawyer, 2014, p.29). All in all, rather than decomposing and analyzing elements in learning processes without any intervention, this study assumes that the theoretical underpinnings stated in the literature of learning theories may contribute to the design with a significant difference. To this end, prominent factors are analyzed and evaluated separately but intervened with a designed tool considering them all.

1.5 Constraints to the research process

The main limitation of this study is that it does not aim to delineate the overall picture of language learning processes but engages with only vocabulary learning skills. In addition, it does not refer to general patterns for language “acquisition” but language “learning” as the learners are at the age above 18 and enrolled as students in a higher education institute. Readers should bear in mind that the study is based on only some of the hindrances and facilitators in language learning and test the effectiveness of some interventions on these variables. Due to practical constraints, the research cannot provide an investigation of all factors affecting language learning processes but presents only a comprehensive view within the particular context of tailored vocabulary learning. The assumption is that constellation of SRL, MOT, and SE is the main point of variables under which other factors stated in the literature could be congregated. A full discussion of all hindrances and facilitators, therefore, lies beyond the scope of the study. A number of questions regarding the other variables or the option to choose different themes for language learning still remain to be addressed. The need for achieving overall educational goals in a tailored or non-tailored version has been addressed numerous times. However, the previous literature has some weaknesses since few projects have been carried out to reveal the effectiveness of methods of constellation of variables. In this study, the researcher discusses how constellation of variables for vocabulary learning could be utilized as a more effective design in vocabulary learning processes through a custom-design technological tool.

A critical question in the current study is whether the design was able to address the solution to the problem. In addition, the group of learners has mutual features as in their foreign language skills. This may lead other researchers to a more

systematic theoretical analysis that is required for different groups of learners with different variables. In this study, randomly selected research participants have mutual learner characteristics. Firstly, their academic achievement lies in the interval to implement the research; they are not high achievers. They are in close cognitive development stages due to being of the same age and academic level. Second, they have had a start in learning how to learn a foreign language but could not excel yet especially in vocabulary learning. In other words, the study's participants are intermediate language learners who lack knowledge of effective language learning strategies. Third, it could be argued that the group of students has a common approach and academic attitude toward English language instruction. This is evidenced by their similar performance in their foreign language courses and the absence of significant differences in their language learning motivation.

The study presents a challenge for the participants by evaluating their proficiency in passive vocabulary learning and receptive comprehension through examination. The research focus is on the capability of "memorizing" words within passages, which is rooted in the first cognitive level of the taxonomy. This approach was selected to ensure that all participants have reached this level and are suitable for the research. Therefore, the research focused on learners' passive vocabulary which refers to words learners understand but has not yet incorporated into their own speech. The opposite would be focusing on active vocabulary, which would include words that students not only understand but also employ when communicating orally or in writing. However, the scope of this investigation is limited to passive vocabulary due to practical constraints and the research goal.

1.6 Rationale and significance of the study

The rationale behind this study emerged from the desire to fill the gap in the practice of tailored foreign language learning, a scant research area despite being emphasized by many scholars. The variation among learners in a group may be thought of as both an advantage and a disadvantage. Differences are, however, taken for granted to be in advantage set as long as they are investigated, revealed and intervened by considering proper individualized learning processes tailored to each learner. Identification of these variables has so far been exclusively focused within the literature on elemental research. Sawyer (2014) distinguishes elemental approaches as it "focuses more on individual learning, and systemic approaches focus on groups and classrooms" (p. 23). Nathan and Alibali (2010) argue that to supplement the more elemental approach emphasized in cognitive science research, learning sciences combines systemic and elemental approaches to investigating questions about learning. However, no prior studies have examined it in systemic scale-up research. Therefore, it is most promising when systemic and elemental viewpoints are brought together.

The individualization process in the study was planned in three steps: identification, diagnosis, and intervention. Similar to the process in medical methodology, the research was carried out utilizing the designed tool in the identification of the learners' overall variables with quantitative data collection tools. Diagnosis is the evaluation step for the data gathered previously, and interventions are designed using design-based research (DBR) principles with the aim of increasing achievement. Therefore, the primary aim of this research is to critically examine the learners' ID variables and test the effectiveness of the interventions with a designed tool in order to propose a new conceptual framework regarding the

practice of tailoring in learning. The goal was to examine the effectiveness of the tool designed to help both the instructor and the learner. The study was conducted at a department in a public university in Turkey. Learners' proficiency levels were considered, and it is noteworthy to state that learners were expected to have around the same achievement levels due to their scores in the university entrance exam.

In light of the increasing number of foreign language learners, this study is important in that it suggests a comprehensive approach considering hindrances and facilitators in L2 vocabulary learning processes at once, and it provides a designed tool that may make it possible for a huge number of learners by the procedural steps it follows. The difficulty of examining hindrances and facilitators in learning processes for each learner may be encountered by most instructors. Therefore, this study endeavors to offer a practical solution to the implementation difficulties faced by many instructors in examining the hindrances and facilitators of each language learner's vocabulary learning process. This study also contributes to the literature as it tests the efficacy of tailored scaffolds in a digital learning environment using a custom-design application. It is important to recognize that the dynamics and parameters of online learning environments diverge from those of traditional face-to-face settings, where education has traditionally taken place. The theoretical foundations of the development of the digital learning environment guided the design decisions for the tool developed for this study, and the theories were applied in a novel way to successfully make the digital transformation from the conventional method to the modern one. As a result, this study may serve as a model for designing and implementing effective digital tools to enhance language learning outcomes in various educational contexts.

1.7 Key terms in the study and definitions

Anxiety	: An experience of general uneasiness, a sense of foreboding, a feeling of tension (Hansen, 1997, p. 91).
Einstellung	: Learners' transfer of their thinking skills to new subjects and problems (National Research Council, 2000).
Ethnogenesis	: Cultural history of human mentation (Killen & Langer, 1998, p.3).
Fossilization	: The long-term persistence of plateaus of non-target-like structures in the interlanguage of non-native speakers (Selinker, 1972; Selinker & Lakshmanan, 1992, p. 197)
Instructional Design	: Translating principles of learning and instruction into plans for instructional materials, activities, information, resources, and evaluation (Smith & Ragan, 1999, p.2).
Language	: A system of arbitrary vocal symbols by means of which a social group cooperates (Bloch & Trager, 1942, p.5).
Language Proficiency	: A person's skill in using a language for a specific purpose .... refer[ring] to the degree of skill with which a person can use a language, such as how well a person can read, write, speak, or understand

	language" (Richards et al., 1992, p. 204; Wilson, 2006, p.34).
Learning	: Foundation of the systemic, dynamic, and interactive relation between the nature of the learner and the object of the learning ecologically situated in a given time and place as well as over time (Alexander, Schallert & Reynold, 2009, p.186).
Learning Strategies	: Systematic plans that assist in the encoding of information and task performance to improve performance on the task at hand and generalize beyond the learning context (Pintrich, Cross, Kozma & McKeachie., 1986; Schunk, 1989).
Motivation	: What people desire, what they choose to do, and what they commit to do (Keller, 2010, p.3).
Ontogeny	: The biological origin and development of an individual, as opposed to a group or a species. Matsumoto (2009, p.348), i.e., the development of the individual during lifespan (Radford, 2010, p.109).
Phylogenesis	: The evolutionary development of any group of organisms (Matsumoto, 2009, p.387), i.e., the historical development of ideas and the mechanisms of their production (Radford, 2010, p.109).
Praxis	: Interaction between theory and praxis in Freire's conceptualization (Benade, 2016, p.6; Freire, 1998).

Scaffolding : Description of how children, with the help of someone more knowledgeable to share and support their problem-solving, can perform more complex tasks than they would otherwise be capable of performing on their own (Palincsar, 1998; Rogoff, 1990; Reiser& Tabak, 2014, p.44; Vygotsky, 1962).

Self-Efficacy : As a contributor to cognitive development and functioning, the beliefs of learners that are directly related to achievement in positive terms (Bandura, 1993)

CHAPTER 2

THEORETICAL FRAMEWORK

2.1 Affective variables in language learning processes

In second language learning (SLL) literature, there is a body of research on the variables affecting the learning processes. The problem with that is the existence of an enormous number of them. Despite the multitude of variables affecting second language learning processes, a selected few that have been deemed significant have been chosen for research feasibility. In this study, three variables (self-efficacy; SE, motivation; MOT and self-regulated learning; SRL) are used as umbrella terms for two reasons: (i) testing to understand how they act as a constellation, (ii) and they are the reference points for most cognitive processes that could be regarded as facilitator or hindrance. For instance, low SE may result in low MOT and/or high ANX, resulting in low achievement scores (Açikel, 2011).

2.1.1 Self-efficacy

Learners' psychological variables are as important as their prior learning experiences in the process of assimilation or accommodation since they may filter the subject to be learned. Among these filters, the current research explored and strategically intervened SE, SRL, and MOT variables. Bandura (1977), as the linchpin in the self-efficacy literature, suggests that self-efficacy is an essential part of learners' cognitive variables in enhancing people's willingness to strive for the expected outcome. The expected outcome is the desired academic achievement, and the widely accepted key assumption to achieve this is learners' self-regulatory behaviors in which self-efficacy beliefs play an essential role (Zimmerman, Bonner & Kovach,

1996; Mizumoto, 2013). As cited by Akkoyunlu, Orhan and Umar (2005), Bandura (1994) lists the pros of high SE among learners as dedication, achievement, and being less fragile for losses. On the contrary, low SE gives rise to avoiding behavior, and learners may give up the tasks before attaining the expected outcome. Learners, in practice, need to take control over their learning processes, and low self-efficacy levels may give rise to low-achieving learners.

In the book "Self-Efficacy Theory" by Brown, Malouff, and Schutte (2013), it is stated that behaviors that support beliefs may be repeated based on prior experiences if the attempts are successful. The authors highlight four essential variables that impact this outcome, including somatic/emotional state, vicarious experience, verbal persuasion, and mastery experience. Each successful learning attempt may result in an increase in motivation and self-efficacy as well as lower anxiety towards the subject.

By short definitions, mastery experiences are our prior knowledge about the result of past attempts, verbal persuasion is the support for the performances as (e.g., basketball) coaches do, vicarious experience is the observation of others' successes and failures, and somatic/emotional state is physical and emotional well-being that may be affected by such variables as stress, anxiety, worry, and fear.

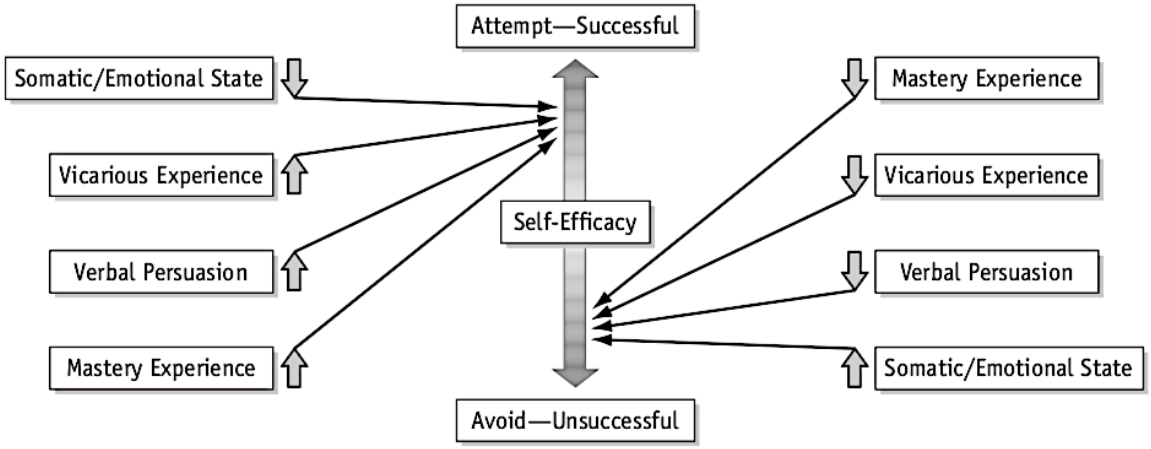


Figure 1. Variables affecting self-efficacy
Source: Brown, Malouff & Schutte, 2013, p.22

Mastery learning is, in this frame, as important as prior knowledge regarding the learning subject, as it also results in new metacognitive knowledge of a learner about himself/herself (Flavell, 1979). Verbal persuasion and vicarious experience play an important role during learning processes and obviously refer to Vygotsky's social learning theory in that learners' ethnogenesis is strengthened by the input they take during learning. Lastly, the somatic/emotional state addresses the negative feelings, and it may be a hindrance for the learner to be affected by them. As for the control over these variables, cognitive prompts such as providing encouragement, positive evaluative feedback, and prompting adapting attributions about the loss may be used as interventions so that mastery experiences shape the next attempt in a positive way. Schunk (1989) supports this view by emphasizing the importance of self-perceived capabilities to control over important aspects of people's lives.

In practice, learners may be prompted to think about something they did well, their successful attempts, the praises they received, the confidence shown by others to themselves, and overcoming unsuccessful attempts by working hard to increase their self-efficacy towards the desired goal. There is a body of research assuming the importance of SE, and it is stated by Karimi, Abdullahi and Hadhighi (2016) that

beliefs play a more important role than even knowledge in achievement. However, there are different explanations for the same topic. For instance, Brown et al.'s (2013) theoretical explanations are different from Schunk's (1989) in that they take aptitudes that occur out of experiences. In return, Schunk's (1989) suggestions to increase self-efficacy emphasize goal setting as one more step for practical implications, and that is claimed to have a key role in task engagement that help learners attain and evaluate their progress. The other task engagement variables, according to him, are social comparative information, attributional and performance feedback, strategy instruction, cognitive processing, and reward contingencies. These are general theoretical explanations for self-efficacy. Mitumozo (2013) specifies the links between self-efficacy in applied linguistics as motivation, learning strategies, academic achievement and learners' autonomy, and "two strategy instruction studies have provided evidence to support this line of argument by showing that strategy instruction can enhance self-efficacy" (p.257; Graham, 2006; Graham & Macaro, 2008). This supports Bai and Guo's (2018) research which sheds light on the dimensions of strategy use and self-efficacy correlation. The model of reverse engineering may be a fruitful way of understanding the factors in SLL achievement. The reverse engineering model refers to decomposing the factors of high achievers in learning and applying them in pedagogic practice for the masses, assuming that the road to the finish line that the winners follow is the shortest.

As quoted by Bai and Guo (2018, p.1), self-efficacy is considered one of the strong predictors of using self-regulated learning (SRL) strategies (Bruning, Dempsey, Kauffman, Mckin & Zumbrunn, 2013; Magogwe & Oliver, 2007; Pajares, 2003; Schunk & Zimmerman, 2007; Yusoff, 2012). Prior to the application of reverse engineering, the self-regulated learning (SRL) strategies outlined by Oxford

(1990) are identified for this study, with the aim of establishing an achievement pattern among learners possessing SRL capabilities. As for cognitive prompts, they are planned to be embedded in the design, since they are also critical in increasing learners' SE beliefs.

2.1.2 Motivation and self-regulation

Popper (1979) proposed a pluralist view of the universe dividing it into three: world 1 consists of physical elements like our bodies, world 2 is a mental and psychological world, and world 3 refers to the products of the human mind. In this frame, world 2 provides the bridge between the physical elements as people and their products. The bridge is the mental and psychological world. As delineated in this exemplification, motivation should be regarded as the world 2 item that enhances learners' mental production, which may be deemed learning. Motivation, by definition, "refers broadly to what people desire, what they choose to do, and what they commit to do" (Keller, 2010, p.3), and a large number of studies in the broader literature have examined the positive relation between motivation and academic success. In light of the pertinent literature, it seems critical to address the question of how motivation could be increased, as it is a promising line of research for the topic. Prior to designing interventions, based upon this, the construct of motivation is to be defined elaborately.

The key tenets in Gardner's (1985) social psychology model are that there are two orientations that influence learners' motivation to learn a language: integrative and instrumental. The former refers to attitudes to learning languages, and the latter to learners' pragmatic view of language learning. The important point is that they both are influenced by social relations. Another model is by Dörnyei (1994), which

builds on Gardner’s model. This model consists of three levels regarding motivation and language learning: language level, learner level, and learning situation level (Courtney, 2017). In other words, desirability, need for achievement, and factors related to elements in the learning environment. From both models, it could be concluded that the identification of the function of motivation in learning processes is based on various factors under different subheads. The current research combines them and makes a list of these as personal and environmental factors. Personal factors may both be about the learners’ personality issues and emerge from the nature of the learning subject, whereas there are numerous environmental factors such as the material, instructor, prior learning experiences and so on. According to Keller's (1979) systematic analysis, both personal and environmental factors contribute to motivation. Personal factors include attention, relevance, confidence, and satisfaction (ARCS). The learner's abilities, knowledge, and skills also shape their interaction with the subject. Environmental factors, on the other hand, include considerations for motivational design, learning management, performance, and consequences, which serve as motivators. In essence, the focus of learning management is on performance and the consequences serve as the initial motivators. Note that this circle is to continue inasmuch as learners are satisfied with the learning as a process and a product. Assumptions are the foci of this circle, and they are what need to be managed when implementing motivational design as an aspect of instructional design.

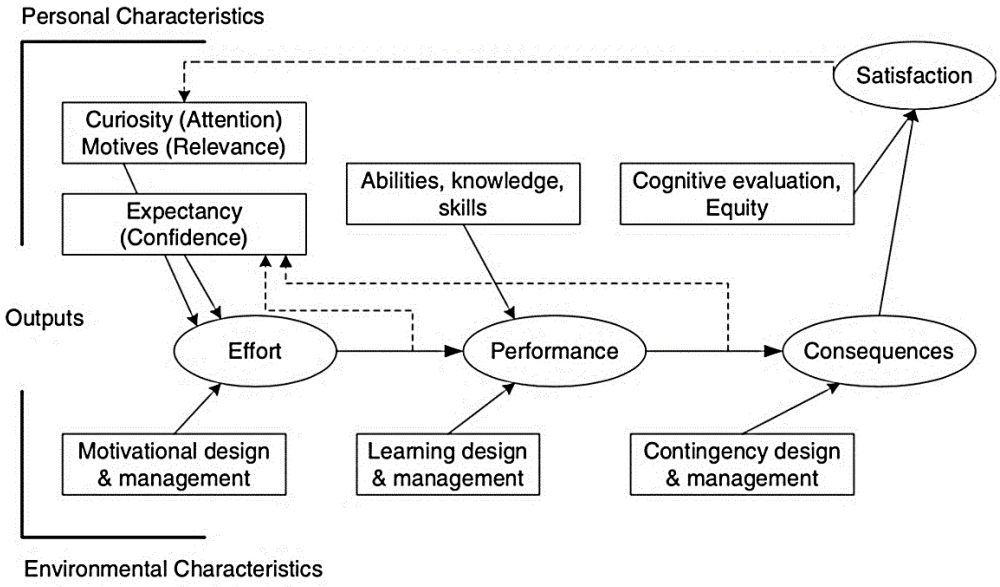


Figure 2. Keller's macro model of motivation and performance
Source: Adapted from Keller, 1979, 1983b; Keller, 2010, p.6

According to Keller (2010), there are four types of motivational design models: person-centered, environmentally centered, interaction-centered, and lastly omnibus models. Omnibus models are "complete solutions to given instructional goals", and providing a body of knowledge to be contextualized by learners may be most effective with this hybrid model (Keller, 2010, p.34). The ultimate objective is to bring about a change in an individual, with changes in the environment and interaction utilized as means to achieve this end. The problems that occur in this process can be listed as identification problems, Yerkes-Dodson law (1908), and implementation problems. Identification is an issue due to the difficulty in measuring all elements influencing motivation. This is to be kept under observation and supervision with data collection tools. Yerkes-Dodson problem, or in other words, the inverted U-curve problem, assumes the existence of an optimal level for an independent variable.

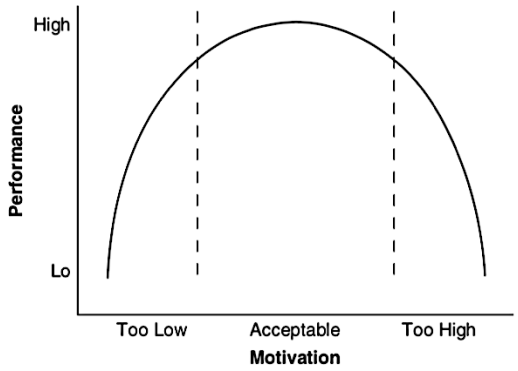


Figure 3. Curvilinear relationship between motivation and performance
Source: Keller, 2010, p.36

The only way to understand if this problem has occurred is the evaluation of the design among interventions. Lastly, the implementation problem is another critical point to take into consideration, since the data collection tools may be insufficient for the analysis and implementation of the design may not apply due to this factor.

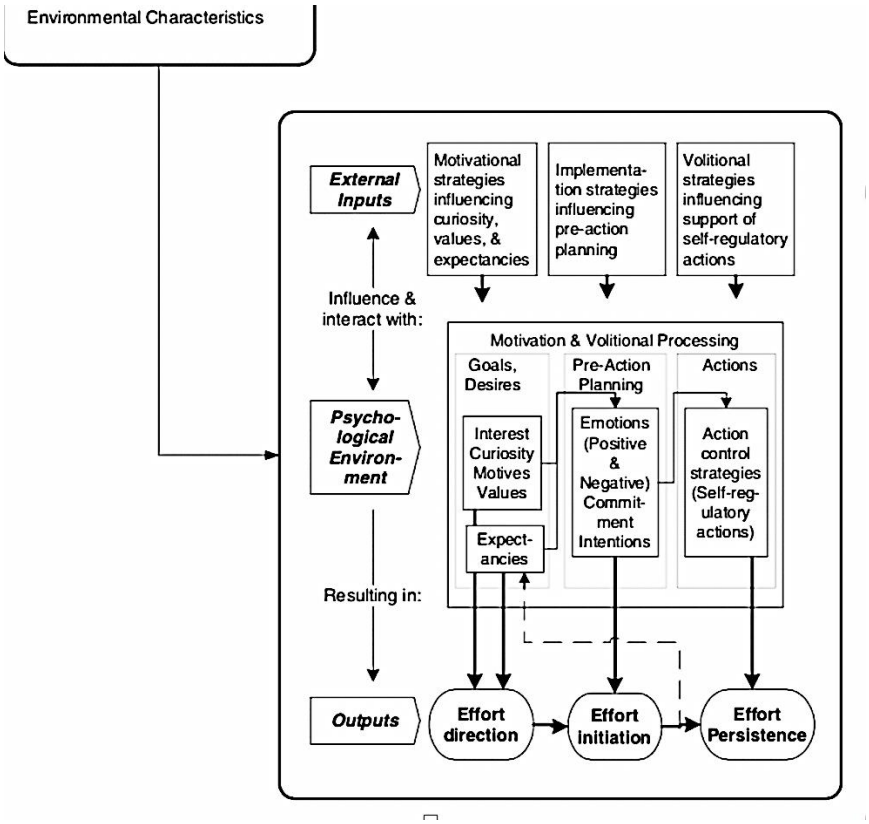


Figure 4. Modification of Keller's macro model to include commitment and volition
Source: Adapted from Keller, 2010, p.10

Environmental characteristics of the process are indicated with all the considerations by Keller (2010, p. 10), and three types of strategies are embedded in the figure: motivational, volitional and implementational. The environment to be designed for increasing motivation consists of psychological elements, and the impact of their manipulation could be measured by interaction analysis along with the quantitative data. An important issue for testing cognition is encountered in this process. The scores for measuring motivation are collected both from learners' overall motivation toward the activity and the material. In this study, motivation was measured in early phases prior to the intervention as well as among interventions so that iteration cycles could be better analyzed and easily upgraded. It is due to the fact that learners' motivational factors for the motivational material function as a mediator between the learner and the subject. The distinction between learners' motivation for the subject and the material is thought to be in need of being analyzed differently. Rheinberg, Vollmeyer and Rollett (2000) conceptualized the interconnectedness between motivation and outcome by framing the process and defining its components with broader vantage points compared to the literature. The process, in their explanation, is impacted by mediators and influenced by variations of the components, and this type of outcome and viewpoint of motivation must be elaborated in its own terms. The individuals who initiate the process are considered antecedents, and the situation and level of initial motivation may vary throughout the processing between different components and mediators. The ultimate point, outcome and consequences differ in their aspects, and the former refers to on-the-spot actions while the latter is authentic usage of the task/learning unit. In Rheinberg's model, there are three expectancy chains: (i) subject to outcome (s→o), (ii) action to outcome (a→o), and (iii) outcome

to consequences (o→c). The current design process in this research aimed to measure and analyze both subject-to-outcome (s→o) and action-to-outcome (a→o). Outcome to consequences (o→c) fell beyond the scope of the study. The illustration provided by Rheinberg et al. (2000) of motivation and outcome aligns with the relevance of motivation in this study, as it proposes that the "action to outcome expectation" should be executed.

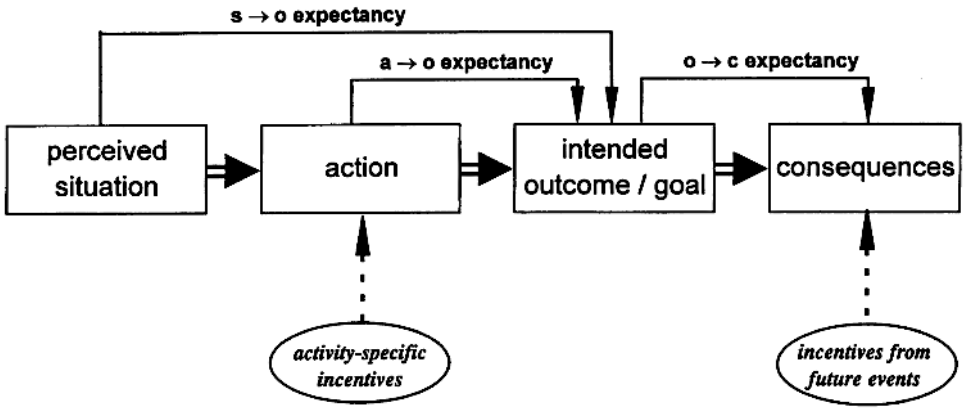


Figure 5. Two kinds of incentives in the expanded model
Source: Rheinberg, 1989; Rheinberg et al., 2000

As per the figure presented by Rheinberg et al. (2000), it is believed that a well-planned and structured intervention will serve as a motivation for learners to reach their desired outcome, by providing a specific incentive tied to the action being taken. Given that the researcher must assume the cores of each component, the motivation triggers need to be defined well. Rheinberg (1989) coined the term Reference Norm Orientation for a better grasp of it in which reference norms as differentiated into two; social and individual. As for incentives, distinguished types of incentives refer to (i) action outcome and (ii) activity outcome. During the action period, Bernaus and Gardner (2008) suggest instructors use diversified strategies in class that may motivate learners to decrease anxiety and improve motivation and

language proficiency. Therefore, as mentioned above, the dynamic interaction between the variables is to be intervened by such changes as materials, activities etc., in a learning environment.

Matthews et al. (2000) framed the interconnectedness of the relation between personality and self-regulation under three subcategories that they defined as research areas in their study: (i) reactions to life stressors, (ii) performance and demanding tasks, and (iii) aggressive behavior. According to them, self-regulation as a cognitive architecture requires the contribution of four processes: cognitive stress processes, knowledge structure, outcome variables and traits. To unpack this claim, in their article, self-regulation, personality, and adaptation of personal, or in other words, idiosyncratic features, are indicated in a correlational context. This approach may have led to an explanation of selves as ideal and possible/future ones, which guides the reader to conclude self-discrepancies on the basis of time. As for other aspects of selves in adaptation to environmental context, Matthews et al. (2000) regarded cognition as an adaptable framework with the help of self-knowledge. Matthews et al. (2000) have separated the terms and tried to explain the relationships between them using correlations. Terms like "self-knowledge," "metaworry," "avoidance," "disengagement," "task focus," etc., are used to build a better understanding of "self-regulation". Diagnosing each term, Matthew et al. (2000) concluded such statements as worry may disrupt attention in self-referent processing, and protracted rumination and self-evaluation may be deleterious to performance. Other indexes mostly resemble each other in correlational deductions. They, however, may be confusing as well (for instance, trait anger is correlated with emotion focus and metamemory but not self-efficacy or mental disengagement), providing the reader with a new insight into understanding hindrances in their

learning processes. Aside from that, they highlight some practical implications, such as the importance of detecting disruptive disorders early so that they can be prevented. All in all, as cited by Matthew et al. (2000), Kendall states (1993), “cognitive distortions refer to dysfunctional or biased thinking”, and all paradigms stated in the article present a powerful heuristic for exploring the cognitive underpinnings.

In the article "Self-Regulation in Learning" by Winne (2017), the author highlights the importance of inputs in the learning process and categorizes them as knowledge, information, and experience. He asserts that the information may be considered as potential knowledge and presents his ideas on SLR based on several principles and key points to comprehend the multifaceted nature of learning. These key points are knowledge and cognition. The former is claimed to have a key role in learning. Knowledge has two types in his terms: declarative and procedural. Declarative format of knowledge, in other saying, representing knowledge, includes statements of likes and dislikes, definitions, elaborations, analogies, metaphors, explanations, judgments, and organizing frameworks as schemas and outlines, while procedural knowledge represents knowledge accomplishing tasks and if-then-else algorithms to follow. According to him, procedural knowledge may be one of those; applying grammatical rules to punctuate, factoring an algebraic expression and reading between the lines of a text. Declarative knowledge, he argues, has two effects: it activates a) working memory and b) other knowledge. Winne mentions cognition and metacognition and suggests learning science ought to understand the link between them. Cognition has some primitive operations such as searching, monitoring, assembling, rehearsing, translating, and metacognition may foster learning by transferring knowledge. Winnie, in his saying on self-regulation, asserts

learners self-regulate even when they decide not to self-regulate, and the self-regulation of learners may be modeled. What is also interesting about his article is the set of examples he uses to show how important SRL is. One example shows that a learner who has seven days to take notes uses working memory better and gets the main point of lectures better. The other example asks the question of restudying, which comes from experiments with clues about what to restudy at different levels of difficulty. In addition, measuring cognitive monitoring models as relative accuracy and calibration provides a means to comprehend the self-efficacy levels of students and their confidence in predicting test outcomes. In his work, Zimmerman (2000) classified self-regulation processes as behavioral, environmental, and covert, and he emphasizes the triadic relationship of person, environment, and behavior in SRL processes. According to him, behavioral self-regulation refers to self-observing in adjusting performance processes, while environmental self-regulation means adjusting environmental conditions, and covert SR involves monitoring and adjusting cognitive and affective states. He claims this triadic relation emerges as a loop and has cyclical phases such as performance or volitional control, forethought and self-regulation. He has structured self-regulation from a cognitive perspective avoiding disregarding environmental links as well. In the forethought phase, he categorizes task analysis and self-motivational beliefs, under which there are some other steps. Task analysis, for instance, includes goal setting and strategic planning, each of which has different aspects and strategies. The other important point for this phase is self-motivation beliefs that mark the cognitive states as self-efficacy. The second phase is volitional control which requires self-control and self-observation skills. For him, after setting a goal and planning the strategy, what else is to be managed in the process of self-learning is the volition using strategies such as self-instruction,

imagery, attention focusing etc., self-control and self-feedback, and performance feedback etc. for self-observation. The last important step is self-reflection, which requires self-evaluation skills of which criteria are mastery and previous performances.

2.2 Cognitive variables in learning processes: learning strategies

Wilson and Myers (2000) state that "Knowledge is not an object and memory is not a location. Instead, knowing, learning, and cognition are social constructions expressed in the actions of people interacting within communities. Through these actions, cognition is enacted or unfolded or constructed; without the action, there is no knowing, no cognition" (p. 59). Based on this idea, the design of the learning environment is considered from multiple perspectives with the aim of embedding the proper action for better cognitive construction. In the history of learning theories, there seem to be three prominent instruments to review: behaviorism, information processing theory and situated cognition (SitCog), and each has its own dynamics and characteristics that are indicated in table 2. By considering multiple perspectives in the design of the learning environment, the aim is to create a comprehensive approach to learning that supports better cognitive development and fosters more effective learning outcomes.

Table 2 outlines various theories of learning that hold differing perspectives on what is crucial in the learning process. Each of these theories has different philosophical underpinnings and should be taken into account when creating a learning environment. It is advantageous to utilize elements from multiple theories, rather than adhering solely to a single, outdated view of the learning process.

Additionally, it is important to keep in mind that these theories are constantly evolving, and new insights may emerge in the future.

Table 2. Priorities as Facilitators in Learning Theories

Behaviorist Insights for Design of Learning Environments (LE)	Information-Processing Principles Relating to the Design of Learning Environments	SitCog Principles Relating to Learning Environments
Learn by doing	Stages of information processing	Learning in context
Taxonomies	Task modelling	Communities of practice
Conditions of learning	Attention	Learning as active participation
Behavioral Objectives	Selective perception	Knowledge in action
Focus on Results	Memory load	Mediation of artefacts
Alignment	Kinds of Knowledge	Tools, artefacts as cultural repositories
Task Decomposition	Skill compilation	Rules, norms and beliefs
Prerequisites	Meaningful encoding	History
Small Successes	Metacognition	Levels of Scale
Response-sensitive feedback	Motivation	Interactionism
Science of Instruction	Experts vs novices	Identities and construction of self
Performance Support	Human development	
Direct Instruction	Conceptual Change	
Pretesting, diagnostics, and placement		
Transfer		

Source: Adapted from Wilson and Myers, 2000, p.62 for Behaviorist, p.64 for Information Processing Theory, and p. 74 for Sitcog Principles

The aim of utilizing facilitators in learning processes also leads to strategy use resulting in a significant difference between learner groups with high and low strategy users. Language learning strategies' influence on learning strategies is identified by Oxford (1990), and there are two types of them: direct and indirect. The

set of direct strategies includes key assumptions related to memory, cognition, and linguistic compensation. For instance, an association between memory, reasoning in cognition and making intelligent guesses in the compensation strategy group form the structure of direct strategies. The utilization of indirect strategies in learning is exemplified by self-evaluation, which is a form of metacognition. As a demonstration of social strategies, promoting positive attitudes and collaboration among groups of learners can also be considered. Prior to bringing strategies into action in SLL processes, it may be better if their listed features are analyzed elaborately.

Table 3. Features of Language Learning Strategies

Language learning strategies
• Contribute to the main goal, communicative competence. • Allow learners to become more self-directed. • Expand the role of teachers. • Are problem oriented. • Are specific actions taken by the learner. • Involve many aspects of the learner, not just the cognitive. • Support learning both directly and indirectly. • Are not always observable. • Are often conscious • Can be taught. • Are flexible. • Are influenced by a variety of factors.

Source: Oxford, 1990, p.9

Features of language learning strategies such as being conscious, teachable and flexible are useful considerations for LE design. However, it should be noteworthy to state that testing their existence may be challenging due to the cognitive roots they have. Black may mean not enough white in observing and evaluating the strategies. Strategy Inventory for Language Learning (SILL), developed by Oxford (1990), is a tool that helps researchers identify learners' level

of strategy use and was used in the current study as well. She also suggests that direct and indirect strategies are all related, as illustrated in the figure below:

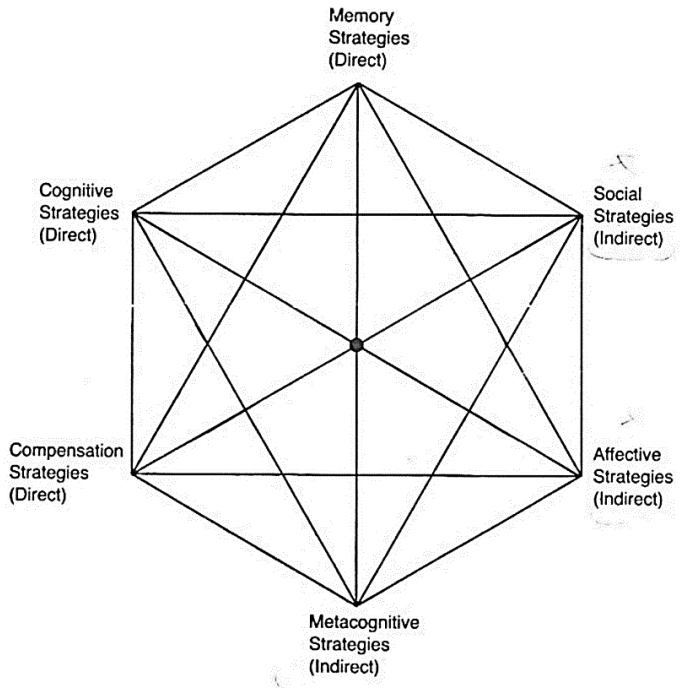


Figure 6. Interrelationships between direct and indirect strategies
Source: Oxford, 1990, p.15

All in all, it is important to state that learners' strategy use is critical in that they are to be controlled properly, and the data provided represents the truth. Therefore, there are important steps to take into consideration: validity, data collection, proper intervention, and evaluation of all these steps. In this research, a literature review was conducted to establish the validity of the factors considered, a thorough plan for data collection and analysis was developed, and the interventions were determined by experts in the field.

2.2.1 Strategy inventory for language learning

2.2.1.1 Direct strategies

Strategies that refer to language learning processes are distinguished as direct and indirect, considering their observable or unobservable factors having an influence on the learning process. Direct strategies in this framework are listed by Oxford (1990) as mnemonics, cognitive strategies and compensation strategies. The mutual feature of direct strategies is that they all require mental processing of the target language. However, the ones listed under direct strategies in language learning have specific processing steps and are there for different purposes. For instance, memory strategies that were also named mnemonics, enable learners to store the necessary vocabulary and remember it; cognitive strategies are the base of reasoning and help learners to grasp the points mentioned in the subject; compensation, on the other hand, allows learners to guess and find another route for the same target. This could occur in many ways: a learner, for example, is supposed to have less speaking anxiety when encountered with questions if (s)he actively uses compensation strategies. In the table below, all direct strategies, strategy groups and sets with specific strategies are highlighted.

According to Oxford (1990), direct strategies refer to specific actions that learners take to process and retain information. These strategies are divided into three main categories: memory strategies, cognitive strategies, and compensation strategies. Memory strategies focus on improving the learners' ability to retain information through repetition, organization, and summarization. Cognitive strategies are designed to enhance the learners' comprehension of the information, such as elaboration, rehearsal, and mental imagery. Lastly, compensation strategies aim to overcome any learning difficulties or limitations, such as using mnemonic

devices or asking for help. Overall, direct strategies are critical for improving learning outcomes by directly affecting the way learners process and retain information.

Table 4. Strategies, Strategy Groups and Strategy Sets of Direct Strategies

Type	Strategy Group	Strategy Set	Strategy
DIRECT STRATEGIES	Memory Strategies	Creating Mental Linkages	Grouping
			Associating/elaborating
			Placing new words into a context
		Applying images and sounds	Using imagery
			Semantic mapping
			Using keywords
			Representing sounds in memory
		Reviewing Well	Structured reviewing
		Employing Action	Using physical response or sensation
			Using Mechanical techniques
	Cognitive Strategies	Practicing	Repeating
			Formally practicing with sounds and writing systems
			Recognizing and using formulas and patterns
			Recombining
			Practicing naturalistically
		Receiving and sending messages	Getting the idea quickly
			Using resources for receiving and sending messages
		Analyzing and reasoning	Reasoning deductively
			Analyzing expressions
			Analyzing contrastively(across languages)
			Translating
			Transferring
		Creating structure for input and output	Taking Notes
			Summarizing
			Highlighting
	Compensation Strategies	Guessing intelligently	Using linguistic clues
			Using other clues
		Overcoming limitations in speaking and writing	Switching to the mother tongue
			Getting help
			Using mime or gesture
			Avoiding communication partially or totally
			Selecting the topic
			Adjusting or approximating the message
			Coining words
			Using a circumlocution or synonym

Source: Adapted from Oxford, 1990.

2.1.1.1.1 Mnemonics strategies

Tezgiden's (2006) study starts with a quote from Wilkins (1972, p. 111) stating that "Without grammar very little can be conveyed, without vocabulary *nothing* can be conveyed" (p. 1). In language learning, it is noteworthy to grab the specific importance of vocabulary, not even by comparing it to learning syntactic structures. It can be easily concluded that knowledge about the target language vocabulary is a power for the learner both in that it can decrease the learners' speaking anxiety and it lies in the capacity to make associations to be able to store. The point to be

considered in learning target language vocabulary may be avoiding a high working memory load that may impede learning (Sweller, 1988). Additionally, Koedinger and Corbet (2006) listed instructional design principles in cognitive tutors, placing the consideration in question as the fifth item on their list (p. 67):

i. Represent student competence as a production set
ii. Provide instruction in a problem-solving context
iii. Communicate the goal structure underlying the problem solving
iv. Promote a correct and general understanding of the problem-solving knowledge
v. Minimize working memory load that is extraneous to learning
vi. Provide immediate feedback on errors relative to the model of desired performance

As for the question of how to minimize working memory load, Oxford (1990) proposes four methods with ten corresponding strategies.

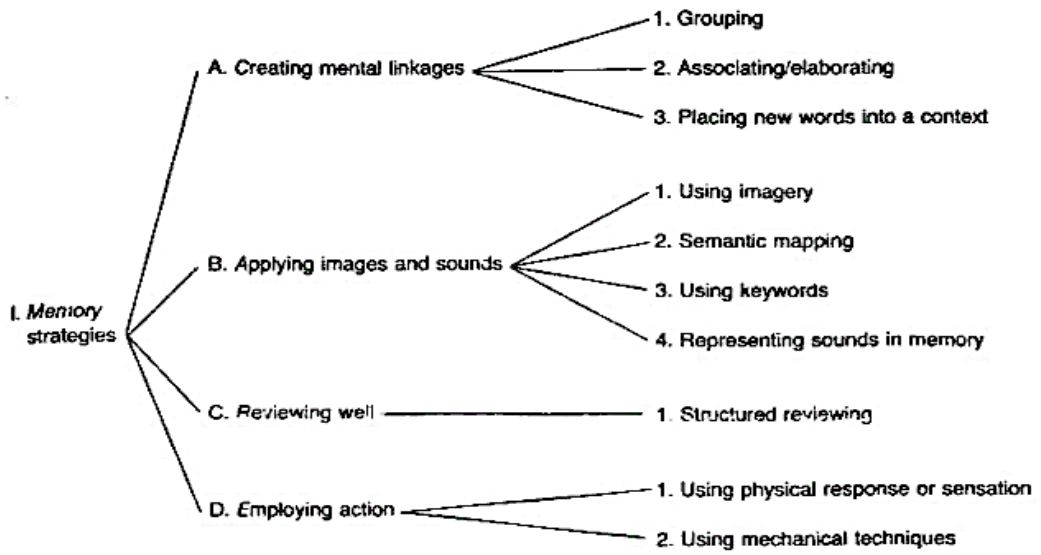


Figure 7. Diagram of the memory strategies
Source: Oxford, 1990, p.39

According to her, mental linkages are to be created by grouping, associating/elaborating and placing new words into a context; images and sounds are to be applied by using imagery, semantic mapping, using keywords, and representing sounds in memory; structured reviewing is to be utilized for reviewing well; and lastly, action needs to be employed using physical response/sensation and mechanical techniques. All suggestions by her are detailed in her book, and they correspond to the findings in strategy use in language learning literature.

2.2.1.1.2 Cognitive strategies

Cognitive strategies play a crucial role in language learning as they are the tools used by learners to process and retain new information. These strategies are an integral part of the learning process, as they help learners to make sense of the material and retain it in long-term memory. By using cognitive strategies, learners are able to construct their own knowledge, build upon their prior knowledge, and become more autonomous in their learning process. Thus, the development of effective cognitive strategies is essential for success in language learning.

Four sets of cognitive strategies are defined by Oxford (1990) For practicing, repetition, sound practice, use of routine formulas, combining phrases for generative purposes, and experiencing in natural, realistic settings are listed as implications. Skimming is also recommended as a good way to get ideas quickly. Providing learners with a variety of tools or materials is also seen as a way to make message reception and transmission easier. As for analyzing and reasoning sets, it is suggested that learners can learn with such strategies as “using general rules and applying them to new target language situations” (p. 46).

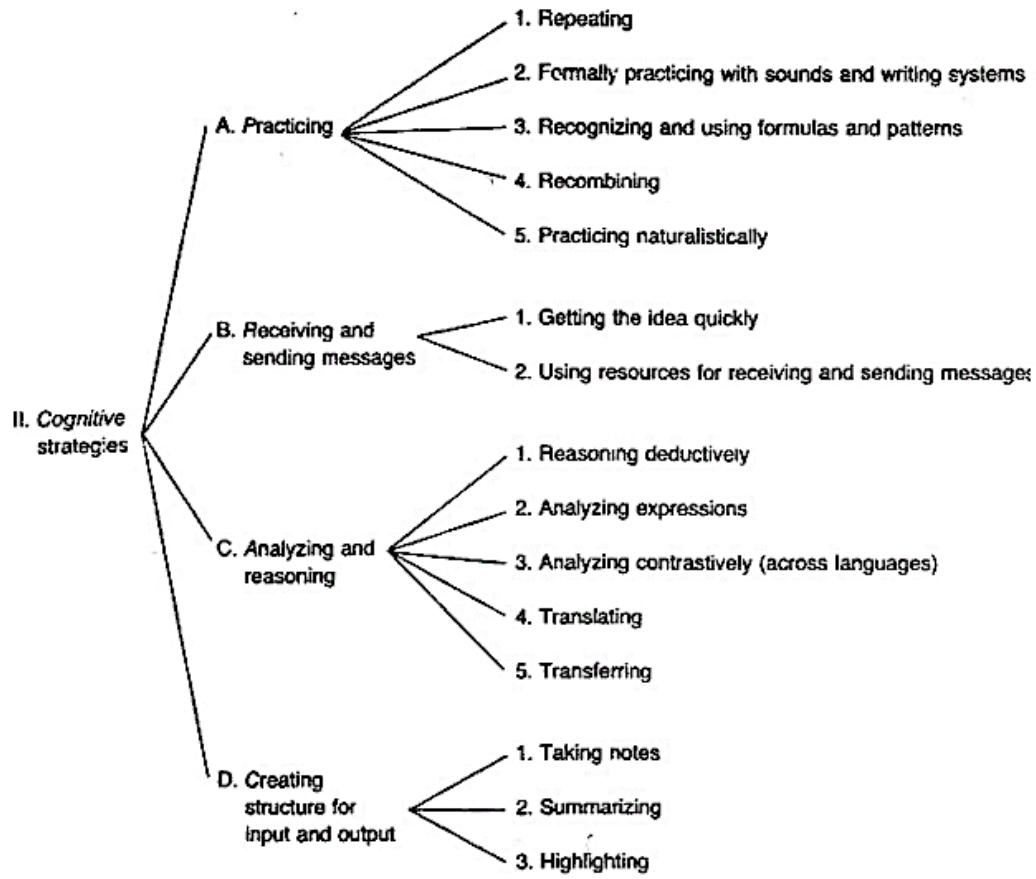


Figure 8. Diagram of the cognitive strategies
Source: Oxford, 1990, p.44

Other suggestions to learners for their cognitive strategy use include decomposing meaning by breaking the expression into parts, comparing elements of the target language and L1 transfer. Comparing linguistic structures, concepts and words to learners' L1 may also be helpful. Lastly, in order to create a structure for input and output, notetaking, summarizing and highlighting are among the suggested activities. Therefore, by utilizing these cognitive strategies, language learners can enhance their ability to understand, analyze and use the target language more effectively, ultimately leading to improved language proficiency.

2.2.1.1.3 Compensation strategies

As stated by Oxford (1990), compensation strategies enable learners to understand the target language for comprehension and production, and there are ten strategies clustered into two sets: guessing intelligently and overcoming limitations. The former, also called inferencing, refers to the use of clues to guess the meaning, and the latter involves a variety of strategies such as code-switching to L1, getting help, using mimes and gestures, avoiding communication partially or totally, selecting the topic, adjusting or approximating the message, coining words, and using a circumlocution or synonym. The figure stated below includes all strategies and sets under compensation strategies.

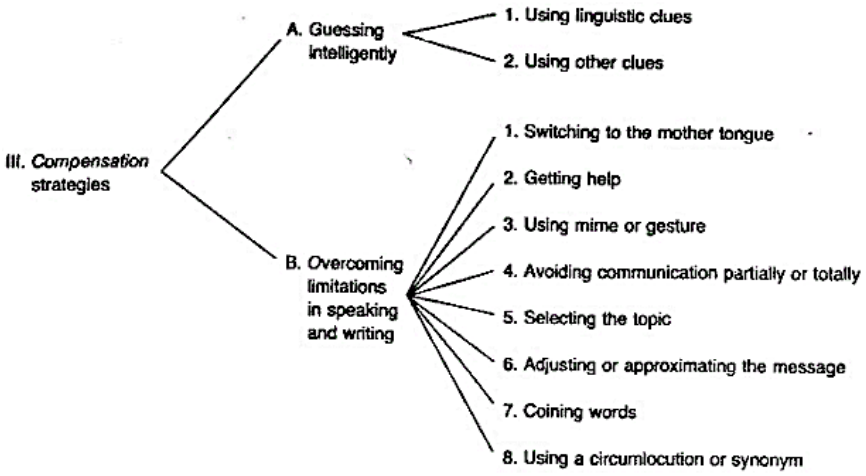


Figure 9. Diagram of the compensation strategies
Source: Oxford, 1990, p.48

Individuals who consistently perform well often unconsciously utilize compensation strategies. For example, an individual learning English may exclusively utilize the term "past" when referring to the time, instead of "to," due to a lack of familiarity or difficulty in recalling the correct usage. This can be observed in the expression of 10:55 AM, where a proficient speaker may say "five to eleven," while the learner, as

a result of limited knowledge, may choose to say "fifty-five past ten." That is another way of expressing the same truth with less cognitive processing for the learner in case the learner focuses solely on using “past” due to more practice with it. Such linguistic production might be encountered among ELLs even though there is a more useful way. This would be due to the need to exert less effort in learning processes, and compensation strategies are good examples of them.

2.2.1.2. Indirect strategies

According to Oxford (1990), indirect strategies can be used for coordinating, organizing, regulating, and optimizing learning processes. These strategies allow learners to “control their own cognition” (p.134). Metacognition, as an indirect strategy, is often utilized less frequently due to its demanding cognitive demands. In contrast, affective strategies aim to regulate the “emotions, motivations, and attitudes” of learners, while social strategies focus on promoting interaction and cooperation among learners (Oxford, 1990, p.134). Indirect strategies are considered indirect as they complement direct strategies. It is important to understand that both direct and indirect strategies are equally valuable in promoting effective learning. Indirect strategies support learners in regulating and optimizing their learning experiences, while direct strategies allow learners to actively engage with the material. The proper integration of both types of strategies can lead to an enhanced learning experience and improved outcomes. Furthermore, the use of metacognition, affective, and social strategies can foster a deeper understanding of the learning process, and help learners become more self-regulated and independent learners.

Table 5. Strategies, Strategy Groups and Strategy Sets of Indirect Strategies

Type	Strategy Group	Strategy Set	Strategy
INDIRECT STRATEGIES	Metacognitive Strategies	Centering your learning	Overviewing and linking with already known material
			Paying attention
			Delaying speech production to focus on listening
		Arranging and planning your learning	Finding out about language learning
			Organizing
			Setting goals and objectives
			Identifying the purpose of a language task (purposeful listening/reading/speaking/writing)
			Planning for a language task
			Seeking practice opportunities
		Evaluating your learning	Self-Monitoring
			Self-Evaluating
	Affective Strategies	Lowering your anxiety	Using progressive realxation, deep breathing, or meditation
			Using music
			Using laughter
		Encouraging yourself	Making positive statements
			Taking risks wisely
			Rewarding Yourself
		Taking your emotional temperature	Listening to your body
			Using a checklist
			Writing a language learning diary
			Discussing your feelings with someone else
	Social Strategies	Asking Questions	Asking for clarification or verification
			Asking for correction
		Cooperating with others	Cooperating with peers
			Cooperating with proficient users of the new language
		Empathizing with others	Developing cultural understanding
			Becoming aware of others' thoughts and feelings

Source: Adapted from Oxford, 1990

Three sets of metacognitive strategies involve planning, monitoring and evaluating steps by the learner, and such tasks directing learners to question their learning process are required to utilize these sets effectively. Affective strategies, associated with the Popper's (1979) article titled "Three Worlds", which explains the importance of world 2 (learners' psychological and mental attitude), are responsible for controlling emotions, whereas social strategies encourage cooperation and interaction among learners by asking questions and empathizing with others. The cultural factors may apply more to social and affective strategies than to metacognition.

In short, metacognitive, affective, and social strategies play an important role in language learning, as they help learners plan, monitor, evaluate their learning process, control emotions, cooperate, and interact with others. The influence of cultural factors is also notable in social and affective strategies.

2.2.1.2.1 Metacognitive strategies

Among language learning strategies, three prominent models are mentioned in Chamot's (2004) article: Styles and Strategies-Based Instruction (SSBI) (Cohen, 1998), Cognitive Academic Language Learning Approach (CALLA) (Chamot, 2005; Chamot et al., 1999), and model by Greenfell & Harris (1999). In the SSBI model, teachers are expected to share their learning processes so that learners think about their learning more. CALLA model aims to embed self-evaluation in learning strategies, whatever it is, and Greenfell & Harris's (1999) model proposes that goals set by students are to be carried out with a plan set by students as well as students' cooperation with the teacher for the evaluation of the strategy. Such methods as CALLA and others have been utilized to improve reading skills with metacognitive strategy models (Takallou, 2014). Yet, beyond these models, as an example of interventions, Razı and Cubukcu (2014) prepared a training program named metacognitive reading strategy training program (METARESTRAP) to understand the difference. They found significant difference between experimental (M = 4.15, SD =.31) and control group (M = 3.52, SD = .38). The prompts to use metacognitive strategies are named differently in these models. Nonetheless, it should be considered that the models for the instruction of language learning strategies are all using explicit methods disregarding the efficacy of covert methods. Considering all assumptions, which could be stated as overt, covert, and multiple, it should be noted that a vast amount of literature is for overt strategy teaching. As an example of this, Anderson (2002) contributed to this proposition by saying that "metacognitive instruction should explicitly teach students a variety of learning strategies" (p. 3) and suggested four questions for reaching objectives in a reading lesson: (i) What am I trying to accomplish? (ii) What strategies am I using? (iii) How well am I using the

strategies, and (iv) What else could I do? It is crucial not only to increase the consciousness of learners regarding learning strategies, but also to highlight the significance of covert techniques. These techniques play a vital role in facilitating the development of critical skills such as strategy selection, goal setting, and self-evaluation, which are ultimately aimed at becoming ingrained learning outcomes and habits for the learners in the long term. To put it differently, the instruction of language learning strategies would be scaled up if learnt by doing with implicit methods as well. Hereby, I would concur with multiple-strategy programs for metacognitive scaffolding as preferred by other scholars such as Pressley, Wharton-McDonald, Mistretta-Hampson, and Echevarria (1998; Dabarera, Renandya & Zhang, 2014). This aligns with the convergence of ideas put forth by notable scholars James, Vygotsky, and Piaget regarding the concept of metacognition, which they perceive as self, medium, and object, respectively (Fox & Riconscente, 2008). All sets and strategies to consider for multiple strategy programs are as indicated below:

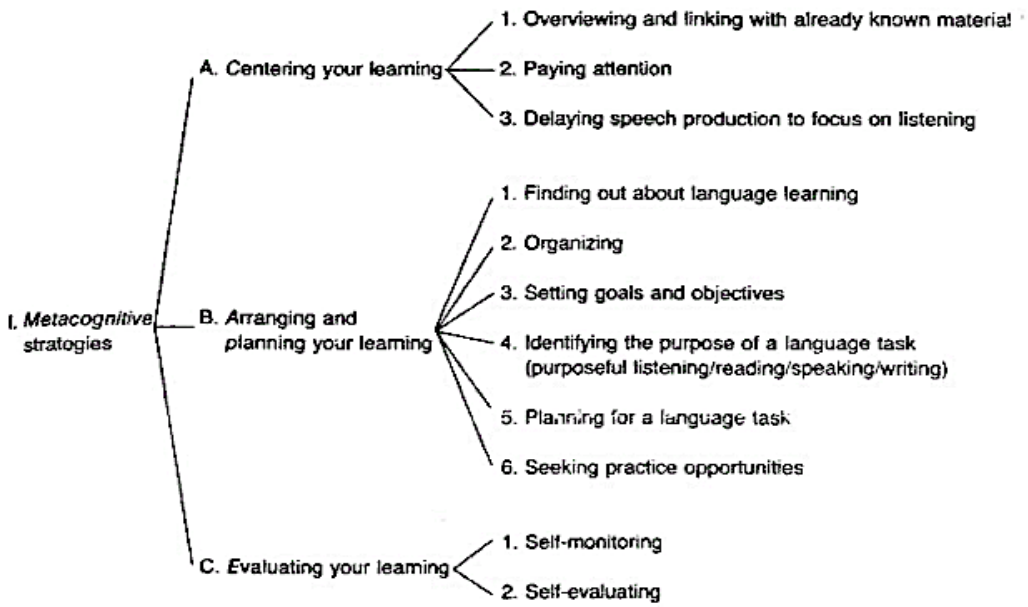


Figure 10. Diagram of the metacognitive strategies
Source: Oxford, 1990, p.137

Studies that examine metacognition and its utility indicate that metacognition plays a role in oral communication of information, oral persuasion, oral comprehension, reading comprehension, writing, language acquisition, attention, memory, problem solving, social cognition, and various types of self-control and self-instruction (Flavell, 1979). Among all the items listed, reading comprehension is at stake in current study.

In the study titled "Issues in Language Learning Strategy Research and Teaching," Chamot (2004) discussed how low-achieving language learners can attain target learning objectives by modifying their learning strategies. Furthermore, she synthesized the shared aspects of proposals for models of metacognitive strategy development using explicit instructional methods and put forth a comprehensive eight-step framework for managing the process of modifying language learning strategies. Her classification regarding the changes in learning strategies comprises various elements such as identification procedures of learning strategies, terminology and classification of strategies, effects of learner characteristics on strategy use, effects of culture and context on strategy use, explicit and integrated strategy instruction, language of instruction, transfer of strategies to new tasks, and models for language learning strategy instruction. Acquiring either the awareness of metacognitive strategies or the metacognitive strategies themselves is a strategy changing and could be better elaborated considering these steps. Prompts do not have to be successful due to the variations in cultural elements and are aimed at keeping flexible. For instance, in Abhakorn's study (2014), learner roles are modified, but the role of the teacher did not change due to cultural elements. To expand his research, he analyzed the effect of student portfolios on increasing metacognitive activities

among Thai students (n=53 in total) at around 14-15 years of age. The analyzed factors were (i) learner's perceptions towards language learning, (ii) learner's perceptions towards the teacher roles in language learning, (iii) learner's perceptions towards the learner roles in language learning, and (iv) learner's confidence in themselves In his study, a comparison of pre-test and post-test for the experimental group indicates that there is no significant difference in students' confidence and attitudes towards the role of the teacher, but written portfolios are useful to access students' metacognitive beliefs and strategies. This data revealed that perception toward language learning could be available, and learner roles, despite being limited, can be changed through student portfolios. The intervention, in this case, does not seem to be directed toward the confidence and role of the teachers. It is noteworthy to state that confidence is a self-reference, and teacher roles are affected by cultural norms. Concordantly, Ismael (2015) conducted research revealing learners' metacognitive knowledge about speaking activities based on person, task and strategy variables. Pre- and post-course tests indicated that learners have more metacognitive knowledge about themselves (person variable) and increase their awareness of task and strategy, such interventions as handouts can be used as directed prompts. Another research emphasizes the importance of giving preparation time before group discussions as learners tend to plan and take precautions for the anticipated problems (Lam, 2008). It seems the first research indicates the effectiveness of metacognitive knowledge gained from metacognitive experiences, and the second one marks the significance of offline metacognitive processes.

The research literature on metacognition and L2 acquisition has various approaches for different purposes with different interventions. To be able to clarify the terms and processes, I list the prominent research and results to understand under

which circumstances it is reasonable to utilize metacognition in L2 acquisition. For instance, one of the specific studies about metacognitive skills in language learning is by Ajideh (2009), who investigated the effect of metacognition in the English for Specific Purposes (ESP) domain in English as Foreign Language (EFL) context. He based his study on the idea that learner-centeredness and learner autonomy, as well as their theoretical underpinning, should aim to shape learner strategies using metacognitive strategies. Autonomous learning and metacognitive strategies are even suggested as the essentials for ESP. Otherwise, it would be a limitation inhibiting permanent learning. He, based upon this assumption, differentiated high and low achievers in terms of the cognitive strategy they possess and concluded that reading comprehension could be improved through metacognitive help to develop strategies. Differentiation of low and high achievers is also mentioned in Fincham's (2015) study that results in the variety among learners' metacognitive knowledge (MCK) towards distance language learning (DLL). He suggests that students' MCK may vary due to several factors, among which insufficient vocabulary knowledge and an acquisition-poor environment appear prominent.

As for the role of metacognitive strategies in L2 reading, Dabarera, Renandya and Zhang (2014) put metacognition as the place where the gap between the declarative knowledge is tapped upon for required understanding, as was in the case of math problems. Thus, there seem to be three components to be understood: L2 proficiency, the information on L2 readings and appropriate metacognitive strategy. Carrell (1988) explained this relation with a formula "L2 reading= L1 Reading + L2 Language Proficiency + Metacognition" (p.8). In her study, she investigated the need for metacognitive strategies in reading in a second language with the assumption that readers must be aware of what is needed to be performed to take steps and preventive

actions. She pointed out the necessity of using metacognition due to the difference in the conceptualization of texts in the first and second language as well as the employment of effective learning strategies. Metacognitive actions may foster comprehension if embedded in a learning strategy, as it involves heightened awareness, active monitoring and deployment of compensatory strategies. Based on this information, notable research includes Dabarera, Renandya, and Zhang's (2014) investigation of the correlation between metacognitive awareness enhancement and reading comprehension improvement. The results from the "Metacognitive Awareness of Reading Strategies" (MARSI) intervention study demonstrated a significant positive correlation (r=.359, p .05) among the participants, 92.5% of whom were 12 years old. The MARSI study employed a self-report tool consisting of 30 items and comprised three strategy sub-scales: Global Reading Strategies (GLOB), Problem-Solving Strategies (PROB), and Support Reading Strategies (SUP). Their intervention is metacognitive strategy instruction via a reciprocal teaching approach. For all scales, significant difference has been identified; GLOB (M= 3.54, SD=.70 for experimental group, M=3.09, SD= .72 for control group), PROB (M=3.78, SD=.76 for experimental group, M=3.13, SD=.81 for control group), and SUP (M=3.32, SD=.83 for experimental group, M=2.93, SD=.70 for control group).

For reading in L2 with metacognitive strategies, Cubukcu's work explains the scope of utilizable metacognitive strategies with their rationales. In both of her studies (Cubukcu, 2008; Cubukcu, 2009), she points to the lack of vocabulary as the epiphenomenon of failure on reading tasks. In the former one, she prepared five weeks of instruction about metacognitive strategies as an intervention and aimed to increase the reading comprehension of pre-service language teachers. The results of

her study indicated that participants' reading comprehension skills increased in parallel with facilitated vocabulary learning (Cubukcu, 2008). In her latter study, she investigated the difference in using frequencies of metacognitive strategies on a reading task between slow and fast learners for both L1 and L2 strategies. She found that there was no significant difference between males (Mean=86.5, SD=7.7) and females (Mean=84, SD=5.7), both slow and fast learners used metacognitive strategies equally, and metacognitive strategies were used both for L1 and L2. Therefore, the difference in achievement scores between L1 and L2 reading comprehension is related to the vocabulary range of learners (Cubukcu, 2009). An example of a counterargument for significant difference between genders in the usage of metacognitive strategies is Koçak and Boyacı's (2009) research [t(440) = -3,50, p<.05]. However, the result is related to the fact that females are going through puberty and certain mental processes beyond males as the participants were all between 14-18 ages. The current study aimed to eliminate this variation by planning and implementing the intervention for the ages above 18. Bacon's (1992) research on a reading task strategy use by college students of Spanish resulted in more frequent use of metacognitive strategies among women, but the difference was not significant (Macaro, 2002), and Öz (2007) mentioned the contradictory results on gender and metacognition. However, it is reasonable to posit that the underlying commonality lies in overall equivalence, taking into account the influence of both age and proficiency.

In support of this view, Feiz (2016) addressed the positive correlation between metacognitive reading strategies and reading motivation. In his research, he found that components of metacognitive knowledge and regulation (the correlation between them is quite high, r=.92 or 85%) are significant predictors of attitudes toward

foreign language learning and acknowledge metacognitively aware teachers, teacher trainers and pre-service teachers. In addition to this, Zhang and Seepho's (2013) study also finds a significant positive correlation between metacognitive strategy use and English reading achievement. For writing skills, most research is in line with Yanyan's (2010) research, which indicates a positive and significant correlation between metacognitive knowledge and writing skills.

When teachers utilize the outstanding advantages of metacognitive strategies for reading tasks, Meichenbaum's (1977) cognitive behavior modification method can be used (Hartman, 2001). This method supports my suggestion to use multiple strategies. From the early steps starting with cognitive modelling, covert self-instruction can be taught to learners using overt guidance, which will first turn into self-guidance and then will be faded to convert automatically.

There is a substantial amount of literature discussing the effectiveness of metacognitive strategies on second language acquisition (SLA). The metacognitive strategies that learners use in SLA are listed as (i) advance organizers, (ii) directed attention, (iii) functional planning, (iv) selective attention, (v) self-management, (vi) monitoring, and (vii) self-evaluation. Concordantly, Bacon's (1992) research indicates that learners follow two types of metacognitive strategies for listening tasks: prior to listening and while listening. Before the task is presented to learners, they are observed to be trying to focus their attention, go in with a plan and apply an advanced organizer. In the listening part, learners tried to manage themselves to keep up with speed and follow their attention. To put it another way, learners tried to gain optimum solutions for their anticipated problems on listening tasks. Therefore, given that using a metacognitive strategy for listening tasks among learners is certainly a proper way, the question of "how" it is used and "how" could be manipulated for

"which" conditions seems to be worthy of expanded understanding. The idea behind this is that "success begets success", and it has been widely acknowledged that learners' listening ability and their metacognitive experiences for listening tasks in L2 are significant (Goh, 1997), and metacognitive processes may foster learning as it motivates learners (Vandergrift & Goh, 2012). Metacognitive strategies may shape learners' metacognitive experiences by encouraging them, as they help learners oversee, regulate and direct them on the task. To test this, Fayyaz and Kamal (2014) conducted research with 314 students between 18 and 30 years of age (M=22.13, SD=2.81). The modified version of the Metacognitive Awareness Listening Questionnaire (MALQ) was used to understand the subscales as planning/evaluation, directed attention, person knowledge, mental translation and problem-solving. Mental translation is regarded as a negative metacognitive strategy as it is more likely to be inhibiting. The results indicate that women outscore men in terms of metacognitive abilities mostly because they have better planning, attention and problem-solving strategies. Still, there is no significant difference between the ages and origins of the students. Therefore, based on their study, it can be asserted that utilizing metacognitive abilities is a universal aspect, regardless of the language spoken and age, although it may be more prevalent by default in females.

In Goh's (1997) research, the main query was about the learners' metacognitive knowledge based on Flavell's major categories: person, task and strategy. Data from students' diaries indicate that there are four major extracts from their personal knowledge: (i) cognitive processes during listening, (ii) problems during listening, (iii) obstacles to listening comprehension, and (iv) obstacles to listening development. Learners' task knowledge is comprised of three mutual themes: (i) factors that affect listening comprehension, (ii) input useful for

developing listening (and reasons given), and (iii) the nature of L2 listening. To me, the most important are the strategies that they develop: (i) strategies that assist comprehension and recall, (ii) strategies for developing listening, and (iii) strategies that do not always work. Note that these are the subheads of types of knowledge, and there are 25 types of personal knowledge, 17 types of task knowledge and 21 strategies. In addition, for different student profiles, levels and learning environments, it could be another problem for researchers to understand the difference among them. Nevertheless, the possible conclusion from his study could be that for listening abilities in SLA, students tried to capture a snapshot of overall problems they have encountered and defined strategies as assisting, helpful and the ones that do not always work. A language teacher's possible aim, in this case, is to remind students about more of their metacognitive knowledge and encourage them to use the best strategy working for them. This supports Brown's (1977) successful application of learners' metacognitive knowledge in L2 research categorized as planning, monitoring, and evaluation (Goh, 2008). Learners, in this identification, as in other skills, apply these steps for a metacognitive activity by default. Not to mention, metacognitive activities are to be embedded in the instruction for developing listening skills. Goh (2008) designed two kinds of metacognitively enhanced listening activities called "integrated experiential listening tasks" and "guided reflections on listening". The former suggests embedded daily talks to raise metacognitive experiences beyond the classroom, and the latter aims to draw out learners' implicit knowledge. Both are necessary for metacognitive instruction to be effective and for encouraging "self-appraisal and self-regulation of comprehension and learning processes" (p. 200). To engage metacognitive experiences in learners' learning processes, it should be regarded that metacognitive experiences are clustered

into two categories forming it: metacognitive awareness and metacognitive knowledge (van Velzen, 2016). It may seem confusing trying to make use of metacognitive processes among all these terms, but in fact, it is even beyond confusing. To clarify the connotations that the terms refer to, the very first useful attempt seems like schematizing, as illustrated below.

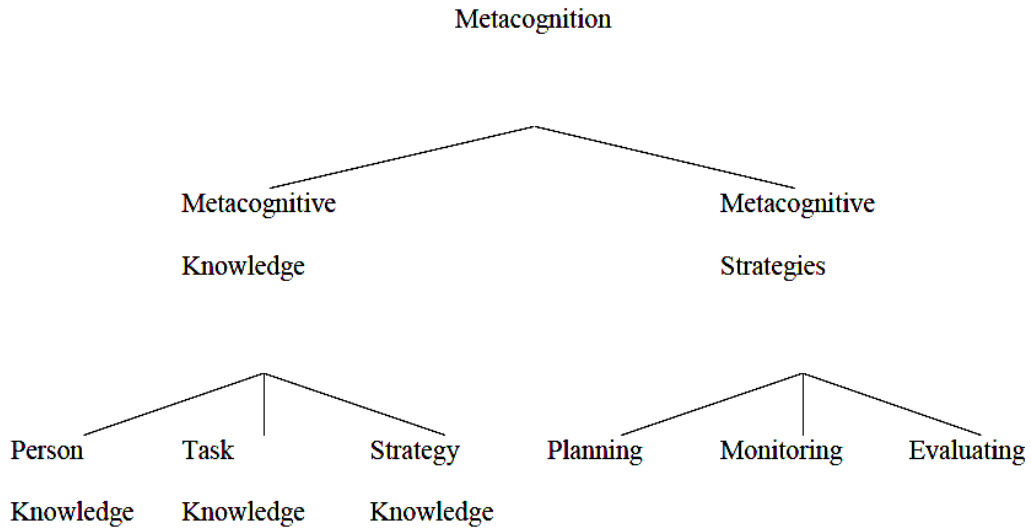


Figure 11. A model of metacognition
Source: Kim, 2013, p.7

Considering all these, reviewing the use of existing records on four basic skills in language learning, and embedding metacognitive activities into learning environments seems to require several elements. Schunk (1996) notes that the ways to assess learning are as follows: direct observations, written responses, oral responses, rating by others and self-reports. Except for peer rating, the rest could be the best fit to be used for an effective way of utilizing metacognition. Among self-reports, the methods are questionnaires, interviews, stimulated recalls, think-aloud and dialogues. A teacher as a practitioner is to take these into consideration for a better evaluation and more effective teaching process that ideally turns into progress.

2.2.1.2.2 Affection strategies

The language awareness approach holds as one of its basic tenets that learning is enhanced when learners are "affectively engaged and when they willingly invest energy and attention in the learning process" (Bolitho et al., 2003, p. 252; MacIntyre & Gregersen, 2012, p. 198). Affection for the learning subject may be considered a bridge as the learner uses it to reach an insightful understanding. It may be overwhelming for students to exert unnecessary cognitive effort. Therefore, controlling or regulating negative emotions might be helpful during learning processes as they "can stunt the progress" (Oxford, 1990, p. 141). In order to get positive emotional results, it is assumed that negative feelings need to be known with their source so that the instructor or another mediator can intervene in this process. In case this gap between the learner and the learning subject is not fulfilled by this analysis, not only the subject that is covered during the lesson but also all subjects related to the domain may be negatively affected. The affective domain covers such concepts as self-esteem, attitudes, motivation, anxiety, culture shock, inhibition, risk-taking, and tolerance for ambiguity (Oxford, 1990). While it may not be possible to completely eliminate all challenges in the learning process, it is believed that by recognizing and addressing the most problematic factors, learners can benefit from a more effective learning experience. Through identifying and analyzing these challenges, targeted interventions can be implemented to reduce their negative impact on the learning process. This proactive approach acknowledges the complex nature of the learning process and recognizes the importance of addressing the challenges that can hinder learning outcomes.

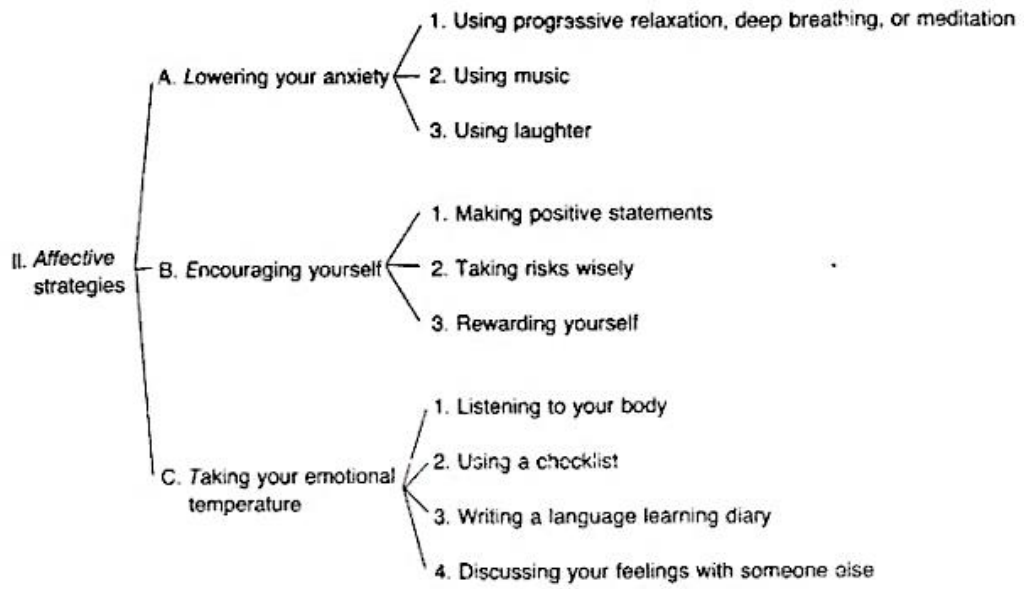


Figure 12. Diagram of the affective strategies
Source: Oxford, 1990, p.141

In the diagram stated above, three main strategy sets are suggested: lowering anxiety, encouraging yourself, and taking emotional temperature. Among the strategies, the salient points address either identification of feelings or external interference. To this end, learners' affection towards the subject needs to be defined well and controlled inasmuch as its negative impacts can be detected. Learners, in this scenario, may tend to be passive and proper prompts may enable them to control their feelings. Popper (1976) addressed this issue and stated that the production of the human mind is only possible with proper psychological and mental readiness.

2.2.1.2.3 Social strategies

Language learning strategies may vary in their effects for a specific culture, and some of them may be more effective than others for different cases. Oxford and Burry-Stock (1995) stated that "cognitive, social and metacognitive strategies had a higher relationship (r = .33, .30, and .28, respectively) to TOEFL scores than did

other kinds of strategies (memory, r = .24; affective, r = .23; compensation, r = ,21)". This result depends on many variables from culture to learner level but is still a good exemplification for conveying its importance. Social strategies include such strategy sets as asking questions, cooperating with others, and empathizing. Learners as social beings have the potential to make use of their learning progress through the use of social strategies, and these strategies themselves may also be the result of their learning processes.

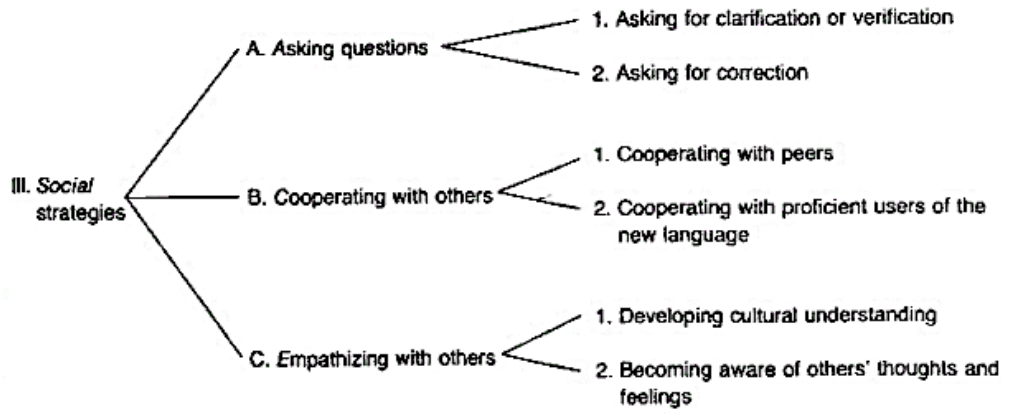


Figure 13. Diagram of the affective strategies
Source: Oxford, 1990, p. 145

Social strategies are significantly associated with L2 proficiency in studies (Oxford, 2003). However, a variation in the instruction can be foreseen for different learners with different learning variables. The point in the current research was to explore the optimal prompts and tasks for each learner that could tailor vocabulary learning process to their needs to their learning styles. The initial stages of evaluating learning variables and formulating intervention plans will be meticulously devised under the premise that vocabulary instructional expertise can be transformed into software. The most difficult part of the analysis of the outcome is the learners' inner speech in the

target language. It would be useful for the learner to imagine a conversation in L2, but it makes the use of social strategies less measurable.

Not only did the design of the current tool consider the cognitive methods that could be presented to learners, but it also planned out the way in which those cognitive methods could be presented. This was deliberated upon prior to the beginning stages of the tool's design. The planning stage and the development process of the educational tool took into account the fundamental principles present in e-learning literature. Whether the strategies are direct or indirect, they are all considered to be in a sequence that takes into consideration the cognitive steps learners go through. It was determined that implementing the suggestions of Mayer and Gagne would be the most effective means of achieving this objective. In short, Mayer's ideas served as the blueprint for the design, while Gagne provided direction for the structure of the tool.

2.3 Application of principles of multimedia design

The multimedia instructional approach was guided by the multimedia principles established through a meta-analysis of studies that defined best practices, or what should and should not be done, in multimedia design in this study. Mayer’s (2008) arguments assume that human learning has common characteristics, but the point not to be disregarded is the divide in learning. Alexander, Schallert and Reynolds (2009) defined learning cases and centered understanding of learning under four themes: what, when, who and where of learning. Since Mayer's research is limited in scope to the learning of declarative rather than procedural information due to the multimedia frame, its limitations could be clarified through the use of the “what” and “who” of learning. Aside from the significance of the discussion on the balance between

maximum variation and minimum common features in human learning, the critical criterion in this regard is the median effect size, d=0.40, which has been deemed educationally relevant according to Cohen (1988) in meta-analysis studies. There are three main assumptions to consider in designing how people learn from words and graphics according to Mayer (2008): (i) reducing extraneous processing; (ii) managing essential processing, and (iii) fostering generative processing. As for the memory stores, sensory memory, working memory and long-term memory are listed. The multimedia instruction for learners encompasses three kinds of processing types: extraneous processing, essential processing, and generative processing. The following concepts from Mayer (2008) were attributed to the consequences of teaching and learning. Besides these, Mayer (2008) suggests that it is better when you

i. Start with a slide depicting the key elements
ii. Show the movement of the units
iii. Prune irrelevant material
iv. Break the explanations into short descriptions rather than one long paragraph
v. Elaborate on the slides rather than reading only
vi. Use a minimal number of words on the screen
vii. Use first- and second-person style (such as let’s see how it works rather than this lesson tells…)
viii. Use human gestures and contact them with the slide
ix. Remove Distracting Logos

Table 6 presents a comprehensive overview of Mayer's research outcomes in multimedia instruction.

Table 6. Mayer's Research Outcomes

Theme	Research Outcomes
	Words and graphics are better facilitators of learning than words alone (d=1.39)
Reduce Extraneous Processing	The Coherence Principle: Extraneous material may better be excluded rather than included (d=0.86) The Signaling Principle: Cues that highlight the organization may better be added (d=0.41) The Redundancy Principle: Graphics and narration may better be used together than graphics, narration, and on-screen text alone (d=0.86) The Spatial Contiguity Principle: Words and graphics must be presented near rather than far from each other (d=1.10) The Temporal Contiguity Principle: Graphics and narration are better when presented simultaneously than successively (d=1.22)
Manage Essential Processing	The Segmenting Principle: Learner-paced segmenting is helpful for more deeply learning (d=0.79) The Pre-Training Principle: Teaching names and characteristics of the main concepts as pre-training is useful (d=0.75) (note that it is not that applicable for high prior knowledge learners) The Modality Principle: Words are better when spoken than printed (d=0.76)
Foster Generative Processing	The Personalization Principle: Multimedia instruction is better when presented in conversational style than formal style (d=0.79) The Voice Principle: Human voice is more learner-friendly than machine voice (d=0.69) The Embodiment Principle: Human-like gesturing, movement, eye contact and facial expression gets learners in human-human interaction feeling which is helpful (d=0.36) The Image Principle: The image of the onscreen speaker does not necessarily have to be helpful (d=0.19)

Source: Mayer, R. E. (2014). Incorporating motivation into multimedia learning. Learning and instruction, 29, 171-173.

The instructional goals are listed by Mayer (2008) as follows: (i) reducing extraneous processing of which principals are detailed as coherence, signaling, redundancy, spatial contiguity and temporal contiguity; (ii) managing essential processing, marking the importance of segmenting, pre-training and modality as principals, and (iii) fostering generative processing that encompasses personalization, (human) voice, embodiment and image principles.

Each of Mayer's suggestions is implemented in the current developed design in accordance with the context of the research's overall methodology. For instance, underlined words served as cues for potential focus words, and the coherence principle ensured that no irrelevant material was included. Moreover, the visuals and voiceover are presented in succession without any on-screen text. Since the majority of the content was written rather than visual, the spatial contiguity principle was not necessary in the design process. In terms of controlling crucial processing, formative assessments apply segmenting at the learner's pace. Furthermore, a pedagogical agent is introduced as a pre-training principle, appearing at the top of each lesson item. The incorporation of audio recordings of the texts caters to the modalities principle. Finally, the chat popup of the pedagogical agent is written in a conversational style in order to encourage generative processing.

2.4 Optimizing vocabulary learning through digital means

The utility of digital technology, both in overall language learning processes and in facilitating the acquisition of new vocabulary has been the subject of debate. The effectiveness of enhancing vocabulary acquisition through the examination of recent theories and models of vocabulary learning, as well as the use of technological resources in the classroom, is evaluated in the context of current study. This

evaluation will explore the potential of various technological tools, such as interactive apps and digital(ized) tools and identify areas for future research.

Vocabulary acquisition is a complex process that linguists and educators have studied for decades. Various hypotheses and models, such as the Input Hypothesis, the Output Hypothesis, and the Interaction Hypothesis, have been put forward to explain how vocabulary is acquired. Krashen (1982) proposed the Input Hypothesis, which states that exposure to language, or input, is the primary determinant in vocabulary acquisition. Swain (1985) proposed the Output Hypothesis, which states that output, or the language produced by a learner, is important for vocabulary development. Long's (1981) Interaction Hypothesis proposes that both input and output are required for vocabulary acquisition, but that interaction, or the interchange of language between a learner and a natural speaker, is the most successful method for acquiring vocabulary. By emphasizing the significance of input, output, and interaction in the acquisition of new vocabulary, these theories explain the use of vocabulary acquisition.

Digital resources, like interactive apps and digital flashcards (Lees, 2014; Hung, 2015), can give students many chances for input and output, as well as engagement with native speakers. For instance, interactive apps can supply learners with authentic input in the form of audio and video recordings, and digital tools can provide possibilities for output in the shape of writing and speaking activities. Moreover, further digital tools can facilitate connection through features such as chat and video conferencing, allowing students to communicate in real-time with native speakers (da Costa, da Silva, 2021). In this study, a comprehensive examination of the integration of technology in language education is conducted, with an emphasis on evaluating the challenges and opportunities presented by such integration, as well

as examining examples of effective and ineffective implementation and determining the underlying causes of these outcomes. It could be claimed that the relevant research questions in this study aims to delve into the various aspects of digital language learning, including its potential challenges and opportunities, examples of effective and ineffective implementation, and the reasons behind these outcomes. The underlying reason is to understand the various dimensions, approaches, and effects of digital language learning practices to provide a comprehensive overview of the integration of technology in language education from both a research and pedagogical perspective. One notable study in this regard is by Kondrakhina and Yuzhakova (2022), who discuss the impact of digitalization on foreign language education and how it affects traditional teaching methods and learning outcomes. They stress the importance of optimizing professionally-oriented training for students and revising the basic aspects of teaching foreign languages. The study also highlights the need to focus on the role of teachers in facilitating students' professional development, as well as how digital tools can be used to enhance problem-solving abilities, critical thinking, and proficiency in professional discourse. Additionally, the authors argue that current foreign language training at the university level does not sufficiently focus on developing students' creative potential. They propose the use of the case study method as an effective way to incorporate digital technology in foreign language education at the university level.

One example of a comprehensive examination of the incorporation of technology in language education is the book "Digital language learning and teaching: Research, theory, and practice" co-edited by Carrier, Damerow, and Bailey (2017), which was also reviewed by Merzifonluoglu and Gonlual (2018). This book focuses on the research perspective and the pedagogical perspective, highlighting key

advancements in digital language learning, teaching, and assessment, written by experienced researchers in the field. The introduction by Carrier (2017) defines digital learning as "the application of technology to the learning and teaching process" and lists different categories of digital technology (p.65). It covers topics such as online grammar practice applications, digitally-mediated learning practices, and the use and importance of feedback in digital language learning. The book provides a comprehensive examination of the current use of digital technologies in English language classrooms globally and models good practice by including the work of both established scholars and emerging researchers in the field of digital language learning.

The primary focus of achieving good practice in digital language education has traditionally been to ensure adequate infrastructure and demonstrate notable results in the intended objectives. However, with the proliferation of digitalization following the changes in social life due to technological advances, there has been an increased need for digital tools among individuals of all ages. The current study employed a methodology that examined the affordances of digital tools used in order to achieve the goal of understanding learners' potential for vocabulary learning in an e-learning platform which was desgined considering learner variables.

As such, this research shifts its focus to utilizing the infrastructure that learners already possess. This approach is exemplified by Haffner, Chik and Jones (2015) who examined the potential of digital language learning tools and developed a framework that encompasses various dimensions of digital literacy in language learning. These dimensions include: Doing (actions in the physical world), Meaning (forms of representation), Relating (patterns of interaction), Thinking (experiencing

and thinking about reality), and Being (social identity). They provide examples of practices within each dimension, as well as questions related to pedagogy.

As for the examples of successful and unsuccessful implementation of digital technology in language education, as well as suggestions for future research and practice, one example is the meta-analytic study by Haidari, Baysal and Kanadlı (2020), which looked at the impact of digital technology-mediated instruction on foreign language vocabulary learning in Turkey, and found that using digital technology in foreign language teaching had a positive and large impact on students' vocabulary learning achievement. Additionally, it was found that the type of study and grouping methods were significant factors, while the study quality, education level, type of technology and treatment duration were not significant factors. Another meta-analysis by Hao, Wang and Ardasheva (2021) found that technology-assisted L2 vocabulary learning for English as a foreign language learners had a large overall positive effect compared to traditional instructional methods and improved long-term vocabulary retention. The analysis also highlighted that device type, game condition, setting, test format, and reported reliability affected the effectiveness of vocabulary learning and that mobile devices and on-the-move learning were the most efficient.

It has also been the case up until this year for all contemporary digital technologies that good vocabulary learning practices were only achievable when learning environment factors and learner variables were taken into account. As an example of this Agca and Özdemir's (2013) research revealed the impact of integrating multimedia content into vocabulary learning using 2D barcode technology. The study found that using mobile learning materials in conjunction with a course book increased students' vocabulary levels for the target words. Additionally, students had positive opinions about the new learning environment. In

another example study by Bazo, Rodriguez, and Fumero (2016), learners were introduced a tool called Vocabulary Notebook, which is a digital solution to the challenges faced with traditional vocabulary notebooks and personalizes learning in a Content and Language Integrated Learning (CLIL) context. The tool addresses the problem of instructors spending too much time teaching CLIL vocabulary and not enough time on social tasks, which are crucial for consolidating knowledge and skills.

Due to the fact that this study focuses primarily on strategy-based models in digitalized language learning contexts, the relevant literature was helpful in structuring the design. In this regard, Li's (2009) research sheds light on prior relevant research by comparing the vocabulary learning processes of ESL students with and without technology-based support. A language learning system was created to facilitate a technology-enhanced reading environment for twenty-four students in the study. The findings indicated that students engaged with a number of cognitive, compensatory, metacognitive, and social techniques when learning vocabulary through continuous reading in a computer-mediated environment. The approaches and functionality of reading strategies also differed significantly across the two reading circumstances. The research contends that technology-enhanced scaffoldings can aid students in developing their learning strategies and optimizing vocabulary acquisition.

Regarding the relevance of the use of mobile devices for vocabulary acquisition as a topic of interest, Hu (2013) explores how the usage of mobile devices for vocabulary learning matches with existing theories of learning activities. The study highlights the advantages of mobile devices for L2 vocabulary learning and suggests how the technology may change language teaching and learning. The

author suggests that the integration of mobile devices should take into account factors such as portability, social interactivity, context sensitivity, connectivity, and individuality. Hu's study provides insights for researchers and teachers about the potential of mobile devices for vocabulary learning and its relevance to innovation in language teaching and learning. Likewise, Khazaie and Ketabi's study (2011) investigated the use of multimedia to develop vocabulary learning materials for mobile learning. The study aimed to consider the different visual and verbal short-term memories of L2 learners, as short-term memory is important in vocabulary learning. The findings of their study suggest that delivering learning materials with pictorial annotations to learners with high-visual abilities and written annotations to learners with high-verbal abilities results in better vocabulary learning. These findings can serve as a guide for creating mobile learning materials for the English language. As a takeaway message from these studies, the integration of mobile technology in language learning can have a positive impact on vocabulary acquisition, as long as it is tailored to the individual needs and abilities of the learners.

The literature on the use of digital technologies for vocabulary acquisition reveals several key findings. One of the recurrent issues that emerged from the studies is the potential of digital technologies to offer appropriate input and output opportunities for learners. The research findings have consistently demonstrated that digital tools and interactive applications can offer learners with authentic input, such as audio and video recordings, and opportunities for output through writing and speaking activities. These opportunities have been found to be beneficial for vocabulary acquisition, as they provide learners with a more immersive and engaging learning experience.

Another important theme that emerged from the studies was the capacity of digital technologies to promote interaction. Many studies have found that digital tools, such as chat and video conferencing, can provide learners with the opportunity to interact with native speakers and improve their vocabulary acquisition. These tools have been found to be particularly effective in facilitating contact with native speakers, which is important for exposure to authentic language and for the development of vocabulary. However, it is crucial to highlight that the reviewed studies also identified gaps in the literature and areas requiring additional investigation. Many studies have demonstrated that digital tools can be useful for vocabulary acquisition. Nevertheless, additional studies are required to find the most effective ways to implement these tools in the classroom. In addition, the long-term effects of digital tools on vocabulary acquisition and how these tools might be used to enhance vocabulary learning for learners from varied backgrounds should be investigated.

The studies reviewed in this section have provided evidence of the potential of digital tools to enhance vocabulary acquisition. However, they also reveal the need for further research to gain a more comprehensive understanding of the effective integration of digital tools into vocabulary instruction in coherent and wholistic ways, rather than with singular elemental approaches. In response to adress this need, the current design-based research developed and implemented a novel method to promote L2 vocabulary learning among intermediate level university students via a multimedia platform that was custom-designed in accordance with learner variables and strategy-based language learning. Thus, the study serves as a further investigation to explore the optimal ways to use digital tools in the classroom

and examine the detailed effects of digital tools on vocabulary acquisition for learners with various variables.

CHAPTER 3

METHODOLOGY

3.1 Purpose and research goals

This study draws upon grounded design principles as it focuses on the importance of "the alignment of design decisions, features and sequences of the learning environment with theoretically ground perspectives on learning and associated pedagogy" (Hannafin et al., 1997, p.7). Grounded design involves incorporating various psychological perspectives to enhance student-centered learning environments. This approach can address the issue of some learning environments lacking a proper theoretical foundation. By incorporating multiple perspectives, the grounded design aims to provide a well-rounded and comprehensive understanding of how students learn and how learning environments can be optimized to support student growth and development. This approach can also help educators to identify and address potential challenges and gaps in student learning, and make informed decisions about how to design learning environments that are tailored to meet the needs and preferences of individual students.

Grounded design, by definition, is "the systematic implementation of processes and procedures that are rooted in established theory and research in human learning", and the basics of ground design are as follows (Hannafin et al. 1997, p.102):

i. Designs must be rooted in a defensible and publicly acknowledged theoretical framework
ii. Methods must be consistent with the outcomes of research conducted to test, validate, or extend the theories upon which they are based

iii. Grounded designs are generalizable; that is, they can be adopted or adapted by other designers.

iv. Grounded designs are validated iteratively through successive implementation

Nathan and Sawyer (2014) quoted Nathan and Alibali (2010), who distinguished learning science research into elemental and systemic categories. The former category refers to components of a learning environment. It relies on factoring assumption, which means that some components of the system can be factored out. At the same time, the latter rejects this assumption and analyses learning at the level of an entire complex system. As for the levels of analysis of complex systems, there is a variation for each method: lower-level analysis and higher-level analysis. The lower-level analysis focuses on individual learners, but the higher levels always supervene them. This study chooses a systemic view and a higher-level analysis. The reason for choosing it is the assumption that psychological barriers such as SE, SRL and MOT are better understood when taken as a constellation (Piniel & Csizér, 2013), and learning is both a process and a product (Alexander, Schaller & Reynolds, 2009). As a process, hindrances and facilitators exist, and as a product, it is related to other learning processes. The systemic approach, in this framework, supports the assumption that learning is a complex system. In this research, learning components cannot be factored out but must be embraced. Given the limitations, not all variables can be taken into account, but variables such as cognitive and affective are considered and the interventions are formulated accordingly. Elemental research, although it has been found superior by some scholars, does not apply better to this research since learning as a change protocol should be taken as a “systemic, dynamic and multidimensional process that

results in a relatively enduring change in a person or persons" (Alexander, Schaller & Reynolds, 2009, p. 186).

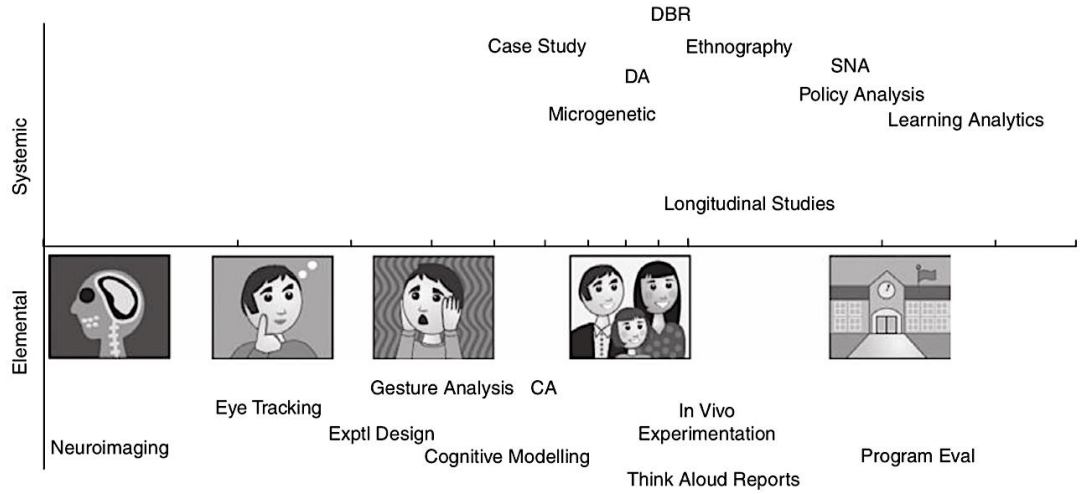


Figure 14. Elemental and systemic research plotted on a logarithmic time scale
Source: Nathan & Sawyer, 2005, p.27

The current design-based research (DBR) was conducted in the light of the information above, and iterations were scheduled as stated by McKenney and van den Akker (2005) in their illustration. Literature review and concept validation were carried out by readings and discussions with the expertise team in the community of practice, a site visit to the department was regularly done, and a prototype of the design was ready before the alpha test. Beta and gamma tests were conducted prior to the decision to finish iterations. In short, needs and context analysis were considered after preparing the design, development, and formative evaluation process were done during piloting. Finally, quantitative analysis phases were carried out to test the effectiveness of the design tools and the overall multimedia platform.

3.2 Methodological approach

3.2.1 Design-based research (DBR)

This study incorporates both pure basic and pure applied research perspectives, following the principles of design-based research (DBR) that advocates for use-inspired research, as proposed by McKenney and Reeves (2018). Use-inspired research is the kind of basic research that stems from the theory and inevitably leads to the development of new technologies.

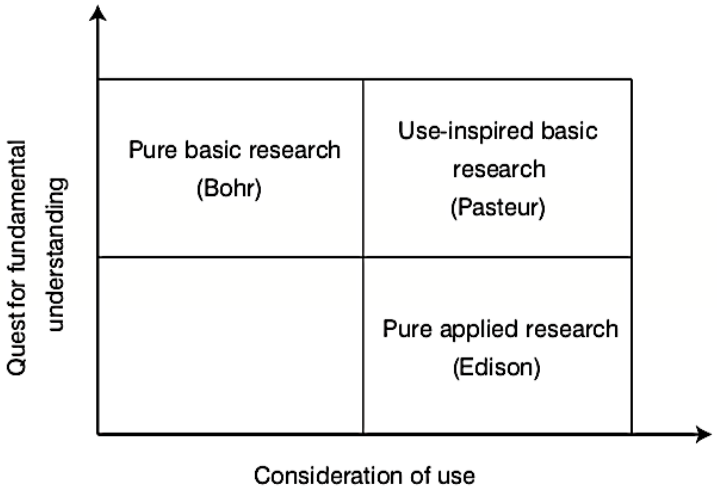


Figure 15. Illustration of the positioning of use-inspired basic research
Source: Stokes, 1997; McKenney and Reeves, 2012, p.9

The reason for selecting DBR in this study is to utilize the use-inspired aspect of this method, in other words, praxis. Praxis as the educational implementation is important in that it both tests the theory and comes up with a designed tool that may make activities for learning processes much more effective. DBR, as the method that enables this goal to be reachable, has its own route to follow in the implementation process. The Design-Based Research Collective (2003) proposes five good characteristics of design-based research, and all are considered in the current study:

i. Developing theories and "prototheories" must be intertwined

ii. Development and research must be carried out via continuous design-redesign circles

iii. Design must be sharable theories for other practitioners

iv. Design must consider how it functions in authentic settings

v. Design must rely on methods that can connect the process of enactment to outcomes of interest

With the aim to bridge theory and practice through the principles set by the Design-Based Research Collective, this study adopted a quantitative approach for data collection. The study employed a quantitative approach for data collection. The design of the material is intended to create a flexible framework that can be adapted, altered with alternative tasks, and modified to suit the needs of practitioners according to the principles of grounded design. According to Wilson and Meyers (2000), grounded design must be anchored in a "solid theoretical framework" that is in line with research evidence, generalizable to other situations and circumstances, and empirically tested and refined through iterative cycles of trial and revision (Hannafin, Hannafin, Land, & Oliver, 1997).

Hannafin et al. (1997) sort two different kinds of constructs, either as schools and instructional programs in operation at some site or models and related materials designed by theorists to be more broadly used by practitioners. This study refers to the latter as it is nurtured by the components of several theories and aimed at practitioners' use. In addition, it was also noted that there are three types of scaffolds: sensemaking, process management, and articulation and reflection. Among these types of scaffolds, four possible functions are observed: conceptual, metacognitive, procedural and strategic. In this framework, the study aims to evaluate the effectiveness of interventions aimed at improving learning outcomes

through the strategic use of scaffolding, with the goal of promoting active student engagement in sociocultural learning practices. In addition, Akbulut and Cardak (2012) emphasize the difference between adaptive and adaptable systems in the individualization of learning processes. The former term refers to the capacity of pedagogical implementation of individualization, whereas the latter is an option for learners and the possibility of the system being adaptable in which learners choose the parameters themselves. The aimed design in this study takes an adaptive system in the centre, intending to crank it up a notch in computer-assisted language learning (CALL) systems.

Hannafin et al. (1997) list four key assumptions of student-centred designs: (i) centrality of the learner in defining meaning, (ii) scaffolded participation in authentic tasks and sociocultural practices, (iii) importance of prior and everyday experiences in meaning construction, (iv) access to multiple perspectives, resources, and representations. They also put forward the principles of implications of design for scaffolding participation in authentic tasks and sociocultural practices:

i. Students should do domain-related practices, not just learn about them
ii. Students need to take ownership of the inquiry
iii. Coaching and modelling of thinking skills are needed
iv. Students should be provided with the explicit opportunity for reflection
v. Dilemmas are ill-structured and complex
vi. Learners must be supported to engage in the authentic complexity of the task rather than simplifying the dilemma with unrealistic problems
vii. Students work in teams to address contextualized problems.

The current design takes into account all of the listed factors and potential issues from the outset. The framework for the study is outlined in Table 7.

Table 7. The Framework of the Study

Design-Based Research	
Main Focus	Demonstrating how second language vocabulary learning in a country of NNES (Non-Native English Speakers) can be more effective by providing learners with cognitive aid through scaffolds based upon language learning strategies
Intervention Developed	Formative prompts and tasks tailored to learner variables
Primary Theoretical Contribution	Zone of Proximal Development (Zoped), Scaffolding, Social Learning Theory
Research Methods Used	Surveys, Artifact and Document Analysis, Quasi-Experimental Study
Research Scope	The design research study is conducted for around a two-year period

In the implementation strategy, technology played a primary role due to the potential challenges that may arise when attempting to spread the design. The primary concern was the number of students since it is not a reachable goal for an instructor to know all variables of each learner. On the contrary, instructors have the expertise in the teaching process and approaching learners considering their variables. Therefore, combining the advantages of both agents was only possible with technological help. Transferring accumulated knowledge and expertise in teaching to the technological tool was a more economical way for the implementation. The second concern for carrying out the research and implementing the design is the vast amount of literature on educational technology. A prevalent argument against the utilization of technology in education asserts that there is limited evidence of its positive correlation with improved student performance. However, this lack of impactful results is attributed to a disregard for principles derived from the learning sciences in the design and implementation of technology-assisted instruction (Sawyer, 2005). Computers have been used for teaching since the 1960s (Akbulut, 2008), but "by 2000, no studies had convincingly shown that

computer use was correlated with improved student performance" (Sawyer, 2005, p.12). These "oversold and underused" (Cuban, 2001; quoted by Sawyer, 2005) devices were not to blame for the little increase in academic achievement, but a proper way of utilizing them was thought of as a gap that needs to be discovered.

On the contrary, technology leads to the "annihilation of space by time", as in Marx's quotation (Marx, Grundrisse, 1857, p. 538, quoted by Wegerif, 2007). The use of technological advances in educational practice, therefore, needs to gear to comply with the learning algorithms that learners use. Proper use of them may both be economical in removing the obstacles due to space and be more effective choice than only taking group dynamics. It may be a gate to access each learner's ID variables with less effort.

3.2.2 Sampling procedures

For this study, the sample population was composed of undergraduate students from the school of foreign languages in a public university. This population was selected due to their alignment with the goal of the study, which was designed for second language learners and focused on the distinction between learning and acquisition. The students were also chosen as they are all active learners, aged over eighteen, who are currently participating in language learning processes. This sample was deemed appropriate for the research as they expressed interest in the subject matter during the pre-design process and were informed of the 'tudy's objectives.

The design was aimed at the below intermediate students, and they all were found in this level of linguistic knowledge in the target language. Permission from the Committee of Scientific Research was obtained prior to piloting.

3.2.3 Conventional procedure

In this study, several distinct phases of research were conducted to assess the efficacy of the evaluated model and method in comparison to traditional approaches. In all stages of the current research and across various investigations, a standardized conventional method was utilized for comparing and contrasting the innovative approach being studied with conventional approaches that have been widely used over the years. In this approach to learning vocabulary, students participate in three distinct exercises: matching definitions, multiple choice questions to check their comprehension, and a cloze test to demonstrate their ability to apply the newly acquired vocabulary in a sentence. The conventional procedure for teaching vocabulary that was used in this research entails a traditional classroom setting where students are presented with a list of new words and their definitions all in pen and paper format. The students are then asked to memorize the words and definitions through repetition and practice exercises such as matching words to their definitions and completing fill-in-the-blank sentences. The students are also given regular multiple choice questions and tests to assess their comprehension and retention of the new vocabulary. This method relies heavily on rote memorization and repetition, and may not necessarily promote a deeper understanding or ability to use the vocabulary in context.

3.2.4 Work plan

Design-based research provides substantial methodological and practical solutions that are gradually improved through the iterative evaluation phases. The terms alpha, beta and gamma testing used in software engineering also apply to educational design research. Alpha testing primarily concerns initial intentions, while beta refers

to implementation, and gamma testing is about the attainment (McKenney & Reeves, 2018). In the timeline for the current study, you may find that the first, second and third periods refer to alpha testing. Implementation starts from the fourth period and is iterated three times at least. In the 21st and 22nd periods (see timeline of the study in Table 8), design and research are considered ready to be in use.

McKenney and Reeves (2018) illustrate the iterations in DBR in three phases and eight steps. The number of steps may increase depending on the research. In this research, each iteration has formative evaluation steps and is planned to take around one semester time with evaluation steps.

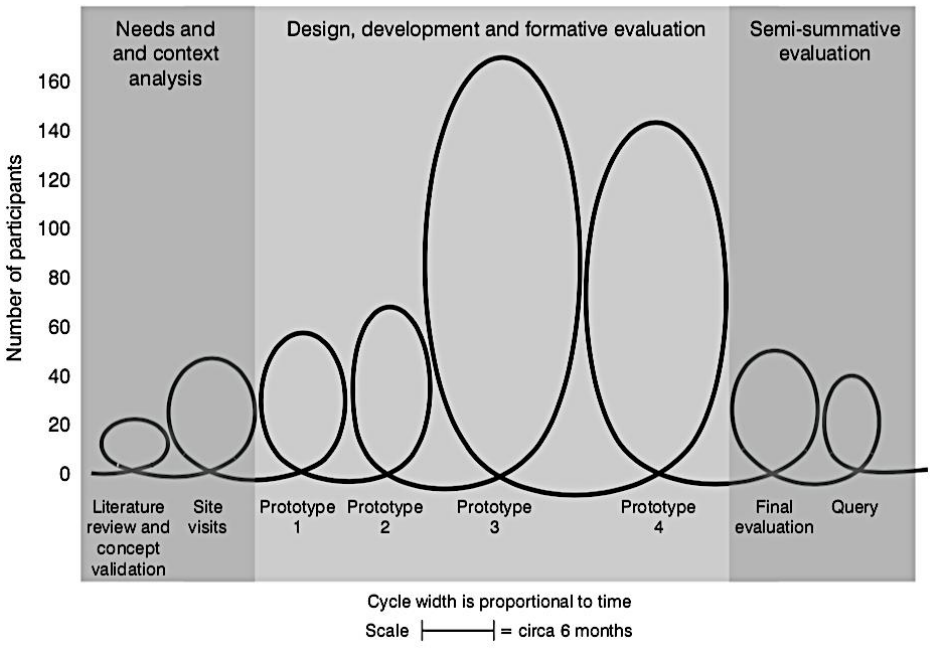
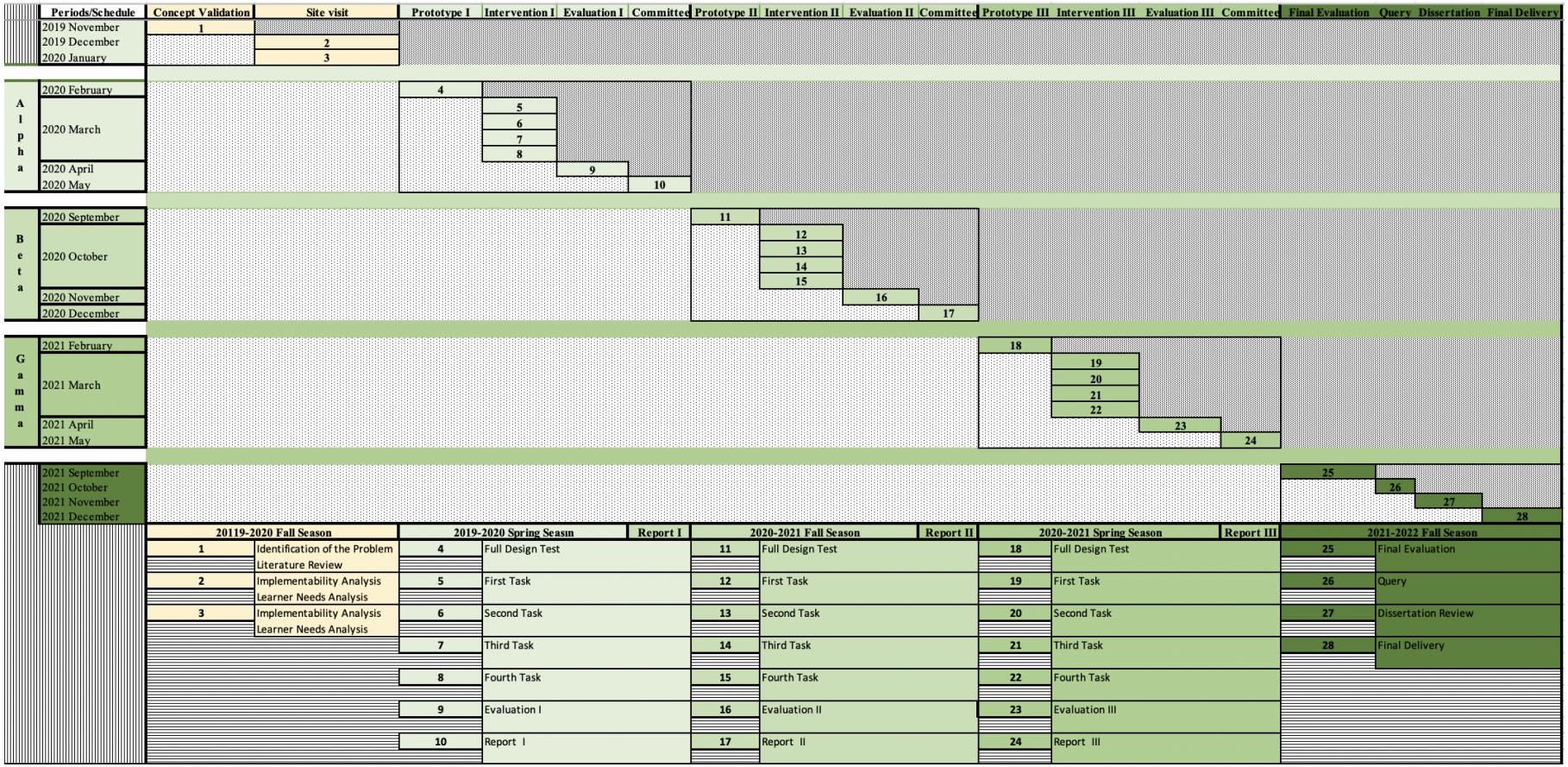


Figure 16. Iterative design procedures
Source: McKenney and van den Akker, 2005; McKenney and Reeves, 2018

In the timeline of the current study, fitting the figure above, there are three phases of DBR processes: needs and context analysis (steps; 4,11,18), design development and formative evaluation (steps 5-8, 12-15, 19-22), and semi-summative evaluation (steps 9,16,23). Each period was planned to take between four weeks and six weeks after the possible approval from the Committee.

Table 8. Timeline of the Study



3.3 Data collection process and components of the design

3.3.1 Data collection instruments

In the study, three sets of data collection instruments were planned to be used: (1) scales for the analysis of the affective variables: SE (Appendix C) and SRCVOC (Appendix D) scales and strategy inventory for language learning (SILL, Appendix B) as well as the vocabulary level test (VLT), (2) The Instructional Materials Motivation Survey (IMMS) (see Appendix E) Instrument to measure learners' attitudes towards the design, and (3) achievement test. The items in the scales were either same as the original, or an adapted version of them was used for SILL (see Appendix F). Prior to the implementation, ethical approval was obtained from the universities where the research was carried out and Boğaziçi University as the PhD program holder (see Appendix F). Since three sessions were planned to be conducted for the design process pre-test, treatment and post-test, different dates are planned to collect the data for the instruments. In the pre-test part, SE, SRL and SILL were collected. During treatment, The Instructional Materials Motivation Survey was used for the evaluation of motivation and lastly post-test was conducted to understand whether there was a significant difference.

After completing the requisite interviews with the relevant experts in each subject field, the data collection instruments for the proposed educational intervention were chosen. Listed below are the names of researchers who developed and adapted each scale, as well as those who determined its coefficient of internal reliability. Following an examination of the relevant prior research, the data-gathering methods that were deemed to be the most recent and reliable were selected for the study. For the objective of conducting a context analysis as part of this

research, a variety of questionnaires, tests, and inventories were carried out over the course of the research. As an example, the self-efficacy scale used in this research was developed by Wang (2012) and was adapted by Açıkel (2011) (Açıkel stated n.d. in his doctoral thesis). Gözüm and Başbay (2019) identified that Açıkel's version has an internal reliability coefficient of .97. Likewise, Tseng, Dörnyei, and Schmitt (2006) developed "Self-regulation Capacity in Vocabulary Learning" (SRCVoc) and Bilican (2013) found that the internal reliability coefficient of his study's Turkish version was. 97. In addition, Keller (1993) developed the "Instructional Material Motivation Survey," which Dinçer and Doğanay (2016) adapted (internal reliability coefficient; .93), and this was also incorporated into the current study. To be able to assess the effectiveness of individualized design, the "Strategy Inventory in Language Learning" (Oxford, 1990) was included in the study. It is the most widely used and accepted strategy inventory (Hsiao & Oxford, 2002; Chamot, 2004; Ellis, 2008; Demirekin, 2017). Cesur and Fer (2007) conducted a validity and reliability study, and full adaptation was based on Demirel's (2009) study (internal reliability coefficient; .91). Finally, Webb, Sasao, and Ballance's (2017) vocabulary test were employed. Since it was already communicated in English, no further translation was required.

3.3.2 Data collection procedure

The research included one vocabulary size test, four scales and an achievement test with IMMS. Considering that the instruments collect quantitative data, it could take time for the participants to answer all items at once. To attain this goal, a day for the questionnaires was planned to be spent with an introductory explanation before they started answering. The order of them started with SILL and continued with SE and

SRL scales. In the first phase of testing the prototype, hardcopy sheets were distributed to learners and data collection was performed manually by the researcher. Then, during the beta-test, Google Forms were used with the aim of testing the automatic analysis done by Google Sheets doc, which gets the data from Forms docs with the “query” formula. In the first iteration, the algorithm planned before submitting the data was tested, and after the significance values were found sufficient, iterations were improved according to the results from the “Instructional Materials Motivation Survey”. Horn (2018) states that tangible interaction with educational material gives rise to better results. Therefore, Google software was used only for the automatic analysis for differentiating learner styles and needs. The intervention for each learner in the experimental group took a handout in which tasks and prompts were stated.

3.3.3 Components of the design

Preliminary research conducted on the tool assisted in identifying the crucial elements of its configuration. For instance, the observation of the hyperlinking during the site visit phase was inadequate, thereby highlighting the necessity for the implementation of a learning management system (LMS). Alternatively, the second phase, which consisted of an investigation of international digital language learning apps, demonstrated the effect that organizers, helpful tools, and methods have on the creation of digital solutions. In this manner, at each stage, the versions that were made available to students were refined and improved. However, several structural units were envisioned from the outset, and the researcher examined the best ways to incorporate them into the design. The following is a list of the aspects of the design

that were considered to be helpful in providing students with an instructional resource that was superior to that provided by conventional materials:

Pedagogical agent: Each item that makes up a lesson or module has a pedagogical agent that may be found at both the beginning and the end of the item. The pedagogical agent first appeared at the beginning of the class to provide some initial instructions on how to pass the item and then reappeared at the end of each lesson to remind students of the final requirements for achieving mastery.

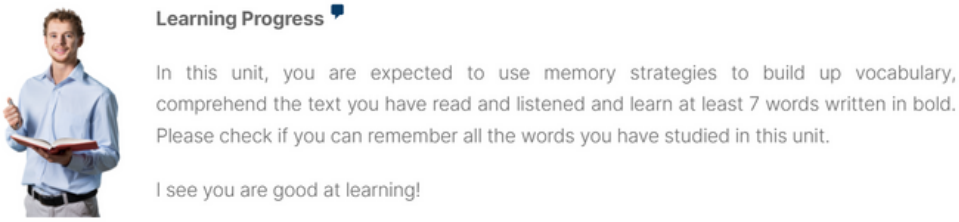


Figure 17. Sample of a text by pedagogical agent

Translation: The instructions offered by the pedagogical agent were translated and made available to the learners. Access to the translations was provided via a chat bubble icon.

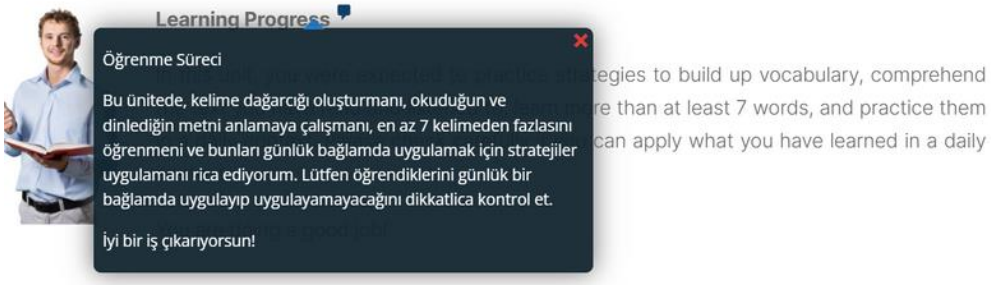


Figure 18. Translation of the prompt by pedagogical agent

Multimedia files: As a supplementary resource for learning new words, students were given two different kinds of audiovisual files. The pictures were utilized to capture their attention, and the audio recordings of the reading passages were delivered to provide the pronunciation of the words. The goal of providing audio support to teach the pronunciation of newly introduced vocabulary was to ensure that students had a thorough understanding of the word.

Figure 19. Sample audio file in a learning item

Dictionaries: The reading materials were equipped with an integrated dictionary to facilitate the understanding of students. The students were instructed that words that were underscored could be clicked on to access their definitions in the dictionary. This pop-up feature presented the meanings of the words in both the native language and an English-English dictionary concurrently with the definition in the native language. This was achieved by utilizing the Merriam-Webster dictionary software APIs.

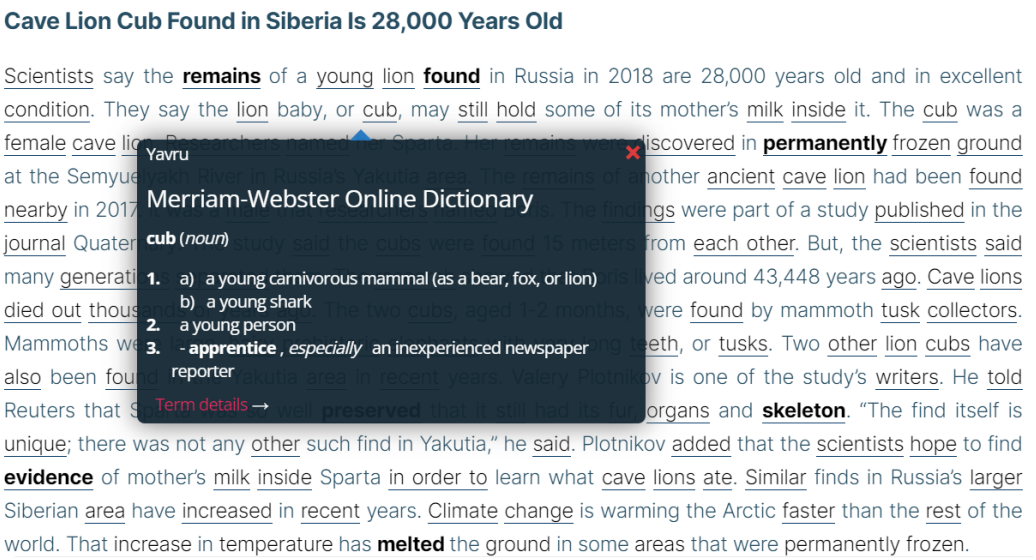


Figure 20. Sample word in a passage of which meaning displayed via API

Pronunciation: Text-to-speech encoding was applied to each word in the reading passages to ensure proper pronunciation. The pronunciation of the words and sentences was audible, thereby benefiting the students by exhibiting the correct pronunciation. To minimize the possibility of disruptions, the voice with the least mechanical characteristics was selected. Mechanical voice refers to a computer-generated or synthetic voice that lacks naturalness and sounds artificial. In this context, choosing a voice with fewer mechanical qualities implies selecting a voice that sounds more natural and less robotic.

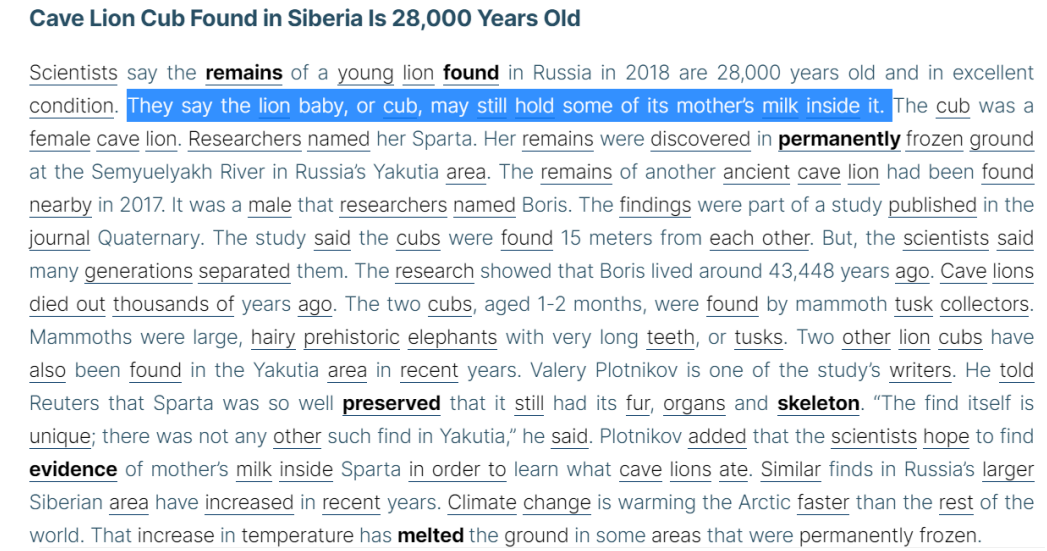


Figure 21. Sample selection display to pronounce the sentence

Assisting tools: Learners had access to a variety of supplemental materials thanks to the use of several different Progressive Web App (PWA)s. For instance, using the created interface, students were able to take notes, construct to-do lists, habit loot forms, access podcasts and articles, use flashcards, and view training module notifications.

Figure 22. Display of essential tools on both computer and mobile device

Live lessons: Students could instantly connect to real-time classes whenever they needed help understanding a concept or a word. A live lesson button was presented to students at the beginning of each section, and they were instructed on how to make use of these sessions.

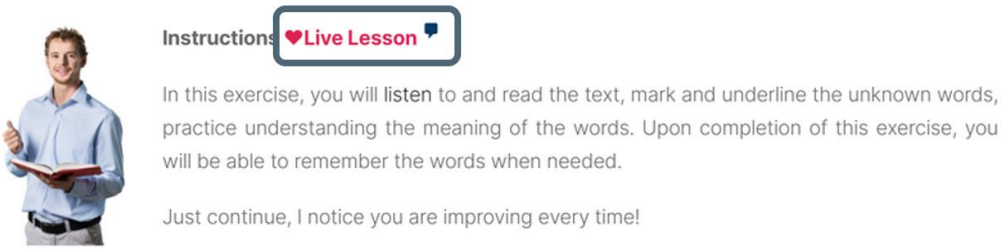


Figure 23. Live lesson button in a sample learning item

Chatbot widget: Learners have the opportunity to ask questions via text in a variety of social media channels during each and every lesson or item in the course. Through the use of a page-based chat widget, they may gain immediate access to various avenues for their questions and get their answers immediately.

Reference QR Codes: Each displayable learning component in a lesson includes a QR code. The intention was to utilize this as a page number. Another role of these codes was to allow students to move their processes between devices. A learner studying on a PC, for instance, can scan the QR code and continue on a mobile device.

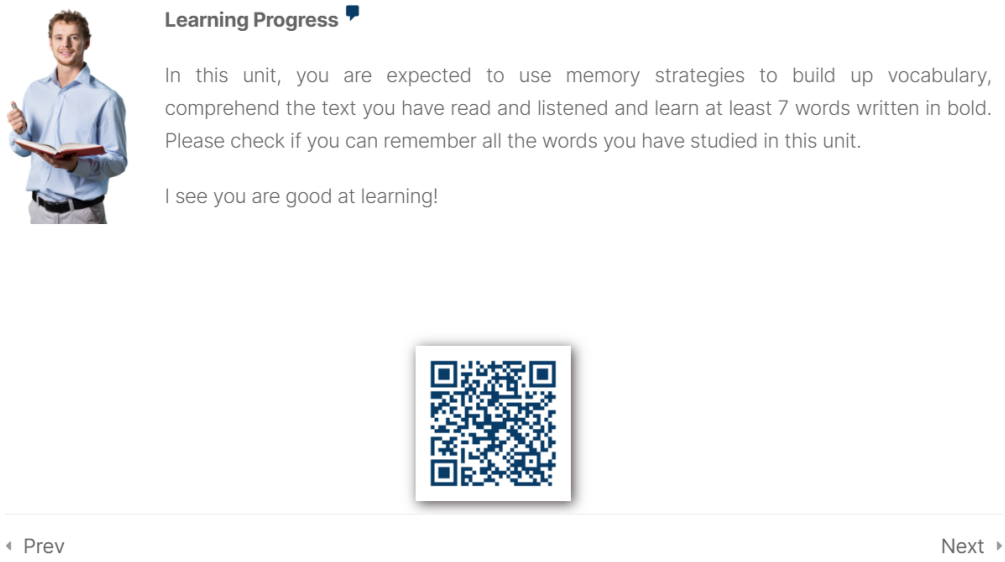


Figure 24. Sample QR code display in a learning item

These elements structured the PWA for the advantage of students. There appeared to be a clear pattern of how often certain resources, such as live lessons, were utilized. Articles about language acquisition processes, for example, were not widely read by language learners. Learners, on the other hand, expressed their gratitude for having access to rapid dictionaries and for being able to contact the instructor at any moment. These supporting tools and APIs led them to acquire the pronunciation of words themselves without asking questions, which eliminates a major source of confusion and misunderstandings while acquiring new vocabulary. The example content for the images displayed with the reading passage was taken from Voice of America due to the fact that their copyright policy states, "all text, audio, and video material produced exclusively by Voice of America is in the public domain." The website voanews.com, Voice of America, or VOA was credited on the PWA whenever any VOA content is used.

CHAPTER 4

RESULTS

4.1 Phase I. Exploratory study related to the design

4.1.1 Introduction

During the site visit phase of this design-based research, questions pertaining to learners' cognitive and affective factors that were deemed essential for profiling were addressed. This phase lasted a semester and, in the end, the exploratory reports for the digital learning environment were generated by drawing upon the relevant outcomes. Following the process of data collection and consequently gap identification, learning objectives for the to-be-developed module were identified. In addition, after establishing the change mechanism, the researcher made a visit and consulted with learning scientists at University of Nottingham to obtain further comments and perspectives on the methodology of the study. This enabled to arrive at useful insights and ideas from specialists in the field, which assisted in refining and enhancing the change mechanism that would constitute the basis of the e-learning platform. Hence, the site visits and soliciting advice from a varied set of specialists ensured that the change mechanism was well-informed and based on current research and best practices in the field of learning sciences.

In accordance with the principles of the Analysis-Design-Development-Implementation-Evaluation (ADDIE) instructional model, the exploratory study phase included context analysis, which comprised a needs assessment and learner and learning environment profiling. In order to pinpoint where improvements were needed, the needs assessment section provided a detailed breakdown of both the overarching educational goals that have not been accomplished and the specific

performance targets for each student that are tied to those goals. As a consequence of this investigation, the factors that contributed to the occurrence of the variables related to learners were investigated, and appropriate solutions were listed and studied. Assessing needs prior to deciding on learning objectives and design choices also assisted in selecting the most feasible intervention.

Contextual analysis of this study was enhanced with learner analysis, but several demographic factors, including gender and socioeconomic status, were deemed superfluous for the design selection. On the other hand, disability or special needs status was investigated to ensure that every participant had equal opportunity and accessibility. Participants with different mother tongues were also excluded since they could struggle to discover counterparts for the terms as they were translated. Cognitive and affective variables were used to examine learner characteristics. Cognitive factors were investigated by identifying the least-used language learning strategy and leveling its utilization. Learners' self-efficacy (SE) levels were also regarded as relevant in terms of emotional variables since the constituents of SE could lead the nascent design to offer either productive or receptive skills. The function of training, concerns for delivery, resources to employ, compatibility with learners' demands, and the capacity to replicate a performance setting were all discussed in the contextual analysis of a probable e-learning environment.

The analysis of learners' demographic data and traits, as well as the components of the learning environment, resulted in a description of the e-learning environment. The description was based on existing curricula as well as the environment, system, resources, cultural, and philosophical factors. The learning outcomes were then classified as declarative knowledge/verbal information using Gagne's (1985) taxonomy. The learning goals were determined based on a

classification process that took into account relevant variables and literature. The learning objectives were aimed to be achieved through three primary learning goals: upon completing the training program that provides cognitive aid tailored to learners' needs, adult EFL learners at higher education institutions will be able to (1) expand their vocabulary through the assigned texts, (2) explain the meaning of them, and (3) use them in a sentence by fostering the use of language learning strategies.

Table 9. Phase I Research Questions and Process Details

DBR Step	Analysis
Research Question	What are the cognitive and affective variables, such as self-efficacy levels, self-regulated capacities, and strategy use, among the target population of the learning environment, and how do they relate to their vocabulary levels?
Data Collection Instruments	Vocabulary Level Test Strategy Inventory for Language Learning Self efficacy Self Regulation Capacity in Vocabulary Learning
Research Method	Survey
Hypotheses	Low cognitive scores in language learning strategy use, Low affective scores, Low vocabulary levels
Intervention	No intervention, descriptive study
Target Population	Adult intermediate learners
Number of Participants	229-193 (changes in surveys)
Results Obtained	Low-scores in target variables

Because the research would be conducted at a higher education institution, the target audience was adult undergraduate EFL students. Bloom's taxonomy (1956) was used to develop terminal behaviors, especially at the lower levels: remember,

understand, and apply. Conditions of demonstration of the behavior were planned to be provided via strategy fostering tasks and prompts. The degree as criteria to measure was the number of correct responses given in the achievement test delivered at the end of the training program.

The hypothesis 91ort he91 study was that the survey results would show that learners with low self-efficacy, low vocabulary size, low cognitive and affective variables, and low self-regulated capacity would have lower vocabulary learning performance. This hypothesis suggested that these variables were related to vocabulary learning performance and were expected to be low among the surveyed learners. The research question aimed to investigate the cognitive and affective variables of the target population in the learning environment and their connection to vocabulary learning performance. Surveys were provided to learners with hyperlinks and the obtained results indicated that target population in the learning environment had low cognitive and affective scores and had low academic achievement in vocabulary learning thus far. The research question and research process 91ort he91 phase was therefore designed to address the research questions 91ort he overall study.

4.1.2 Research goal

The Phase I research objective was to conduct context analysis in order to inform the design of the learning environment. The context analysis process includes steps such as need assessment, learner analysis, learning environment analysis, learning environment description, and learning goal selection. Educational needs were defined, analyzed, and prioritized for the design during the needs assessment step. In the learner analysis section, questionnaires were used to investigate several variables

relating to learners' demographics and learner characteristics. Consequently, the learning environment was defined using the data gathered during these processes. Learning objectives were established in light of the findings from the final stage of context analysis regarding needs, the learning environment, and learner analysis.

4.1.3 Participants

The Phase I study included 229 intermediate-level English language learners enrolled in the first or second year of undergraduate studies at a Turkish state university. The sample represents individuals learning English as a foreign language, as they were all above the age of 18 and engaged in an active learning process with a variety of affective and cognitive characteristics. The vocabulary size test (n=229) had a higher number of participants than other data collection instruments, such as the strategy inventory of language learning (n=212), self-efficacy scale (n=194), and self-regulation capacity in the vocabulary learning scale (n=193). Because the preliminary design necessitated a considerable understanding of Turkish as a native language, international students were not included in the participation list.

4.1.4 Data collection instruments

Prior to the subsequent phases of the research, it was planned that the instructional material for Phase 1 would be delivered via hyperlinks and that affective and cognitive data would be collected in this manner. In practice, the tangible benefit of hyperlinks proved to be more detrimental. This was because the researcher was unable to retain the same number of participants (n=229 maximum, n=193 minimum, 36 missing) in different data collection instruments such as VLT, SILL, SE, and SRCVoc. Learners were provided with a spreadsheet table to track their progress on the surveys and inventory, and links to their uncompleted surveys were periodically

reminded to them via this table. Because the phase's research objective was to identify overall learner profiles prior to developing the intervention (i.e., design), and because hyperlinks resulted in data with varying participant counts, a learning management system (LMS) was determined to be necessary for the tool.

4.1.5 Procedure

Each data collection instrument was distributed weekly to a total of 229 students. Participants were given 30 minutes to complete the questions on the instrument. Since the number of students attending each week varies, the number of participants in various forms of data collection decreased from 224 to 193. The instruments for data collection were created online, and a hyperlink was created in both QR code and text format. Three distinct distribution methods were used in both forms: mass emailing to university-provided user accounts, sharing on course-related social media platforms, and projecting QR codes to the entire classroom via the projector. Additionally, participants were provided with a control link to verify that they could submit the form assigned to them, ensuring that no technical difficulties occurred during the connection.

Prior to the collection of cognitive and affective variables, a vocabulary level test was conducted in which learners were asked to complete 30 vocabulary matching questions across five levels, totaling 150 items. This test was used to determine the participants' vocabulary level. The level of passages from which to learn vocabulary was intended to be determined by this data, which justifies the design choice. Along with level detection, data on participants' perceptions of their scores for each level were collected via the final item at the end of each segment, which asked participants to estimate the number of correct answers. The purpose of

collecting this data was to correlate it with self-efficacy scores to determine whether there was a significant difference in levels or whether the data demonstrated a pattern for overall judgment expectations. In addition, the number of participants in each level of vocabulary size was determined, as well as the level of perceived confidence expressed by participants via their judgment of learning scores. In short, this test was designed to elicit information about learners' achievement scores and self-evaluation for both the current level and the levels above and below. The purpose of this study was to determine whether patterns were visible and, if so, whether there was a more congruent design choice for participant use.

Along with the vocabulary test using JoLS, cognitive and affective variables were considered critical data points to profile learners and inform the learning environment more precisely. The strategy inventory for language learning was used to collect data on cognitive variables (Oxford, 1990). In this variable, learners were profiled according to their least effective strategy. The underlying rationale is to ascertain the factors impeding learning and devise interventions to mitigate the effect of these impediments. Another dimension of these findings was the identification of broad trends and frequencies associated with strategy use. It was also considered necessary for the intervention's design phase, as the number of participants in each strategy set could be anticipated during the intervention phase.

Concerning affective variables, learners were asked to complete two forms: one measuring self-efficacy (SE) and another measuring self-regulated vocabulary learning capacity (SRCVoc). The purpose of selecting these variables was to inform and shape the prospective learning environment based on the data's overall SE scores and the existing model's SRCVoc values.

Additionally, the sub-dimensions of each questionnaire were examined to aid in the design process. The frequency and means of receptive and productive skills were compared to accomplish this goal. Finally, the statistical significance of the difference between subdimensions was calculated to inform learning environments about choice tendencies, and the results were analyzed using a *t*-test. Thus, three categories of participant profiling were created for the learning environment context: placement by vocabulary achievement scores, distribution of cognitive variables, and patterning of affective variables.

4.1.6 Responses from participants

As this phase aimed to identify learner profiles for the purpose of reporting site visit steps in DBR, the researcher was interested in developing an overall profile and ensuring that details such as perceived confidence levels remained consistent across iterations. Four distinct instruments were used in this phase to assess the current state of learning prior to intervention. The vocabulary size test was the initial instrument. The purpose of collecting this data was twofold: to identify the target group for iterations and to reveal differences between different iteration groups. During this phase, participants were mostly found to have lower vocabulary levels on a vocabulary level test (VLT). The second instrument, strategy inventory language learning (SILL), was used to collect data on participants' strategy use and determine the least frequently used strategy by learners. Six disti'ct strategies were classified as direct and indirect strategies (three sub-strategies for each one). The third and fourth instruments were used to assess participants' self-efficacy and capacity for self-regulated vocabulary learning. Comparing the various participant groups were also intended for reporting in subsequent iterations.

Table 10. Descriptive Statistics for the Distribution of Vocabulary Level Test (VLT) Results

	Groups	N	%	Mean	Std. Deviation
Levels	L1(within the group)	135	58.95	16.84	5.78
	L1(all answers)			21.29	7.06
	L2 (within group)	58	25.33	18.67	5.00
	L2(all answers)			15.97	8.38
	L3 (within group)	15	6.55	20.13	5.19
	L3(all answers)			12.52	8.80
	L4 (within group)	3	1.31	13.66	10.40
	L4(all answers)			12.72	8.93
	L5 (within group)	18	7.84	27.05	2.53
	L5(all answers)			10.23	8.23
Total		229			

The vocabulary size test analysis indicated that the sample group (n=229) was primarily composed of L1 speakers (n=135), with a percentage of 58.95 percent (M=21.29, SD=7.06). The second level had 58 students and a percentage of 25.33 percent (M=15.97, SD=8.38), the third level had a percentage of 6.55 percent with 15 students, and all higher levels had a percentage of 9.15 percent with 21 students. As a result, a focus group of students in the first three levels with a 90.83 percent percentage (n=208 out of 229) was chosen. Additionally, data at these levels were notable in that average values within groups increased significantly (16.84, 18.67, and 20.13, respectively). This may imply that learners at the target group's higher levels had higher academic achievement scores during this exploratory phase.

The following step was to assess learners' perceptions of learning in order to correlate their memory judgment and self-efficacy. Among the affordances of the judgement of learning (JoLs) is the ability to monitor progress and comprehension, assess achievement, and assess readiness for a test (Pintrich, 2000). For this assessment, learners are required to monitor and evaluate their progress through each segment in order to profile them. After each segment, JoLs questions are placed, and

it is explicitly stated that they are related to the segment's previous 30 questions. This JoL question was designed to aid in the development of overall memory judgments for each level.

Along with the 30 questions designed to place learners on a vocabulary size scale, each segment received an additional question. The participants were asked how many words they believed they correctly answered, and their JoLs scores were subtracted from the total number of correct responses. If the result was positive, the participants' level of perceived confidence was classified as 'unconfident.' According to this formula, negative results in this calculation indicated that participants were 'overconfident,' whereas a score of 0 (zero), which indicates that the number of correct answers equaled the JoLs, indicated that participants were simply 'confident,' as they knew the exact number of correct answers.

Table 11. Descriptive Statistics for the Distribution of Participants' Perceived Confidence in Levels

Levels	Segments	N	%
L1	Unconfident Learners	81	60.0
	Confident Learners	41	30.37
	Overconfident Learners	13	9.63
L2	Unconfident Learners	35	60.34
	Confident Learners	18	31.03
	Overconfident Learners	5	8.62
L3	Unconfident Learners	6	40.00
	Confident Learners	6	40.00
	Overconfident Learners	3	20.00
L4	Unconfident Learners	2	66.67
	Confident Learners	1	33.33
	Overconfident Learners	0	0.00
L5	Unconfident Learners	9	50.00
	Confident Learners	5	27.78
	Overconfident Learners	4	22.22
	Total	229	100.00

Perceived confidence levels among students demonstrated a pattern for each level, with an emphasis on unconfident students. Unconfident learners outnumbered confident and overconfident learners in the first two levels: 60.00 percent for L1, and 60.34 percent for L2, with 81 and 35, respectively. Correspondingly, at higher levels, the number of unconfident learners was observed to be comparable to the number of confident and overconfident learners in their respective test segments.

Table 12. Descriptive Statistics for the Distribution of Overall Perceived Confidence Levels

Segments	N	%
Unconfident	133	58.08
Confident	71	31.00
Overconfident	25	10.92
Total	229	100.00

Unconfident learners outnumbered the sum of confident and overconfident learners when compared to the total number (%55.40). This pattern repeated itself at nearly every level and thus could be used to profile learners in this dimension.

The distribution of strategy groups within the overall population and within their own strategy set was analyzed. Additionally, learners were profiled in their own groupings as low, medium, or high users in accordance with Oxford's formula (1990).

Table 13. Descriptive Statistics for the Distribution of the Least Used Strategies

Groups	Variable	N	Range	Minimum	Maximum	Mean	Std. Deviation
Strategies	Mnemonics Strategies	32	23	9	32	21.97	4.94
	Cognitive Strategies	33	31	20	51	33.79	7.94
	Compensation Strategies	36	18	7	25	14.92	4.05
	Metacognitive Strategies	20	18	9	27	17.95	4.77
	Affective Strategies	72	19	6	25	12.29	3.72
	Social Strategies	19	12	8	20	14.16	3.04
	Total	212					

The strategy inventory for language learning (SILL) revealed the least and most frequently used strategies in this sample, as well as their distribution. The results indicated that the number of minimum direct strategy users (n=101, percent 47.64) was less than the number of indirect strategy users (n=111, percent 52.64), with the affective strategy group having the largest population. With a percentage of 15.09 and a population of 32 participants (M=21.97, SD=4.94), the minimum strategy used in direct strategies was memory strategies. The second strategy was cognitive, with 33 students representing 15.57 percent of the total population (M=33.79, SD=4.05), while the third direct strategy had 36 participants representing 16.98 percent of the total population (M=14.92, SD=4.05). In terms of direct strategy, the total number of direct strategy groups (n=101) was more evenly distributed than the indirect strategy groups. It could be ranked as follows: mnemonics (percent 31.68), cognitive (percent 32.67), and compensation (percent 35.64).

However, the distribution of participants claiming not to use the affective strategy was different from that of the direct strategy, with participants claiming not to use the affective strategy outnumbering all other strategy groups. The affective

strategy group had a significantly larger sample size (n=72), accounting for 33.06 percent of the total population and 64.86 percent of the indirect strategy group (M=12.29, SD=3.72). Other strategies were scarce. Twenty participants were assigned to the metacognitive strategy group. This represented 9.43 percent of the total population and 18.02 percent of the indirect strategy group (M=17.95, SD=4.77). Finally, the social strategy group had a total of 19 participants. This represented 8.96 percent of the total population and 17.12 percent of the indirect strategy group (M=14.16, SD=3.04).

The frequency with which participants in each group used the minimum strategy was levelled. Three label levels were used, and each learner was profiled in their own group. This data was gathered in order to determine the number of interventions to be repeated, as this design choice was intended to be determined by the data.

Table 14. Descriptive Statistics for the Distribution of Direct Language Learning Strategy Use by Levels

Strategies	Level	Number of Participants	%
Mnemonics Strategies	Low	17	53.13
	Medium	14	43.75
	High	1	3.13
Cognitive Strategies	Low	15	45.45
	Medium	17	51.52
	High	1	3.03
Compensation Strategies	Low	17	47.22
	Medium	15	41.67
	High	4	11.11
Total		101	100

Among thirty-two participants in mnemonics strategies and 36 participants in the compensation strategy group, the lower level of users of these strategies was higher (%53.13 and %47.22, respectively), while the cognitive strategy group had more

medium-level users (%51.52) than low ones (%45.45). The number of high-level users, however, was the least of the population in all strategy groups and could be listed as follows: %3.13 for mnemonics (n=1), %3.03 for cognitive (n=1), and %11.11 for the compensation strategy group (n=4).

Table 15. Descriptive Statistics for the Distribution of Indirect Language Learning Strategy Use by Levels

Strategies	Level	Number of Participants (n)	%
Metacognitive Strategies	Low	17	85.00
	Medium	3	15.00
	High	0	0.00
Affective Strategies	Low	56	77.78
	Medium	15	20.83
	High	1	1.39
Social Strategies	Low	10	52.63
	Medium	9	47.37
	High	0	0.00
Total		111	100

In the indirect strategy group, all strategy sets displayed the same pattern for the distribution of levels. The number of low users of each strategy was higher than the medium and high segments of users. The number of low-level metacognitive strategy users made up %85 of all within the group (n=17), and analysis of the results for affective and social strategies had the same pattern with fewer numbers, %77.78 in affective strategies, %52.63 for social strategies. The medium level of users was only significant in the affective strategy group in number (%20.83), but the number of high-level users was not significant for any group for being close to zero.

Among the affective variables of the participants in the exploratory study group, data regarding self-efficacy beliefs and self-regulation capacities were

collected. The distribution of the levels of learners' SE beliefs is shown in the table below.

Table 16. Descriptive Statistics for the Distribution of Self-Efficacy Levels Among Learners

	Segment	Number of Participants	Percentage
SE Levels	L1	2	1.03
	L2	3	1.55
	L3	26	13.40
	L4	66	34.02
	L5	66	34.02
	L6	20	10.31
	L7	11	5.67
Total		194	100

In this dataset, the data values are concentrated closely near the mean. Contrary to perceived confidence level data that displays more unconfident learners, the results display a discrepancy between self-evaluation of self-efficacy and the JoLs of each segment in the vocabulary level test.

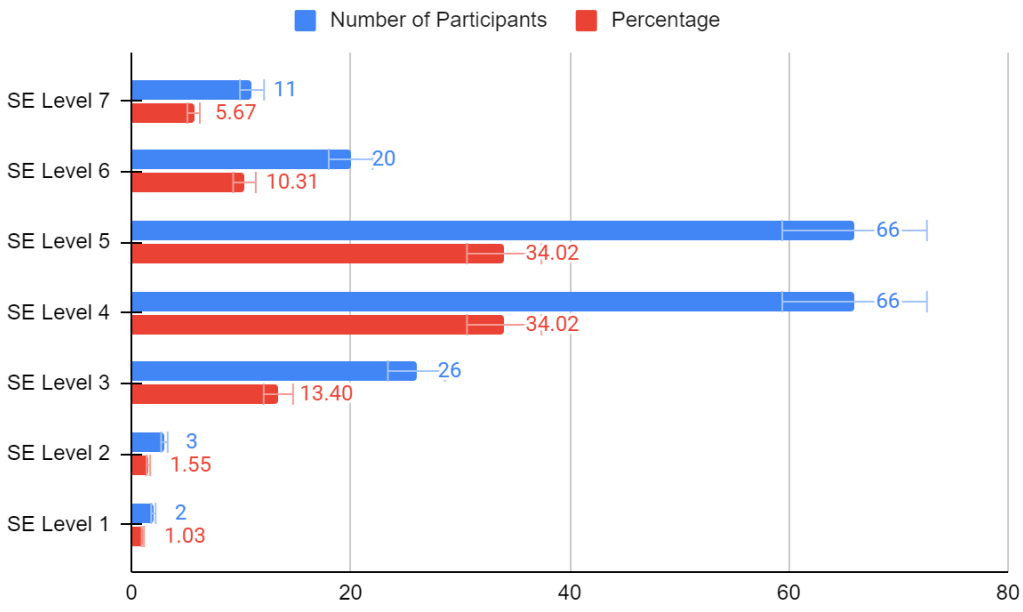


Figure 25. Distribution of self-efficacy beliefs in levels

The figure above illustrates that learners were primarily in the fourth and fifth levels of self-efficacy beliefs and that lower levels of the medium segments had fewer participants than higher levels.

Table 17. Descriptive Statistics for the Distribution of Self-Efficacy Constituents

Self-Efficacy Constituents	Number of Items	Range	Minimum	Maximum	Mean	Std. Deviation
Productive Skills	8	54	9	63	38.34	10.26
Receptive Skills	24	156	26	182	103.56	28.64
Total	32	210	35	245	141.90	38.23

In the self-efficacy questionnaire, eight items measured SE beliefs towards productive skills, while there were twenty-four questions for receptive skills. Among four skills in the language learning process (reading, writing, speaking, and listening), learners had higher mean values in productive skills (writing and speaking).

Table 18. T-test Result Comparing Subdimensions of Self-Efficacy on Means and Significance

Groups			Statistical Difference in Subdimensions			
		N	Mean	Std. Deviation	t	p
Subcomponents	Productive	194	4.77	1.285	3.791	.000
	Receptive	194	4.29	1.192		

There was a significant difference in the scores for productive skills (M=4.77, SD=1.28) and receptive skills (M=4.29, SD=1.19) sub-dimensions; t(386)=3.79, p=0.00. These results suggest that among subdimensions of self-efficacy beliefs,

learners tended to express higher self-efficacy for productive skills than for receptive skills, and the difference between these subdimensions was statistically significant.

Table 19. Descriptive Statistics for the Distribution of SRCVoc Constituents

SRCVoc Constituents	Number of Items	Range	Minimum	Maximum	Mean	Std. Deviation
Commitment Control	4	20	4	24	15.60	3.89
Metacognitive Control	4	17	4	21	14.27	3.69
Satiation Control	4	20	4	24	15.00	3.73
Environment Control	4	20	4	24	17.08	3.63
Emotion Control	4	18	4	23	14.54	3.41
Total	20	91	20	111	76.60	15.64

Data from vocabulary learning questionnaires on self-regulation capacity show that each sub-dimension has a wide range (M=19, SD=1.41) and close mean values. The average mean was 15.30 (SD=1.11). The highest segment was environment control (M=17.08, SD=3.63), and the lowest segment was metacognitive control (M=14.27, SD=3.69). Each segment had four items, and there was a total of twenty items. Each item had six alternatives for answers in this questionnaire, from “strongly agree” to “strongly disagree”. As the distribution was normal, this data indicated the need to equalize the focus on each segment in the design.

4.1.7 Discussion and conclusions

On the basis of the data collected, the site visit was reported under the headings of cognitive and affective variables. The vocabulary size test focused on the information on learners' achievement levels and judgments of learning. The strategy inventory aimed to explore the distribution of cognitive variables and the frequency of the least used strategy. In addition, each strategy's usage level was reported for the

number of iterations within phases. As for affective variables, a self-efficacy questionnaire was given to learners. This variable was analyzed at the suggested levels and constituents to explore whether there was a statistically significant difference between them. In short, the researcher was interested in drawing a general framework for the preliminary design and justified his choices by conducting a context analysis. The context analysis was conducted in five steps: i) needs assessment, ii) learner analysis, iii) learning environment analysis, and iv) learning environment description and selection of learning goals.

The results of the needs assessment test indicated that there was a performance gap in expected learning in vocabulary learning. Among the four basic skills in language learning, reading and listening could be considered for the learning phase of getting input, while writing and speaking aim to produce the ultimate expected output. Lack of vocabulary issues was found to have been inhibiting learners' ability to get input and create expected output. Learners all declared to be motivated to learn a foreign language. However, it was not an ordinary process for them to initiate their training by learning words. Therefore, both the performance gap for achieving learning outcomes and the information gap for following the correct route for each learner were aimed to be provided on a digital platform for their convenience and learning environment variables. Among the identified problems, target skills were prioritized accordingly.

Among learners' demographic variables such as gender, age, educational background, ethnicity, disability, and socioeconomic status, homogeneity conditions were stable. This was also ensured by excluding international students. Therefore, all the learners in this study were undergraduate native Turkish learners between the ages of 18 and 20. No participant declared a disability. Strategy groups were formed

by exploring learners' least-used strategies. Learners' cognitive characteristics were identified by the number of learners in each strategy group. The minimum number was in social strategies, while the maximum number of learners was in the affective strategy group. In accordance with this data, the importance of affective components in design was considered essential that needed to be placed priorly in the intervention plan. Additionally, activating learners in their community of learning was found as a facilitating factor.

The learning environment was evaluated through the results of the examination of various digital platform types, utilizing rapid prototyping techniques. The efficacy of the instructional venue was tested through various prototypes in hybrid, native, and progressive web app formats. In addition, a variety of learning management systems were assessed based on their universality criteria, as learners may have access to different tools to access the initial web design. The learning environment was designed to be as compatible as possible with instructional requirements and learner needs. The learning environment was described to inform the design, and three learning goals were stated: "upon completing the training program that provides cognitive aid tailored to learners' needs, adult EFL learners at higher education institutions will be able to (1) expand their vocabulary through the assigned texts, (2) explain the meaning of them, and (3) use them in a sentence by fostering the use of language learning strategies".

4.2 Phase II. Exploring worldwide platforms

4.2.1 Introduction

The site visit in Phase I revealed the requirement for a tool that could be utilized by all learners inside and outside the classroom. As the parts of this educational tool

were being put together, another search for the parameters of similar tools on the market turned up, was planned and carried out. Business models, learner preferences, app types, generated materials' service platforms, and interactivity models were all considered essential parts of the process. As a result, the objective of this Phase was to define the preferences of the learners as well as the digital solutions that were accessible on the market at the time being. In addition, the various types of apps had been through a process of rapid development, and the solution that was picked to be produced was the one that was the most adaptable and accessible. The researcher collaborated with a team of other researchers within the context of a COST (European Cooperation in Science and Technology) Action. The researcher contributed to the preparation and distribution of surveys and participated in the analysis of the collected data, working alongside data scientists and computer scientists. The goal of this collaboration was to provide a framework for the market by presenting an overview of existing solutions and informing the environment in which a tool to be designed would be implemented. In order to develop the questionnaire for this phase of the investigation, a workshop was organized at the University of Coimbra, Portugal. It entailed establishing suitable routes for survey distribution and ensuring that it was translated into a number of languages to maximize participation rates. By meticulously designing and implementing the survey, we, as group of researchers, were able to collect rich and diverse dataset that provided significant insights into the present state of digital language learning tools and how they are utilized by learners throughout the globe.

The table below describes a study that was conducted to examine the various features and services offered by language learning applications and platforms. The research question for the study focused on how these features, including the

languages taught, interactive exercises, and user interaction, were being used and implemented in the current market.

Table 20. Phase II Research Questions and Process Details

DBR Step	Analysis
Research Question	How have the many functions and services that language learning applications and platforms provide, such as the languages that are taught, interactive exercises, user interaction, and business models, been utilized and put into practice in the current market?
Data Collection Instruments	Survey Annotation Form
Research Method	Survey
Intervention	No intervention, descriptive study
Target Population	Users of digital language teaching applications
Number of Participants	1374
Results Obtained	A variety of provided languages, business model types, operating frameworks, and offerings of interactive exercises.

Data collection instrument was a survey and the target population was users of digital language teaching apps and platforms. The results of the study indicated that there was a diverse range of languages, business models, operating frameworks, and interactive exercises being offered by language learning platforms. Permission to use the survey and the resulting data for this study was granted to the researcher. Subsequently, the researcher offered to perform the analysis of the results independently. The aim of this phase was to identify patterns in the data that would inform the direction of the research. To achieve this, the researcher collaborated with a data scientist from the Bulgarian Academy of Sciences for a period of twenty days.

During this collaboration, the researchers thoroughly analyzed the data to identify relevant patterns.

After the researcher had finished conducting the initial analysis and annotation of the data on his own, the members of the COST Action group extended an invitation to the researcher to verify the accuracy of his findings with a computer scientist from the Artificial Intelligence department of the University of Malta. The researcher spent one month at the University of Malta so that he could be certain that the data he was using were accurate and reliable. Utilizing cutting-edge data analysis technologies such as artificial intelligence and cooperating closely with coworkers was a necessary step in this procedure for locating any inconsistencies or anomalies that may have been there.

4.2.2 Research goal

The objective of the Phase II study was to investigate the available digital media solutions for language learning and perform an analysis of their size, platforms, business model, interactivity in exercises, and offered languages. The purpose of this analysis was to establish the foundation principles for decision-making. Information on entities provided by participants was annotated, and the existence of interactive exercises was noted for further analysis in future phases. Data regarding the size and business model of apps/platforms were aimed to indicate overall learner e-learning preferences. Information about the number of provided languages for teaching services was also collected in all apps/platforms with the purpose of detecting the dedicated products in the market. In addition, digital media platforms and app types were investigated for the purpose of comparisons in terms of performance, flexibility, and universality.

4.2.3 Participants

The Phase II study enrolled 1374 people from sixty-seven different countries with 42 different native languages. All participants confirmed they had used at least one digital language learning platform. Project team members contacted the participants by emailing a list of 182 committee members from 38 different countries in the project and asked for assistance with the distribution of the survey prepared by the working group members. Because the project's council was comprised of academics, the survey was disseminated mainly to university students. The demographics of the participants were not deemed relevant to the study as the primary aim was to identify users of digital language platforms.

4.2.4 Data collection instruments

This phase utilized two instruments. The first was the survey issued to participants, and the second was the annotation file for the responses collected. The survey that was distributed to the members of the committee involved in the COST Action project was initiated by our working group. A statement was included in the survey which described the nature of the project and the purpose of the research. The participants were advised regarding the consent procedure and were informed that their completion of the survey would be considered as an expression of their consent to use their data for research purposes. The survey was dedicated to collecting the names and reference links of various digital language learning platforms. Participants were requested to provide up to ten URL links that they know and/or have encountered. Participants were also notified that they would be kept informed of the survey's results, the next steps of the research, project initiatives in general, as well as the survey's expiration date and project organizers' email addresses for any

potential concerns. The survey was prepared by the members of the working group involved in the COST Action project. It consisted of a set of items designed to gather information and data related to the project and research. The number of items in the survey may vary, but the overall objective of the survey was to gather information in sub-dimensions such as project progress, research findings, and participant experiences. The team members carefully crafted each item to ensure that it was relevant to the project and research, and that it effectively captured the information needed to advance the project and support the research initiative. The survey was designed to be comprehensive and to provide a clear understanding of the project and research.

The annotation file for the gathered responses served as the second instrument for conducting the data analysis. Several meetings were held by the project's working group in order to select the probable dimensions that were going to be evaluated. Following that, the annotation file included the following variables:

i. cryptic and working references,
ii. platform language,
iii. access blockers,
iv. size of the user base,
v. existing interactive exercises,
vi. automatic feedback mechanism,
vii. number of languages taught,
viii. business model

This four-step process followed by the working group led to the investigation of the aforementioned dimensions for the existing global digital language learning platforms. The researcher took part in all stages of the project, including attending

meetings to prepare the survey in Coimbra, as well as online meetings to prepare the annotation file. The researcher also annotated all items in the first round with a data scientist and then annotated all items in the second round with the team working group members. The researcher double-checked any changes between the first and second rounds at the University of Malta's Artificial Intelligence department with a computer scientist from the working group.

4.2.5 Procedure

The data collection instruments were prepared by researchers in a meeting held at the University of Coimbra, within the context of the COST Action-European Network for Combining Language Learning with Crowdsourcing Techniques (Action Nu.: CA16105). The technological requirements for survey distribution were relatively basic. Therefore, most survey technologies should be able to accomplish the work. Despite this, the Cost Action working group considered and tested various options before settling on the lime survey as the most efficient one for the current case.

To motivate participants, we held a lottery (e.g., to win Amazon vouchers). A "ticket" was awarded to each participant for their response. The value of these tickets increased if the reference to the language-learning platform was uncommon. The reason for this was to find the least populated platforms. Users were encouraged to submit reference links to smaller or more country specific. We limited the number of participant contributions to 10 answers to generate a sense of doability and forced them to refrain from spamming us with well-known platforms. The restriction to only 10 reference links was implemented to prevent excessive spamming.

We asked for only the most essential information and concentrated almost entirely on acquiring their URLs. If participants utilize some platforms, we asked

their view of the platform's utility and the frequency with which they use it. Since this survey was the most extensively disseminated component of this effort, we wanted to ensure its accuracy before sending it out. Prior to the distribution of the survey, we thus conducted a pilot study and examined the potential communication channels as below:

i. Cost actions member of committee (MC) group and social media,
ii. teachers' associations,
iii. universities students,
iv. citizen Science platforms,
v. search engine scanning,
vi. local conferences.

Hyperlinks of the surveys were distributed online to 1702 participants in 42 different languages from 67 countries, and items of 576 different digital solutions were collected and listed. Following this process, the working group in Cost Action decided that the researcher would annotate 595 responses for the detection of the populated digital language-learning platforms. Annotation of items was organized in four stages. The first stage involved the creation of an annotation file that accounted for the analysis's dimensions. The second phase of the process involved the primary annotation of all items by the researcher. This was followed by a third phase, where all group members participated in a re-annotation of all items to verify the initial annotation and enhance consistency. In the event of any discrepancies, the group members informed the researcher, who then had the opportunity to review and make adjustments to any differing annotations from the first stage. The objective of this two-stage process was to ensure the accuracy and reliability of the annotations. In the fourth stage, the researcher concentrated on the inconsistencies, provided

justifications for the final decisions, and obtained confirmation of this analysis from the working group leader. For the early annotation, the researcher worked with a data scientist at the Bulgarian Academy of Sciences to analyze each item on the annotation form. For the reannotation stage, the researcher collaborated with a computer scientist at the University of Malta's Artificial Intelligence Department to ensure analysis consistency and reliability. COST Action-CA16105 funded all the costs for the process within the scope of short-term scientific mission (STSM) projects.

4.2.6 Responses from participants

The phase consisted of two parts, the first of which was to compile a list of references to language-learning platforms and the second of which was to tag and analyze each one in-depth with an annotation form. The numbers reached during this phase were determined after the valid references were extracted from the total data and the cryptic links were eliminated. The number of total references was 595, but 31 responses out of them were deemed invalid and taken out of the study.

Table 21. Number of Valid Responses Without Blockers

	Number of Blockers	Total
Number of references		595
Invalid references	31	564
Language barrier	162	402
Registration and other blockers	9	393

The analysis was subsequently revised to remove platform links to languages that were unknown to the researchers (n = 162). The number of references made in the Dutch language was the highest among links containing an unknown language.

The researcher came across a total of twenty-five distinct languages that were completely beyond his comprehension when he was looking through the reference links. It is important to note that the use of translation technologies was found to be ineffective in terms of comprehending the target language. As a direct consequence, the researcher and the working group concluded that digital translation tools should be excluded from the research. This decision was made since the analysis was meant to be as accurate as reasonably practicable.

Table 22. Reference Links in an Unintelligible Language to the Annotator

Language	Number of Entities (n)
Croatian	15
Dutch	13
Portuguese	11
French	9
Hebrew	9
Spanish (Castilian)	9
Basque	8
Other languages	88
Total	162

The researcher encountered several additional challenges in accessing the platform, as a requirement to register with a credit card and make a recurring payment for access was necessary (n=9). The researcher was only able to gain access to some of the platforms that imposed this requirement, but not all of them. As a result of these challenges, the working group reached the conclusion that items with these blocking references should not be annotated.

Table 23. Number of Blockers Among the Reference Links

Blockers	Number (n)
Credit card registration	9
Invalid	393
Total	402

The requirement to register a credit card for recurring monthly or annual payments was not the only obstacle in gaining access to the platform. There were also other reasons, such as broken links within the platform and the need for access codes to Massive Open Online Courses (MOOCs). As a result of the dynamic nature of the digital language learning platforms and the fact that the market necessitates substantial updates in order for these platforms to catch up with the modern interfaces, methods, and standards of service, the researcher came across a few websites that had broken links in various points of entry to the website.

Table 24. List of Issues Preventing the Access to the Platform

Reason	Number (n)
Available Soon	1
Broken sublinks	1
Class/Book Code	1
Closed Server/No more working	1
Registration Code	1
Total	5

The researcher also examined the user bases of platforms to identify the most populated ones available on the market and the distribution among three categories: small (less than 10 000 users), medium (between 10 000 and 1 000 000 users), and large (more than 1 000 000 users). Excluding the option “I don’t know/I can’t tell.” (31.31%), 9.6% of all platforms were small, 31.82 % were medium-sized, and 27.27 % were large. The decision regarding the size of the user base was taken through a

comprehensive review of the platforms, particularly the social media followers, likes and download statistics of those platforms.

Table 25 summarizes the main characteristics of non-language-learning entities that were analyzed in the study. The tags column lists the different types of entities, while the number (n) column provides the count of each entity, and the percentage (%) column shows the proportion of each entity relative to the total number of entities analyzed. It is evident from the table that the most prominent non-language-learning entity was a webinar platform, accounting for 52.07% of the total entities analyzed. The second most prevalent entity was a Learning Management System, representing 16.53% of the entities. The remaining entities, including dictionaries, reading assistants, and others, accounted for a smaller proportion of the total entities, with each entity accounting for less than 2% of the total. Overall, the table provides a snapshot of the main characteristics of the non-language-learning entities analyzed in the study, highlighting the predominant entities and their relative prevalence.

Table 25. Main Characteristics of Non-language-learning Entities

Tags	Number (n)	Percentage (%)
Website to create interactive exercises.	1	0.83%
Chatbot	1	0.83%
Dictionary	14	11.57%
Find a tutor	1	0.83%
HTML language	1	0.83%
Irrelevant	1	0.83%
Learning Management System	20	16.53%
Language Learning School	1	0.83%
Music (or Podcast) platform	1	0.83%
Notetaking/Flashcard App	1	0.83%
Reading Assistant	15	12.40%
Social Media/Language Exchange	1	0.83%
Webinar Platform	63	52.07%
Website to share or download language learning content	1	0.83%

In the study, some of the reference links were directed to websites that were not relevant to the research objectives, including websites of language learning institutions and content sharing platforms for multimedia. Not all of the platforms offered interactive exercises with automatic feedback mechanisms. Despite this, the participants were encouraged to provide a link to any digital solution that aided them in their target language learning. Tools such as webinars and dictionaries could fall within this category.

Due to the fact that the chain questions were utilized for the annotation form, as well as annotation disagreements that arose from a question to the other, the number of responses to each question varied. Therefore, not all questions were displayed on each platform. For instance, questions concerning business models or service platforms were not displayed on platforms with cryptic references or irrelevant links.

Table 26 summarizes the operating framework of the entities analyzed in the study. The Service Platform column lists the different types of platforms, while the Number (n) column provides the count of each platform, and the Percentage (%) column shows the proportion of each platform relative to the total number of entities analyzed. It can be seen from the table that the majority of the entities, 43.64%, were operating as online websites. This was followed by entities operating as Android apps (27.18%), IOS apps (23.94%), and Mac apps (2.74%). The number of entities operating as Windows apps and other platforms was relatively small, accounting for 1.75% and 0.75% of the total entities, respectively. The table provides a clear picture of the operating framework of the entities analyzed in the study, highlighting the dominance of online websites and mobile apps as the preferred platforms for language learning entities.

Table 26. Operating Framework of the Entities

Service Platform	Number (n)	Percentage (%)
Online website	175	43.64
Android app	109	27.18
IOS app	96	23.94
Windows app	7	1.75
Mac app	11	2.74
Other	3	0.75
Total	401	100.00

In order to frame another aspect that was found significant, it was necessary to comprehend the business models of the entities. This dimension was included for no other reason than to have a complete picture of the market as a whole. Within the annotation item pertaining to the business model, there were three different options available. “Mainly free” refers to either entirely free or ad-included models, whilst “mostly not free” versions usually only provide a limited demo and require payment before you can advance with any further activities. Lastly, the business model marked as “partially free” does permit you to use the platform without paying and restricts your usage at some point.

Table 27. Business Models of Language Learning Platforms with Automatic Feedback Mechanisms

Business Models	Number (n)	Percentage (%)
Mostly free (e.g., the vast majority of content and features are freely accessible)	100	50.00%
Mostly NOT free (e.g., you can have a demo or a tour of the tools and content, but most of them are not available unless you pay for it)	48	24.00%
Partially free (e.g., paying some money gives you access to additional content or features or allows you to use the service more often)	52	26.00%
Total	200	

This business models could only be shown on two hundred entities because that is the number of identified entities (entities identified as language-learning platforms with automative feedback mechanisms and no blockers) that have been consensually annotated twice. It could be concluded from the results that the market favors free services supported by adverts and/or other income sources unless entirely free (50.00%).

The final aspect of the market for digital language-learning solutions examined was the frequency of languages taught among the reference links collected by the participants (see Table 28). A total of 312 languages were encountered through the use of digital language learning platforms. This data represents the number of languages that are taught by digital language learning programs or supported by these platforms. The most common languages found in reference links are presented below.

Table 28. Popular Languages in Digital Language Learning Solutions Market

Languages	Number (n)
English	135
German	85
Spanish	73
Portuguese	67
French	66
Italian	65
Russian	56
Japanese	55
Dutch	51
Swedish	50

The general framework of digital language learning solutions revealed that relevant solutions either offered English as a language service or already taught it. The most popular service platforms were online websites and mobile applications;

more than half of them used advertising on free versions as their business model. However, desktop versions and alternative services were used so infrequently, and paid versions of digital services were not widely employed. Consequently, each entity was analyzed in depth, and design decisions for the instructional tool were developed with a great deal of consideration for existing digital language learning solutions.

4.2.7 Conclusions

The objective of this phase was to define the existing digital language learning solutions on the market in order to comprehend the services provided and learner preferences. The inclusion of this stage in the research was done with the intention of assisting the researcher in better comprehending the implications, affordances, and uses of digital solutions. Valid references, languages taught, business models, service platforms, user size, and interactive examples with an automatic feedback mechanism made up the aspects of analysis. Based on the responses and the statistics collected, it was determined that English was the most used language, with German and Spanish coming in second and third, respectively. In terms of business models, freemium solutions were the most popular. There was a wide variety of service platforms available, but mobile compatibility was vital due to the widespread use of platforms like iOS and Android. In the final step of this research project, user sizes and interactive examples were studied for a follow-up study to better comprehend the proportions of exercises found in textbooks and digital solutions.

Additionally, the ideal service platform for the educational tool to be developed for this study was researched. iOS, Android, and Windows versions were all favored by different learners, indicating that both the learners' preferences and

their devices were diverse. As a result, the universality and adaptability of the design were of the utmost importance in order to reach all students within the same educational setting.

As an implication of the findings from this phase of the research, it was discovered that a website or access to a learning management system (LMS) was a practical means to reach all learners with a smart device. This was owing to the fact that all smart devices should have an active internet connection that can access websites, and all students in the educational setting have access to this technology. The solution, therefore, met the universality criterion but was not flexible enough to accommodate the growing popularity of mobile-friendly digital language learning platforms over traditional websites or learning management systems. Because of this, the researcher opted to test both native and hybrid app solutions for mobile versions of the application in order to satisfy the adaptability criterion. Many content management systems, or CMSs, were examined to achieve this. The researcher decided to proceed with the most reliable one. Following this, research was conducted on learning management systems (LMS), and the most versatile and stable system with device compatibility was chosen to embed into CMS. The LMS-embedded CMS concept was initially implemented as a web view app so that its effectiveness could be compared to that of hybrid versions. The researcher then encountered two disadvantages of this method: i) incompatibility with software updates and ii) a slow operating system. As an alternative, the hybrid solution developed during the conceptual design phase was ultimately implemented in the form of a Progressive Web App (PWA). The PWA solution provided the most advantages in terms of universality, adaptability, flexibility, speed, and software update.

4.3 Phase III. Study I. Enhancing language learning strategies

4.3.1 Introduction

The framework of the strategies-based instruction model proposes considering learners' cognitive, metacognitive, affective, and social variables in instructional processes in such forms as i) providing general study skills, ii) awareness training, iii) peer tutoring, iv) via strategy insertion into textbooks, v) videotaped mini-courses, and vi) strategies-based instruction (Cohen, 2000). The rationale behind is the assumption that high FLL strategy users end up with higher academic achievement. However, it should be pointed out that some strategies are already inherently good for some learners, while some other strategies may just have the potential. Therefore, in this phase of the research, the researcher investigated the effectiveness of the application of Oxford's strategies (1990) in the individualized form of a web design. As there are six different strategies in Oxford's frame, the researcher firstly found out the minimum strategy a learner uses, among others and assigned learners with the course that provided the potential help via strategy-based exercises in Oxford's recommendations (1990). Although there is a vast amount of literature on the effectiveness of providing guidance for the use of strategies in language learning, the researcher did not find a statistically significant difference between the control group with conventional exercises and any units in the experimental group with an individualized strategies-based instruction model course. Nevertheless, the statistical values in the comparison helped the researcher determine the design components and their sequence, as there was no significant relation found. It should also be noted that the effectiveness of Oxford's recommendations was

tested in a digital environment for each strategy different to popular approaches in the literature.

Table 29. Phase III. Study I Research Questions and Process Details

DBR Step	Design
Research Question	How do different language learning strategies compare in terms of effectiveness on a digital platform, as measured by vocabulary learning test scores, and how do these strategies compare to the conventional method of vocabulary learning on this platform?
Data Collection Instruments	VLT, SILL, SE, SRCVoc, Achievement Test
Research Method	Experiment
Intervention	Strategy Based Prompts
Target Population	Adult Intermediate Learners
Number of Participants	250
Results Obtained	Both the direct and indirect strategy groups had low strategy use VLT, SE, and SRCVoc scores were consistent with previous phase Higher scores in metacognition group, but difference not statistically significant

The table above describes a study that was designed to compare the effectiveness of different language learning strategies on a digital platform, as measured by vocabulary learning test scores. The research question for the study focused on how these strategies compared to the conventional method of vocabulary learning on the platform. To collect data for the study of this phase, the researcher used several data collection instruments including the Vocabulary Learning Test (VLT), the Strategy Inventory for Language Learning (SILL), the Self-Efficacy (SE) scale, and the Source of Vocabulary Learning (SRCVoc) scale. The target population for the study

was adult intermediate language learners, and a total of 250 participants were included in the experiment. The results of the study showed that there was low strategy use in both the direct and indirect strategy groups, and that there were consistent VLT, SE, and SRCVoc scores compared to the previous phase of the study. The scores for the metacognition group were higher, but the difference was not statistically significant.

4.3.2 Research goal

The goal of the Phase III study was to test the effectiveness of Oxford's recommendations (1990) on a digital language learning platform where the conventional method of vocabulary learning was the control group and courses prepared using each language learning strategy were the experimental ones. This research focused on the strategies themselves rather than the direct/indirect grouping or subdimensions of strategies. The conclusions of the comparison research aimed to establish correlations between strategies and scores on vocabulary learning tests. The preliminary design of the digital language learning platform was informed by the results of this comparison.

4.3.3 Participants

The Phase III study enrolled 405 participants in completing the strategy inventory. They were all enrolled in the first or second year of a Turkish state university's undergraduate program. International students (n=40) were not included in the study. In addition, two participants left the study. The surveys were completed by the following numbers of participants: n = 363 for the vocabulary size test, n = 343 for the self-efficacy scale, and n = 339 for the self-regulation capacity in the vocabulary

learning scale. Out of 339 students participating in all surveys, the first three language proficiency levels (L1, L2, and L3) were chosen as the sample. In vocabulary, levels were a total of 157, 69, and 24 participants, respectively. As a result, this phase involved a total of 250 active participants.

4.3.4 Materials

This step included the creation of a syllabus, hyperlinks to surveys, a tracking spreadsheet, and an e-learning demonstration environment. At the start of the semester, participants were presented with critical information to assist them with tracking the process. The syllabus specified the weeks for completing surveys and completing assigned activities. Each week, students were provided hyperlinks to surveys and SILL in order to follow the survey series synchronously. The spreadsheet had a list of participants who successfully submitted the form and those who did not. Any failed submissions by learners resulted in their exclusion from the study, as the study's analysis of the entire process was intended. Finally, a demonstration web-based learning environment was created in accordance with Oxford's guidelines for enhancing strategy utilization in a classroom setting. Seven courses were built into the learning management system to do this. The first was for the long-established conventional approach, while the next six were for six Oxford-developed alternatives. Each course included activities for each method and designated them as mandatory to complete in order to ensure that all students covered them. At the end of the semester, learners took a vocabulary exam to assess the efficacy of their learning.

Using an internet-connected device was required for participation, and the entire process was handled by integrating the contents into a learning management

system that was accessible from any smart device. Existing software was configured with embedded codes to present them as if they were native components of courses, allowing learners to follow a natural flow of tasks. With this way, the items, questions, activities, and all types of data were displayed to participants.

4.3.5 Procedure

Oxford's strategy proposals were listed in a software program, and each one was discussed with experts to ensure that they could be implemented in a digital environment while maintaining the original objective and origin of the activities. Based on this information, seven courses were created in the LMS, the first of which represented the conventional exercises that had been employed thus far, and the remaining six courses were for six distinct strategies Oxford framed. In total, seven courses were prepared; the first one was the control group of learners, and the others were enrolled in courses designed based on Oxford's strategies. Half represented direct strategies, while the remaining half represented indirect strategies. They were considered equal items for the sake of evaluating the efficiency of each of them, regardless of whether they were direct or indirect strategy group sets. In the following stages, the process was divided into three steps: (i) completing surveys for profiling, (ii) completing courses for the process, and (iii) completing exams to evaluate the effectiveness of each strategy in comparison to a control group of learners who were given conventional exercises.

The initial step consisted in administering a vocabulary level test to all participants, as it was determined that the design's target learner group would be pre-intermediate learners. Out of five different vocabulary levels, the lowest third was chosen to proceed with the research process.

In addition, each participant was given the SILL survey designed to determine the minimum strategy they employed when learning a foreign language. In this implementation, the goal was to assign participants to courses based on their individual status. Finally, all participants were also provided with the SE and SRCVoc surveys as a last step in the profiling process.

In the second step, participants were informed of the course they would be participating in and were supplied hyperlinks by e-mail as well as a software program. The courses were given the code ENGSA, and a number of items ranging from 101 to 107 were appended to the code, resulting in, for example, ENGSA101 for the control group in the course description. This method was followed to keep the purpose of their courses hidden.

4.3.6 Responses from participants

The study analyzed the results of tests comparing strategy-based exercises to conventional vocabulary learning methods. Results showed participants' vocabulary levels, self-efficacy beliefs, comparison of test scores between groups, confidence levels, and self-regulation capacity.

Table 30. Distribution of Vocabulary Size Test Results of Phase III

Levels	Groups	N	%	Mean	Std. Deviation
	L1 (within group)	185	50.96	15.34	6.59
	L1 (all answers)			21.57	8.03
	L2 (within group)	84	23.14	20.35	3.47
	L2 (all answers)			17.55	8.44
	L3 (within group)	33	9.09	18.91	4.32
	L3 (all answers)			15.05	9.22
	L4 (within group)	5	1.38	19.40	7.67
	L4 (all answers)			14.79	9.21
	L5 (within group)	56	15.43	25.77	1.85
	L5 (all answers)			12.45	8.89
Total		363			

The study in question identified five distinct levels of vocabulary proficiency among its participants. According to the results, nearly half of the participants (50.96 percent) were classified in the first level. This suggests that a significant proportion of the participants had a limited vocabulary and struggled with basic language skills. Furthermore, the distribution of the population across these levels was consistent with the results of the exploratory phase of the study. This indicates that the initial findings were reliable and representative of the larger population. The study's focus was on the first three levels of vocabulary proficiency, which accounted for a total of 83.19 percent of the participants. This suggests that a large majority of the sample population had limited vocabulary skills, and that these participants represented the primary target audience for the study.

Table 31. Distribution of Participant's Perceived Confidence According to Levels in Phase III

Levels	Segment	N	%
L1	Unconfident Learners	113	61.08
	Confident Learners	16	8.65
	Overconfident Learners	56	30.27
L2	Unconfident Learners	50	59.52
	Confident Learners	8	9.52
	Overconfident Learners	26	30.95
L3	Unconfident Learners	19	57.58
	Confident Learners	1	3.03
	Overconfident Learners	13	39.39
L4	Unconfident Learners	2	40.00
	Confident Learners	0	0.00
	Overconfident Learners	3	60.00
L5	Unconfident Learners	29	51.79
	Confident Learners	4	7.14
	Overconfident Learners	23	41.07
	Total	363	100.00

The learners' perceived confidence level was measured by adding one more question to each vocabulary level section. Learners were asked to estimate the total number of correct responses they gave in a certain section. Three possible self-efficacy statuses emerged from the total number of correct answers and participants' estimations: unconfident, confident, and overconfident. The distribution of participants' responses in the first three segments indicated that they lacked confidence in their responses. At these vocabulary levels, the number of unconfident learners outnumbered the number of confident and overconfident learners combined.

Table 32. Distribution of Overall Perceived Confidence Levels in Phase III

Segment	N	%
Unconfident	213	58.68
Confident	29	7.99
Overconfident	121	33.33
Total	363	100.00

The distribution of perceived confidence levels among language learners can be an important factor to consider in designing language learning materials and courses. In this study, the researcher found that learners in the lower vocabulary levels lacked confidence in their responses, with unconfident learners outnumbering confident and overconfident learners combined. This suggests that learners may need additional support and resources to improve their confidence and language proficiency. By taking into account the learners' perceived confidence levels, the researcher was able to make informed design choices and follow mastery learning principles. Mastery learning principles prioritize ensuring that learners fully understand and master a concept before moving on to more advanced material.

Table 33. Sample Group Perceived Confidence Status by Levels in Phase III

Level	Segment	N	%
L1	Unconfident Learners	94	59.87
	Confident Learners	16	10.19
	Overconfident Learners	47	29.94
L2	Unconfident Learners	45	65.22
	Confident Learners	5	7.25
	Overconfident Learners	19	27.54
L3	Unconfident Learners	13	54.17
	Confident Learners	1	4.17
	Overconfident Learners	10	41.67
	Total	250	100.00

The sample group was comprised of students who successfully completed all forms and tasks within the specified time frame. A total of 363 people participated in the study, with only 250 of them being selected as participants. Participants in the vocabulary learning test were mainly unsure of their responses, which was consistent with the overall picture. As a consequence, assumptions were formed, and the design choices were made.

Participants were awarded one point for each correct answer and zero points for each incorrect answer they provided. Because there were forty-eight questions in the test, the maximum possible score was 48, and the minimum scores ranged from six to thirty-five points among the groups. The social strategy group, represented in experimental group six, had the most considerable variation between the minimum and maximum scores, whereas the metacognition course students had the smallest range between the minimum and maximum scores. The experimental group with metacognition exercises outperformed the control group. The descriptive data for the study, which was based on replies from 250 participants, is presented in Table 34.

Table 34. Descriptives of Control and Experimental Group

Groups	Variable	N	Range	Minimum	Maximum	Mean	Std. Deviation
Multimedia Tasks	Comprehension Based Activities	42	27	21	48	38,17	7,80
	Experimental Group1[b]	31	31	17	48	36,29	8,22
	Experimental Group2[c]	47	3	11	48	37,02	10,14
	Experimental Group3[d]	46	30	18	48	36,89	8,61
	Experimental Group4[e]	16	13	35	48	42,62	4,95
	Experimental Group5[f]	45	28	20	48	36,24	7,26
	Experimental Group6[g]	23	42	6	48	35,56	11,22
	Total	250					

CBA[a] : Comprehension-Based Activities
Experimental Group1[b] : Mneomics Strategy-Based Activities
Experimental Group2[c] : Cognitive Strategy-Based Activities
Experimental Group3[d] : Compensation Strategy-Based Activities
Experimental Group4[e] : Metacognitive Strategy-Based Activities
Experimental Group5[f] : Affection Strategy-Based Activities
Experimental Group6[g] : Social Strategy-Based Activities

On the vocabulary accomplishment exam, the only group to perform better than the conventional group was experimental group 4, which participated in activities focused on metacognitive strategy-based activities. It is noteworthy to state that the smallest number was likewise found in the metacognitive strategy-based activity group, resulting in a high degree of homogeneity among learners when it came to applying their metacognition skills. This suggests that incorporating metacognitive strategies in language learning activities can enhance vocabulary acquisition and promote a more consistent level of achievement among learners. This result informed the researcher on the decision making processes for the designed tool as this aspect is outstanding.

Table 35. Analysis of the Difference in Achievement Scores Between the Comprehension-Based Activities Program and Strategy-Based Activities Program

Groups			Mann-Whitney U			
		N	Mean	Std. Deviation	Z	p
Multimedia Tasks	Control Group CBA[a]	42	38,17	1,204		
	Experimental Group1[b]	31	36,2903	1,47684	-995	.320
	Experimental Group2[c]	47	37,0213	1,47990	-128	.899
	Experimental Group3[d]	46	36,8913	1,27033	-732	.464
	Experimental Group4[e]	16	42,6250	1,23786	-1.824	.068
	Experimental Group5[f]	45	36,2444	1,08253	-1.619	.105
	Experimental Group6[g]	23	35,5652	2,33958	-813	.416

CBA[a] : Comprehension-Based Activities
Experimental Group1[b] : Mnemonics Strategy-Based Activities
Experimental Group2[c] : Cognitive Strategy-Based Activities
Experimental Group3[d] : Compensation Strategy-Based Activities
Experimental Group4[e] : Metacognitive Strategy-Based Activities
Experimental Group5[f] : Affection Strategy-Based Activities
Experimental Group6[g] : Social Strategy-Based Activities

In spite of the fact that academic performance scores in the metacognitive strategy-based activity group were higher than in the control group, there was no statistically significant difference. Overall, the 42 participants in the control group (M=38.17, SD=1.20) and groups of participants in the experimental groups had no statistically significant differences in achievement scores. Statistics of comparison for each group can be found in Table 36.

Table 36. Analysis of the Difference in Achievement Scores Between Comprehension Based Activities and Mnemonics Strategy Based Activities Group

Groups			Mann-Whitney U (post-test)			
		N	Mean	Std. Deviation	Z	p
Multimedia Tasks	Experimental	31	36,2903	1,47684	-995	.320
	Control	42	39.12	8,22		

Achievement scores of participants in the control group with comprehension-based activities (Mdn=40) were higher than those of participants in the mnemonics strategy-based activities group (Mdn= 37). A Mann-Whitney U test indicated that this difference was not statistically significant $U(N_{comprehension}=42, , N_{mnemonics}=31,) = 562.00$, z= .-995, p< .001.

Table 37. Analysis of the Difference in Achievement Scores Between Comprehension Based Activities and Cognitive Strategy Based Activities Group

Groups			Mann-Whitney U (post-test)			
		N	Mean	Std. Deviation	Z	p
Multimedia Tasks	Experimental	47	37,0213	1,47990	-128	.899
	Control	42	39.12	8,22		

Participants in the control group with comprehension-based activities (Mdn=40) had higher achievement scores than those in the cognitive strategy-based activities group (Mdn= 40). This difference was not statistically significant, according to the Mann-Whitney U test, $U(N_{comprehension}=42, , N_{cognitive}=47,) = 971.50$, z= .-128, p< .001. The non-significant difference in achievement scores between the control group with comprehension-based activities and the cognitive strategy-based activities group suggests that both types of activities may be equally effective for improving student achievement.

Table 38. Analysis of the Difference in Achievement Scores Between Comprehension Based Activities and Compensation Strategy Based Activities Group

Groups			Mann-Whitney U (post-test)			
		N	Mean	Std. Deviation	Z	p
Multimedia Tasks	Experimental	46	36,8913	1,27033	-732	.464
	Control	42	39.12	8,22		

Participants in the control group (Mdn=40) with comprehension-based activities also outperformed those in the compensation strategy-based activities group (Mdn=39). According to the Mann-Whitney U test, this difference was not statistically significant, $U(N_{comprehension}=42, , N_{compensation}=46,) = 878.50$, z= .-732, p< .001.

Table 39. Analysis of the Difference in Achievement Scores Between Comprehension Based Activities and Metacognition Strategy Based Activities Group

Groups			Mann-Whitney U (post-test)			
		N	Mean	Std. Deviation	Z	p
Multimedia Tasks	Experimental	16	42,6250	1,23786	-1.824	.068
	Control	42	39.12	8,22		

The achievement scores of participants in the control group who participated in comprehension-based activities (Mdn=40) were lower than the achievement scores of participants in the metacognition strategy-based activities group (Mdn=43). However, Mann-Whitney U test revealed that this difference was not statistically significant either, $U(N_{comprehension}=42, , N_{metacognition}=16,) = 225.50$, z= .-1.824, p< .001. It is noteworthy that the metacognition strategy-based activities group was the only group that outperformed the control group, even though the difference was not statistically significant.

Table 40. Analysis of the Difference in Achievement Scores Between Comprehension Based Activities and Affection Strategy Based Activities Group

Groups			Mann-Whitney U (post-test)			
		N	Mean	Std. Deviation	Z	p
Multimedia Tasks	Experimental	45	36,2444	1,08253	-1.619	.105
	Control	42	39.12	8,22		

Participants in the comprehension-based control group (Mdn=40) scored higher than those in the affective strategy-based control group (Mdn=38), and there was no statistical significance found between them.U($N_{comprehension}$=42, , $N_{affective}$=45,) = 735.50, z= .-1.619, p< .001. The results suggest that the difference between the effectiveness of the comprehension-based strategy and the affective-based strategy is not significant.

Table 41. Analysis of the Difference in Achievement Scores Between Comprehension Based Activities and Social Strategy Based Activities Group

Groups			Mann-Whitney U (post-test)			
		N	Mean	Std. Deviation	Z	p
Multimedia Tasks	Experimental	23	35,5652	2,33958	-813	.416
	Control	42	39.12	8,22		

The last group comparison was between the group of learners in conventional exercises and social strategy users. Achievement scores of participants in the control group with comprehension-based activities (Mdn=40) were higher than those of participants in the social strategy-based activities group (Mdn= 39). Mann-Whitney U test indicated that this difference was not statistically significant U($N_{comprehension}$=42, , N_{social}=39,) = 413.50, z= .-813, p< .001.

An additional survey was administered to participants, with the results revealing seven distinct levels of self-efficacy. Out of 343 participants, approximately 61.22 percent were in the fourth and fifth grades, according to the

results. Level 1 corresponds to the lowest level, and level 7 corresponds to the highest level in this ranking. In general terms, the overall distribution was very similar to a normal distribution.

Table 42. Participants' Self-Efficacy Levels

	Segment	Number of Participants	Percentage
SE Levels	L1	1	0.29
	L2	14	4.08
	L3	61	17.78
	L4	105	30.61
	L5	105	30.61
	L6	45	13.12
	L7	12	3.50
	Total	343	100

Figure 26 visually depicts the number of participants in each self-efficacy level and their percentage. Participants' responses indicated that they clustered around the middle levels, particularly levels 4 and 5. The sum of the first three levels (22.15 percent) exceeded the sum of the sixth and seventh levels (16.62).

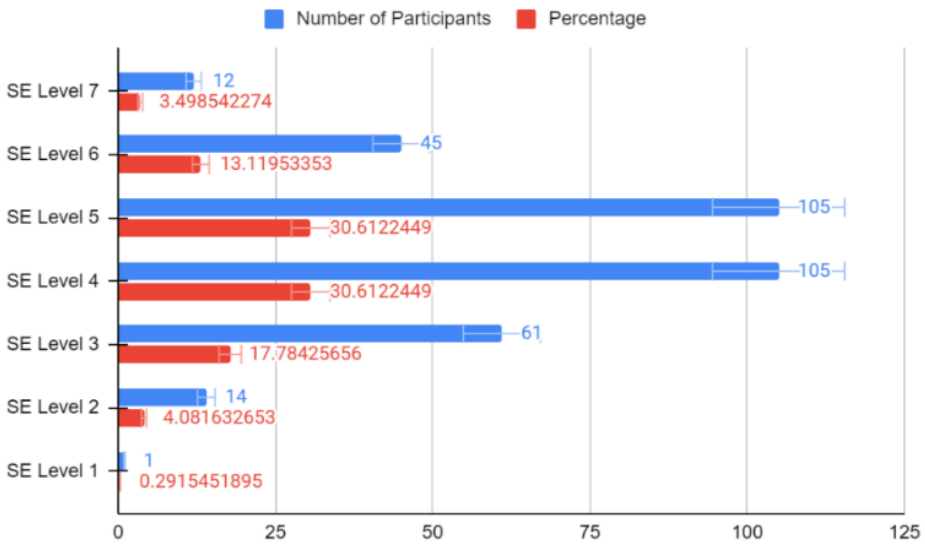


Figure 26. The figure for self-efficacy beliefs

The perceived confidence levels of participants in the Vocabulary Level Test indicated that the majority of students (58.68 percent) lacked confidence in their responses to vocabulary questions. Overall self-efficacy levels, on the other hand, were significantly higher when compared to the results of the vocabulary size test.

Table 43. Self-Efficacy Constituents

Self-Efficacy Constituents	Number of Items	Range	Minimum	Maximum	Mean	Std. Deviation
Productive Skills	8	54	9	63	37.08	10.64
Receptive Skills	24	153	26	179	100.75	29.04
Total	32	206	35	241	137.83	38.92

The self-efficacy test was composed of two components: productive and receptive skills. The mean score on this scale for productive skills was higher (4.63) than the mean score on receptive skills (4.17).

Table 44. Constituents of Self-Regulation Capacity in Vocabulary Learning Scale

SRCVoc Constituents	Number of Items	Range	Minimum	Maximum	Mean	Std. Deviation
Commitment Control	4	20	4	24	15.90	3.92
Metacognitive Control	4	20	4	24	14.14	3.89
Satiation Control	4	20	4	24	15.16	3.76
Environment Control	4	20	4	24	17.57	3.66
Emotion Control	4	20	4	24	14.49	3.12
Total	20	100	20	120	77.27	15.72

There were five factors on the “Self-Regulatory Capacity in Vocabulary Learning” scale: commitment, metacognitive, satiation, environment, and emotion

controls. The mean values of the results indicated that the lowest score corresponded to metacognitive control, and the highest value corresponded to environmental control.

In conclusion, the data showed that 250 participants were in the first third level of the vocabulary learning test. They were divided into one control and six experimental groups. Only one experimental group outperformed the control group, but there was no statistically significant difference. The number of unconfident participants outnumbers confident and overconfident students in the sample group, but students reported higher overall self-efficacy beliefs. Participants also believed in their productive skills more than receptive skills. Finally, in the self-regulated capacity in vocabulary learning scale, learners demonstrated less metacognitive control than other factors.

4.3.7 Discussion and conclusions

In comparison to the results of Phase I (site visit), analysis of collected data on cognitive and affective variables of participants revealed a very strong pattern with the results obtained in this phase. These results confirmed that learning environment parameters were significantly important and could be patterned in this case. The results of the strategy inventory for language learning showed that metacognitive strategy users were the least populated group, while the group of affective strategy users was the most populated one.

As a result, it was concluded that participants had a low level of perceived confidence in vocabulary acquisition but a moderate level of it was observed in general SE beliefs. They did not primarily employ metacognitive strategies, but

affective strategies were frequently employed. Additionally, they lacked metacognitive control in self-regulation.

As for the comparison between the control and experimental groups, no strategy alone was found to help learners attain higher scores than the conventional group, except for metacognitive strategies.

The results of the analysis of the learning environment and learners led the researcher to concentrate on metacognitive activities in order to encourage learners to engage with those activities more frequently. Additionally, conventional exercises were analyzed in detail. During a research progress monitoring meeting, the researcher discussed the steps involved in conventional methods, and it was decided to conduct strategy-based training while considering cognitive steps in the next phase.

4.4 Phase III. Study II. Incorporation of cognitive steps

4.4.1 Introduction

An assumption of the research was that adult learners of English with strategy-based exercises would score higher in vocabulary learning tests after several weeks of training compared to the control group of learners who took conventional exercises in textbooks. For this purpose, the strategy-based teaching model developed by Oxford (1990) was tested in a digital learning environment. There was, however, no statistically significant difference between the control and experimental groups when comparing the two groups. The responses from the previous phase revealed that variables pertaining to the learning environment were consistent across all the participants. This means that there was a pattern of the middle level of self-efficacy among learners who were also mostly unconfident in the answers they gave in

vocabulary-level tests. Furthermore, metacognitive control was the most important factor in determining whether learners had sufficient self-regulated capacity in vocabulary learning. Finally, the size of the group of learners fell below the third level of vocabulary size, which corresponded to the size of the representative sample group. The process for the design was then decided to proceed with the combination of strategy groups to make them sets to test their effectiveness. The possible reasons for the results were discussed at a meeting held for the mid-term report and evaluation of the previous phase, and conclusions were reached.

Table 45. Phase III. Study II Research Questions and Process Details

DBR Step	Design
Research Question	What is the effectiveness of a combined teaching model that merges Bloom's taxonomy with a strategy-based approach, compared to conventional methods, in terms of vocabulary achievement test scores? Do activities designed using this combined approach contribute to a more successful vocabulary learning experience on the digital platform?
Data Collection Instruments	VLT Achievement Test
Research Method	Experiment
Intervention	Combined theories of Oxford and Bloom
Target population	Adult Intermediate Learners
Number of Participants	163
Results obtained	Improved vocabulary scores for participants in the experimental group compared to the control group.

As Oxford's strategies were listed and assigned to courses in design, they were decided to be simplified and classified into Bloom's cognitive taxonomies

(1956), which afforded a unique approach in the custom-design of strategies to be used in the platform. The primary purpose was to provide a new methodology for presenting the content and exercises so that learners could take steps ahead considering the cognitive steps in Bloom's taxonomy. The research procedure, which combined Oxford's and Bloom's taxonomies, was carried out during this phase of the project. The conventional method was thus put up against a set of theories that had been put together and tested digitally during this stage of the process.

The purpose of the study II at Phase II was to examine the effectiveness of a combined teaching model that merged Bloom's taxonomy with Oxford's strategy-based approach in improving vocabulary achievement test scores and enhancing the overall digital learning experience for learners. The study employed an experimental method and involved an intervention of combining the theories of Oxford and Bloom's Taxonomy. Data were collected using a vocabulary learning test and an achievement test, and the target population consisted of 163 participants. The results showed that the use of the combined teaching model resulted in improved vocabulary scores for the experimental group, compared to the control group.

4.4.2 Research goal

In this phase, Bloom's taxonomy was merged with the strategy-based model. The effectiveness of this combined teaching model was tested compared to conventional methods. The overall aim of this study was to find out whether a combination of theories and the inclusion of cognitive steps in exercises provided by Oxford led to higher scores on a vocabulary achievement test. The experimental group activities were designed using combined versions of theories that hypothesized a better and more successful digital learning experience.

4.4.3 Participants

There was a total of 245 learners in groups during this phase. Following the completion of the vocabulary size assessment, it was discovered that 163 students fell into the first third of the vocabulary level distribution. As this phase was conducted during a pandemic, nine participants had to withdraw from the research due to infection with the Covid-19 virus. A total of 154 (L1+L2+L3) participants were randomly assigned to the control or experimental groups. The surveys and the achievement test were completed by a total of seventy-seven participants from each group.

4.4.4 Materials

During the study of this phase, the preliminary design was complete and ready for use by students. In order to accomplish this, the PWA structure had been completed, and a learning management system (LMS) had already been integrated into the content management system (CMS). As a result, the surveys, reading texts, and exercises were all completed within the framework of the research system that had been developed. This phase of the learning process, on the other hand, required learners to complete new versions of exercises that combined the theories of Bloom and Oxford. The VLT, SE, SRCVoc, and SILL were all used to identify the learner profile and select participants for the study. All the surveys were delivered through the LMS as lesson pages, and their analysis had been pre-programmed to be done by an automated system. The conventional group's learning experiences were also advanced in the digital environment, which was not the case with the control group. In the final step, both the experimental and control groups completed a pen-and-

paper test for the comparison and testing of the effectiveness of the material provided to the experimental group.

4.4.5 Procedure

The researcher worked on converting Oxford's strategies into a format suitable for use in digital environments. The aim was to enhance understanding of how the strategies could be applied in these settings. In this phase, the researcher iteratively worked to increase the use of these strategies in the classroom and adapt them for digital environments. Additionally, Bloom's taxonomy was applied to the listed and digitally adapted activity suggestions provided by Oxford (1990). There were numerous steps involved in this procedure. The first objective was to catalogue and annotate Oxford's classroom suggestions and finalize their adaptation to an e-learning environment. Then, Bloom's taxonomy was examined to compile a list of all verbs for learning outcomes at each taxonomy level. At this moment, the researcher matched Oxford's activity strategies with the verbs in Bloom's taxonomy and categorized them accordingly. For example, some activities were in the "remembering" stage of the taxonomy, while others focused on encouraging learners to "apply" what they had learned. The researcher received feedback and confirmation from his peers and the supervisor during this process. The feedback was discussed in meetings, and the classification of Oxford strategies according to Bloom's taxonomic classification was finalized with mutual agreement.

In terms of application, the combined theories' exercises were applied to reading texts in the already embedded learning management system. As a result, according to Bloom's taxonomy, the structure of each lesson for the experimental group included a hook page to capture learners' attention, a "build up vocabulary"

page for the remembering phase, a “comprehension exercises” page for understanding stage and a “practice in daily context” page for applying phase step.

The control group of students used conventional method of learning vocabulary from reading passages. Their activities included a matching exercise in which learners were expected to match the definitions and words from a passage, multiple choice questions to assess comprehension, and a cloze test to examine their ability to apply what they had learned. Finally, following a systematic application of the training for both groups, all students took the same exam that tested their vocabulary knowledge.

4.4.6 Responses from participants

In this phase, participants' experiences with strategy-based exercises were compared to their experiences with conventional vocabulary learning exercises. The results of the analysis revealed insights into the effectiveness of the combined theories of Oxford and Bloom. Detailed information about participants' vocabulary and self-confidence levels, as well as results of the t-test comparison, can be found in the tables (table 46, 47, 48, 49, 50) below. The objective of the vocabulary size test was to investigate the degree to which the demographics of the learning environment remained consistent in relation to the levels of academic accomplishment, as well as to think about the insignificant nuances and the reasons behind them.As was the case in earlier stages, the vast majority of students have an achievement level that falls within the first three levels of vocabulary. However, similar to the situation in the preceding phases, not all learners (n = 245) directly became participant but learners with lower level of English were included in the study.

Table 46. Distribution of Vocabulary Size Test Results of Phase III

	Groups	N	%	Mean	Std. Deviation
Levels	L1 (within group)	75	30.61	17.21	6.72
	L1 (all answers)			24.64	6,27
	L2 (within group)	65	26.53	19.92	4.11
	L2 (all answers)			21.34	7.09
	L3 (within group)	23	9.39	20.50	3.91
	L3 (all answers)			19.27	8.63
	L4 (within group)	5	2.04	19.2	6.14
	L4 (all answers)			19.69	8.52
	L5 (within group)	77	31.43	25.48	2.43
	L5 (all answers)			17.75	8.37
Total		245			

In this phase, learners are grouped according to their vocabulary achievement levels, from the lowest level to the middle level. The total number of students in the third-lowest level (66.53 percent) outnumbered those in higher levels. Even though the total number of first lowest levels of vocabulary achievement was 163, nine participants had to withdraw from the study due to Covid-19 infection.

Table 47. Distribution of Participants' Perceived Confidence According to Levels in Phase II

		N	%
L1	Unconfident Learners	33	47.14
	Confident Learners	7	10.00
	Overconfident Learners	30	42.86
L2	Unconfident Learners	39	62.90
	Confident Learners	7	11.29
	Overconfident Learners	16	25.81
L3	Unconfident Learners	13	59.09
	Confident Learners	3	13.64
	Overconfident Learners	6	27.27
	Total	154	100.00

In each vocabulary level, the number of unconfident learners exceeded the number of confident and overconfident learners. In L1, unconfident learners comprised 47 percent of the group, whereas, in L2, unconfident learners

outnumbered both confident and overconfident learners combined. Lastly, among L3 learners, thirteen out of 22 were unconfident, which corresponded to 59.09 percent of the group. Parallel to previous phases, it is possible to assert that the majority of learners fell within the lowest third of vocabulary levels and that, among them, a lack of confidence was prevalent in this particular learning environment.

Table 48. Distribution of Overall Perceived Confidence Levels in Phase III

	N	%
Unconfident	85	55.19
Confident	17	11.04
Overconfident	52	33.77
Total	154	100.00

In terms of overall perceived confidence levels, 55.19 percent of all participants (n=85) were unconfident, while 33.77 percent of them were overconfident (n=52). The remaining participants were labelled as confident in the answers they provided to the vocabulary size test. A total of 154 participants were randomly assigned to the experimental and control groups. The mean values of the achievement test results are displayed in Table 49.

Table 49. Descriptive Statistics of Sample Groups

Groups			Independent Samples Test				
		N	Range	Minimum	Maximum	Mean	Std. Deviation
Groups	Experimental	77	38	10	48	29.43	9.405
	Control	77	39	4	43	25.19	9.766

A one sample *t*-test was performed to compare the control group and experimental group. Each group consisted of seventy-seven participants, with the experimental group outperforming the control group on vocabulary achievement.

Even though the ranges of the groups were close, the mean scores revealed that the experimental group had had a more successful learning experience than the control group. The results of the one sample t-test suggest that the difference in vocabulary achievement between the experimental and control groups is statistically significant as is shown in Table 50.

Table 50. Comparison of Control and Experimental Group

Groups			Independent Samples Test				
		N	M	SD	t	df	p
Groups	Experimental	77	29.43	9.405	2.740	152	.007
	Control	77	25.19	9.766			

The result of the independent sample *t*-test revealed that there was a significant difference between the experimental group (M=29.43, SD=9.405) and the control group (M=25.19, SD=9.766) achievement scores; t(152)=2.740, p=0.007. This finding suggests that when learners received training designed with the goal of combining theories, such as that provided in this phase, as opposed to the conventional method used and tested in the control group, they were able to achieve higher levels of vocabulary.

4.4.7. Discussion and conclusions

Design-based research principles include iterations to improve the effectiveness of the tools and procedures used for a specific task, which are referred to as iterations. In Phase III-Study II, the researcher performed the steps necessary to uncover any issues related to the application of strategy-based training within a digital language learning environment. In order to accomplish this, it was necessary first to identify the shortcomings of conventional methods. In the following stages, the theories for addressing this problem in the literature were investigated and their effectiveness was

analyzed. However, in previous phases, the use of a single attribute (without the involvement of Bloom's taxonomy) produced results that were statistically non-significantly different from those obtained by using a different attribute. To address this issue, it was deemed necessary to integrate theories to enhance their overall strength. The design process required implementing iterations with the consideration of these parameters, as well as utilizing a more effective algorithm and methodology. The combination of theories was therefore planned and carried out in a delicate manner during this phase. Results indicated that learners benefited from a carefully designed strategy aid in a digital learning environment, as they had a more systematic learning experience compared to previous versions of this process. Notably, using only a strategy aid as a scaffold for the least used strategy set, as recommended by Oxford, did not prove to be effective in this learning environment, whereas using general strategy aid that considered cognitive steps did prove to be effective. Briefly stated, participants' vocabulary scores improved as a result of the systematic structure of exercises with cognitive steps in mind.

Bloom's taxonomical considerations were already incorporated into the conventional exercises provided to participants in the control group. As part of the first exercise, matching exercises were used to assist students in learning the vocabulary and matching the definitions to the unfamiliar words and phrases. To demonstrate that they had comprehended the passages they had read, they were required to respond to multiple-choice questions in the second section of the test. The final step was to put the new vocabulary into practice by using it in a sentence. Previous versions of the design, which focused solely on the effectiveness of strategy aids, did not include these cognitive steps in their analysis. Incorporating this step, along with other cognitive factors, led individuals in the experimental group to

demonstrate a higher degree of vocabulary acquisition than those in the control group. This suggests that the integration of the novel instructional approach, combined with other cognitive factors, can significantly improve vocabulary acquisition among learners. These findings highlight the importance of considering the cognitive steps and Bloom's taxonomy when designing digital language learning environments to optimize learners' success.

4.5 Phase III. Study III. Development of instructional tool

4.5.1 Introduction

This study for phase III was conducted with the objectives of (1) examining the vocabulary exercise types found in textbooks and digital platforms to discover the differences between them and (2) completing the development of the design by selecting the reading materials. The reason for this was to enrich the vocabulary learning environment that was designed and developed specifically for the research. In order to attain these goals and provide a more novel and effective response to the research questions, design-based research was used, and the "Analyze, Design, Develop, Implement, and Evaluate" (ADDIE) approach was followed. Therefore, this section of the study was the culmination of the development process.

Subsequent to the preliminary site inspection, an analysis of global applications and digital platforms was carried out to identify the optimal format and elements for the instructional tool. Oxford's (1990) strategy prompts were then analyzed within a digital context, and Bloom's Taxonomy of Cognitive Learning was integrated to enhance the effectiveness of the tool compared to conventional pedagogical methods that are frequently employed. The constituent parts of the intended product were then determined to be adequate, and it was decided that the

development phase could come to a close. Considering all available methods and steps, Gagne's (1965) suggestions were utilized to achieve this objective.

Gagné (1965) proposed a set of events that address the mental conditions for learning. The current study used Gagné's nine events of instruction in conjunction with Bloom's Revised Taxonomy to assist the development of a successful vocabulary teaching strategy with prompts that capitalized on Oxford's (1990) recommendations. The steps articulated in Gagné's work are presented in Table 51.

Table 51. Gagne's Nine Events and Corresponding Units in the Designed Tool

Gagne's Steps	Unit Names
Step 1. Gaining Attention	Item 1. Let's get started
Step 2. Informing Learners of the Objective	Item 1. Let's get started
Step 3. Stimulating Recall of Prior Learning	Item 1. Let's get started
Step 4. Presenting the Stimulus	Item 2. Build Up Vocabulary & Item 3. Comprehension Exercises & Item 4. Practice in Daily Context
Step 5. Providing Learning Guidance	Item 2. Build Up Vocabulary & Item 3. Comprehension Exercises & Item 4. Practice in Daily Context
Step 6. Eliciting Performance	Item 5. Test Your Vocabulary
Step 7. Providing Feedback	Item 5. Test Your Vocabulary
Step 8. Assessing Performance	Item 5. Test Your Vocabulary
Step 9. Enhancing Retention and Transfer	Item 6. Check Your Learning

Source: Gagné, Briggs, and Wager (1992)

Structuring the design in alignment with Gagné's work, the curriculum design was developed accordingly – that is, each lesson item in a unit corresponded to Gagne's nine events of instruction. Each of Gagne's nine events was mapped out to have six related items in the learning management system embedded inside the progressive web app.

To this point in the process, the progression had reached the fifth phase which involved implementing Gagne's first five events. In order to comprehend the current

state of vocabulary exercises, a study was conducted to investigate the various types of vocabulary exercises found in both digital and physical materials. This examination aimed to identify the user interactions and diversification of exercises, with particular focus on the remaining items (6, 7, and 8). The study also indicated the potential benefits of integrating emerging technologies, such as gamification and adaptive learning, in the design of vocabulary exercises for language learners. Such integrations were considered as a future plan for the designed tool.

Table 52. Phase III. Study III Research Questions and Process Details

DBR Step	Development
Research Question	How do the characteristics of exercises, including the linguistic targets, the actions taken by the user, and the context in which they are presented, differ between vocabulary learning materials in textbooks and those on digital platforms?
Data Collection Instruments	Annotation Form
Research Method	Descriptive
Intervention	No intervention, descriptive
Results Obtained	Word order is the most common focus of linguistic exercises. Sentence production and transformation is the most common type of user action in linguistic exercises. Among vocabulary exercises, selecting the correct 152ord from options is the most common focus. Providing a sentence context is the most common type of context used in vocabulary exercises.

All units in the learning management system adhered to the same methodological sequence. Therefore, there were nine instructional events that were incorporated into the lessons that made up each unit, and each module followed the same order for its lessons while having passages that were different from one another. A module, in

this regard, is a unit of study that typically lasts for a week and includes a set of learning objectives and activities. Within each module, there are several lessons, which are the individual components or building blocks of the module's content. Each lesson represents a specific aspect of the material to be covered, and together they form the total body of information or knowledge that the student will be expected to learn and understand over the course of the week.

The research question for this study was to investigate how the characteristics of vocabulary learning exercises, including the linguistic targets, user actions, and contexts, differed between materials in textbooks and those on digital platforms. To answer this question, an annotation form was used as a data collection instrument and a descriptive research method was employed, with no intervention taking place. The results showed that word order was the most popular linguistic target overall, while sentence production and transformation was the most common user action. Among vocabulary exercises, selecting the correct word from options was the most popular linguistic target, and providing a sentence context was the most common type of context.

4.5.2 Research goal

This part of the research mainly aimed to utilize Gagne's contributions to the field by developing the eliciting performance, providing feedback and assessing performance steps. To accomplish this, the researcher expanded the Phase II research in which global digital language learning platforms were examined and attempted to reveal the difference between textbook exercises and digital platform exercises, taking into account the dimensions of user actions and versatilities for each different linguistic target. In addition to that, the choice of reading materials for each subject was

deliberated. To review, the purpose of this stage was to bring the process of developing the instructional tool to a well-planned conclusion.

4.5.3 Materials

Data obtained during Phase II – Worldwide language learning apps and platforms supplied a wide variety and quantity of digital language learning platforms, and the annotation process of these entities examined the frequency of interactive exercises contained in them.

The researcher made a list of screenshots of various kinds of interactive exercises found on digital language learning platforms, and more than four hundred activities were stored away for subsequent examination. The most well-known digital platforms and mobile applications were the ones that had their screenshots selected for the collection.

In addition to that, more than ten books on the teaching of the English language were investigated for the purpose of the analysis. It was planned that the examination of the exercises in these books would continue until the researcher and the supervisor were satisfied that they would not come across any novel exercise types. Therefore, the study continued until the researcher was unable to uncover a new type of exercise in any of the textbooks. In total, 1060 unique exercises from ten unique textbooks and 281 screenshots from digital platforms were examined, and their dimensions were compared.

4.5.4 Procedure

This part of the study was conducted with a working group leader in the COST project – CA16105 – European Network for Combining Language Learning with

Crowdsourcing Techniques (enetCollect). Both researchers aimed at utilizing the data collected but with different research questions. The researcher of this project aimed to understand the dimensions of exercises in textbooks and digital platforms to reveal the differences between them. To realize this, the researcher had written a Virtual Mobility Network (VMN) project and submitted it to the working group in the project.

The researcher was supported in his effort by Lionel Nicolas, a senior researcher at the Institute for Applied Linguistics of EURAC research in Italy. He had collaborated in identifying the language learning platforms. As the current working group leader and a leading figure in the enetCollect project, Dr. Nicolas provided feedback on the dimensions identified by the researcher, as well as on the compiled project final report.

The main 155bjectivee of this Virtual Mobility Grant was to devise a classification of language learning exercises used in textbooks and digital platforms; hereafter referred to as mapping. Such a mapping was to provide the possibility for stakeholders interested in creating new language learning solutions to understand what the state-of-the-art on the question was, and what were the characteristics of the types of exercises most commonly used nowadays in textbooks and digital platforms.

The work plan for this research effort was composed of several iterations, in which the exercises of a language learning textbook were classified according to relevant dimensions and categories specific to each dimension. The dimensions used considered aspects such as the type of answers provided by the student (e.g., text, multi-choice), the type of knowledge tested (e.g., lexical, grammatical), or any relevant aspect identified in the process. Each dimension was composed of a specific

finite set of categories. Within the foreseen timeframe, this mapping of exercises was expanded from one textbook to the other. A comprehensive description with examples was created for each dimension and category that was identified.

The main expected output from this project was a document presenting a mapping of the language learning exercises used in textbooks nowadays according to three or more dimensions. This document contributed to two deliverables of the project: “Summary report on existing state-of-the-art solutions” and “Theoretical framework for producing material through implicit crowdsourcing.” It discussed the current learning offer available and provided an overview of language learning exercises which were used as a key component for the project’s second working group. In addition, this research aimed to utilize this data to understand and frame the overall exercise types and embed the results in developing the instructional tool.

This virtual mobility aimed to contribute to the COST Excellence and Inclusiveness policy by supporting a collaboration geographically spread over two countries (Turkey and Italy) between a senior researcher and an early career researcher in an Inclusiveness-target-country (ITC). Throughout this VMN, researchers had two meetings every working day. The first meeting was to decide how to proceed and which material to select for the analysis, while the second meeting was to discuss the entities’ controversial items. The researcher annotated prominent entities and left the rest for a mutual decision.

4.5.5 Data analysis

The main idea behind analyzing and mapping the various types of exercises that were currently available in textbooks was to complete the rest of the units according to Gagne’s sixth, seventh and eighth steps in nine events of instruction (Eliciting

Performance, Providing Feedback, Assessing Performance) in this phase. The examination continued until the researcher was unable to find a new type of exercise in any of the textbooks. To reach this status, 1060 different exercises from ten different textbooks were analyzed, with 125 different exercise types revealed. Following an examination of each textbook, conversations about where to find new workout types finally led to a mutual decision that researchers could cease searching, as the results gave an overall view of the frame.

Table 53. Dimensions Found in Exercises

Linguistic Target	User Action	Context
Word order	Ordering	Sentence context
Syntactic rule – open category	Sentence transformation	Picture context
Semantic completion	Match sentences	Dialogue context
Syntactic rule – closed category	Choice between options	Text context
Vocabulary	Sentence production	Listening Context
Pragmatics	Question answering	
Translation	Open choice	
Listening Comprehension	Translation	
Reading Comprehension	Listening	
	Reading	
	Marking text	
	Spot Errors	

Table 53 displays the most well-liked exercise categories, as determined by our comprehensive analysis. In total, twelve distinct user actions were identified across nine linguistic targets with five different indications. The lexical and functional properties of the language targets are referred to as open and closed categories, respectively. A diachronic distinction relates to the ease with which new components can enhance a set of expressions. An open category is one in which new things are added to the class over time. However, in the case of a closed category, there would

never be any new prepositions, determiners, or conjunctions generated from the word. These groups include phrases such as “of”, “the”, and “but”, among others. They are referred to as closed categories, since the word sets that make up their functions are fixed and are never expanded.

As the research advanced, the researcher became aware of the repetitive dimensions of exercises and sought to organize all of their components in a comprehensible table. Finally, three unique dimensions were sufficient to account for all of the exercise components. Language targets, user actions, and indicators varied between exercises. The researcher was able to filter user activities in this frame based on each language target and indicator. Indications, in this sense, refer to the contexts observed throughout the exercises. For instance, some tasks only provided a listening context, whereas others contained text context prior to the exercises. Not only were single indications detected, but also combinations of them were observed. Three was the maximum number of indications detected during an exercise. At no point throughout the same activity were there more than three indications identified.

The maximum number of linguistic targets and user actions both accounted for the same number of occurrences. The study’s author compiled a list of the 125 distinct exercise types that came from the researcher’s tagging of the combinations of these dimensions.

The identification and categorization of these exercise types provided a useful framework for language teachers to design language activities that target specific language skills and user actions. It also allowed for the comparison of the effectiveness of different exercise types in achieving specific language learning objectives. The comprehensive table and the list of exercise types can also serve as a resource for researchers in the field of second language acquisition who are

interested in conducting quantitative studies on the effectiveness of different types of language exercises. Furthermore, this part of the study highlights the importance of analyzing and categorizing the components of language exercises in a systematic and comprehensive way, which can lead to a better understanding of how language exercises impact language learning.

Table 54. Number Of Exercise Types, New Exercises and Their Ratio

Textbook	The total number of exercise types found	New Type of Exercise Found Per Book	The ratio of new exercises/number of exercises
Textbook 1	30	30	0.64
Textbook 2	46	16	0.34
Textbook 3	65	19	0.08
Textbook 4	68	3	0.03
Textbook 5	75	7	0.21
Textbook 6	89	14	0.29
Textbook 7	100	11	0.13
Textbook 8	106	6	0.07
Textbook 9	121	15	0.08
Textbook 10	125	4	0.02

Table 54 presents, along with their respective ratios, the overall number of exercises discovered, as well as the number of new exercises identified in each book. It was anticipated that the ratio would fall by as much as possible to the least amount that was conceivably possible.

Researchers came to a consensus on which texts should be used for the research. The researchers observed that the exercises were becoming repetitive and wanted to find new alternatives. To address this, they planned to change the publishers and types of books being used. Therefore, the ratio in the fourth textbook appeared to be the lowest conceivable, yet the literature of English teaching books was studied again to find the most different books with diverse activities.

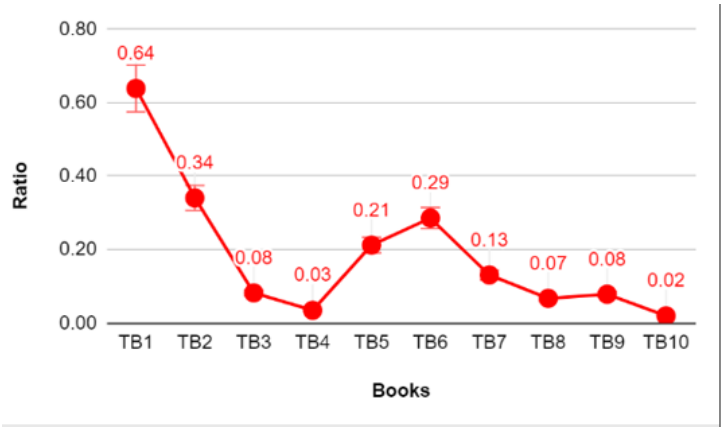


Figure 27. The ratio for new exercises divided by number of exercises

Note: TB stands for "textbook" on the horizontal axis

First Dimension: Linguistic Target

The primary component of exercises was their intended learning outcome. Whereas some exercises focused on improving students' proficiency in a single linguistic aspect of the target language, others had multiple aspects considered and incorporated into the same question. Since grammatical themes were frequently included in the exercises, students were typically required to identify and/or write the proper form of a word.

Table 55. Frequency of Linguistic Targets in Exercises

Linguistic Target	LT1	%	LT2	%	LT3	%
Word order	3	2.40	6	7.41	9	42.86
Syntactic rule – open category	35	28.00	36	44.44	7	33.33
Semantic completion	13	10.40	10	12.35	1	4.76
Syntactic rule – closed category	30	24.00	15	18.52	1	4.76
Vocabulary	24	19.20	10	12.35	2	9.52
Pragmatics	0	0.00	0	0.00	1	4.76
Translation	2	1.60	0	0.00	0	0.00
Listening comprehension	12	9.60	2	2.47	0	0.00
Reading comprehension	6	4.80	2	2.47	0	0.00
Total	125	100	81	100	21	100

The most popular of these tasks was the verb transformation questions. As part of the answer, learners were supposed to write grammatically correct verbs that were relevant to a variety of user behaviors, settings and time.

The most popular first linguistic target (LT) was the "syntactic rule-open category", which accounted for 28% of the total, and this LT most commonly belonged to the category of grammatical exercises. This LT was likewise the leading item in the second (44.33% of the total) and third (33.33% of the total) linguistic targets, and it was followed by the "syntactic rule-closed category". Given that word ordering was also highly popular (42.86%), it was possible to discern a pattern that the initial linguistic targets were concerned with syntax. The researcher narrowed the data to this feature, as the assessments that would be included in the tool development were anticipated to be on vocabulary instruction. This was a second-priority language aim throughout all exercises after syntax.

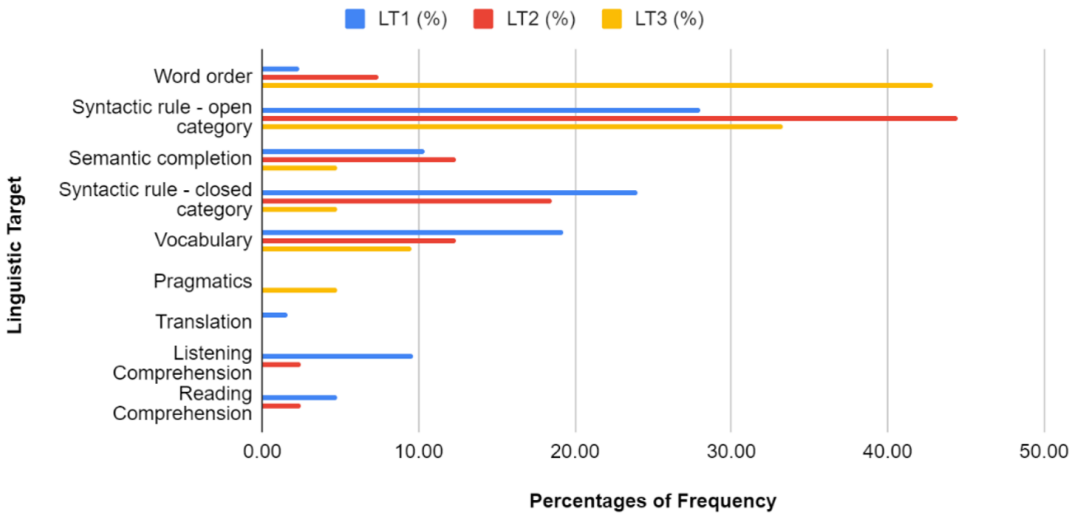


Figure 28. Linguistic targets chart
Note: The terms LT1, LT2, and LT3 refer to linguistic targets with their priorities

In Figure 28, the most common linguistic targets are depicted in different colors as horizontal columns. This pattern identifies and illustrates the types of activities that made up the majority of those found in textbooks.

Second Dimension: User Actions

Learners of the target language are expected to do certain user activities during language learning activities. There is a wide range of these activities that serve a number of functions, all of which aid students in gaining a better grasp of the issue at hand in the context of a particular language objective. However, the most popular ones also fall into the grammar exercises category. It has been discovered that learners are expected to choose from the options that are presented to them most of the time. Alternatively, students are required to rewrite (sentence transformation category) or create (sentence production) their own sentences.

Table 56. Frequency Of User Actions in Exercises

User Actions	User Action 1	%	User Action 2	%	User Action 3	%
Ordering	3	2.40	3	3.66	1	4.76
Sentence transformation	27	21.60	31	37.80	5	23.81
Match sentences	3	2.40	0	0.00	0	0.00
Choice between options	50	40.00	24	29.27	2	9.52
Sentence production	14	11.20	10	12.20	9	42.86
Question answering	1	0.80	4	4.88	2	9.52
Open choice	5	4.00	8	9.76	2	9.52
Translation	2	1.60	0	0.00	0	0.00
Listening	12	9.60	0	0.00	0	0.00
Reading	6	4.80	1	1.22	0	0.00
Marking text	0	0.00	1	1.22	0	0.00
Spot errors	2	1.60	0	0.00	0	0.00
Total	125	100	82	100.00	21	100.00

In Table 56, “Choice between options” referred to multiple-choice questions that could have single responses or multiple answers, and these questions were in the lead for first-user actions with a 40% share of the pie. It was then followed by “sentence transformation,” which was then the leading second user activity with 37.80 percent of total usage. One possible pattern was that most exercises had sentence generation as their ultimate goal, whether that was in the first action or the last. The percentage breakdown of user activity is depicted in Figure 29, where each color represents a different set of user actions.

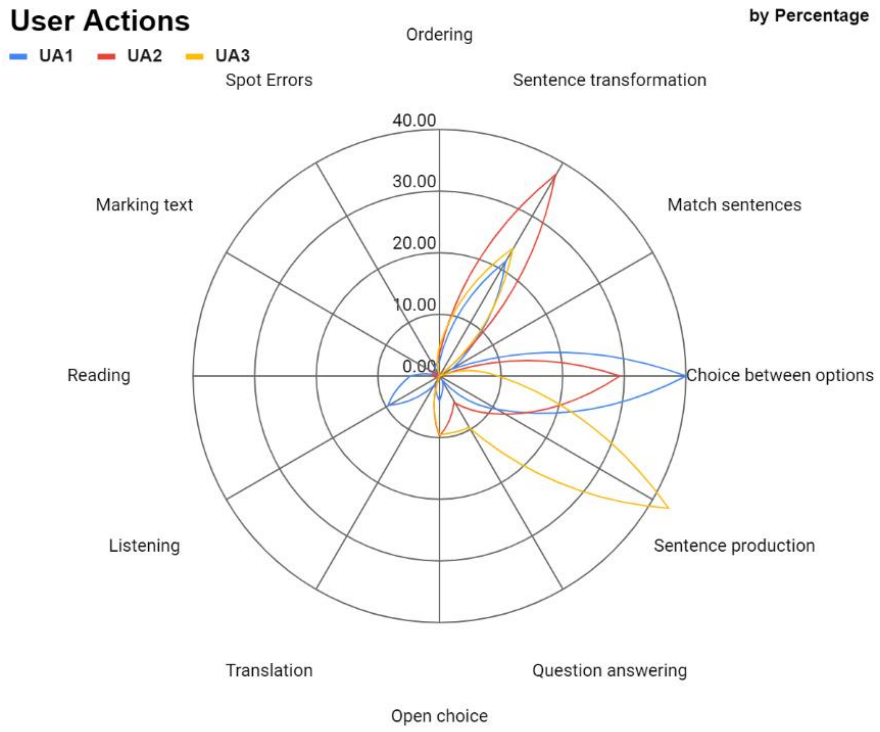


Figure 29. Frequency of user actions in exercises by percentage

The research revealed a total of 125 unique exercise types from combinations of dimensions after the investigation. Each type of exercise was given a name, and the names of the most common types of exercise were listed with their names for comparison. Among all the exercises, the most frequent was the exercise in which

learners were expected to transform sentences by changing a word (open category) in a sentence context. It was followed by multiple-choice questions about closed-category words in context. No other user actions than “sentence transformation” or “choice between options” were detected in the top 5 user action list. Words in open or closed categories, as well as vocabulary exercises, were the linguistic foci of these types of exercises. The top list contained only one dialogue context, with the exception of the entry for “sentence context”. The study of the data collected revealed that picture, text, and listening contexts were encountered infrequently.

Table 57. Most Frequent Dimensions in Exercises

Rank	Frequency	%	User Action 1	Linguistic Target 1	User Action 2	Linguistic Target 2	Context 1
1st	248	23.40	Sentence transformation	Syntactic rule – open category			Sentence context
2nd	96	9.06	Choice between options	Syntactic rule – closed category			Sentence context
3rd	52	4.91	Choice between options	Vocabulary	Sentence transformation	Syntactic rule – open category	Sentence context
4th	45	4.25	Choice between options	Syntactic rule – open category			Sentence context
5th	43	4.06	Sentence transformation	Syntactic rule – open category			Dialogue context

The mapping to create the frame for most used user actions and linguistic targets are displayed in Table 57. Their frequency was also investigated, considering the variety they provided. It is worth noting that this data analysis was conducted in order to map out all alternatives, identify the most utilized, and select the most optimal solution for the instructional tool that was being developed.

Third Dimension: Indication of contexts

Exercises with labels that took into account the linguistic targets and user actions were also examined with the contexts that were provided to the students. Some exercises were given in the form of a sentence, a picture, or one of the other ways listed in Table 57. Exercises revealed a total of five contexts. The maximum number of contexts discovered in a single exercise was three, and the Table 58 lists and checks the frequency of all contexts used in any sequence altogether.

Table 58. Comparison of Contexts Provided in Exercises

	Number of Indications	Percentage (%)
Sentence context	89	48
Picture context	36	19
Dialogue context	18	10
Text context	28	15
Listening Context	15	8
Total	186	100

In this framework, a sentence context can be either a sentence with a blank for a cloze exam or an entire sentence that is for being transformed. Sentence context was the one that the researcher came across the most frequently. This was followed by text and image context. Nevertheless, it was conceivable to combine the two, and it was also highly common among exercises.

As the research was primarily concerned with vocabulary teaching tools, the researcher filtered the annotation file to the “vocabulary” linguistic target in order to identify the user actions and contexts indicated in vocabulary exercises. Five user actions and five context types were found to be used with vocabulary teaching language aim among the 125 activity types discovered from 1060 distinct exercises.

Table 59. User Actions Utilized in Vocabulary Teaching Exercises in Textbooks

	User Action 1	User Action 2	User Action 3
Choice between options	19	3	1
Open choice	5	0	0
Listening	0	2	0
Sentence transformation	0	4	0
Sentence production	0	1	1
Total	24	10	2

It was identified that “choice between options” and “open choice” exercises were the most frequently employed user actions while learning and building up vocabulary. In these activities, learners were compelled to make a selection from the vocabulary that wasd presented to them, either between brackets or within boxes that include a variety of words together.

Table 60. Contexts Indicated in Vocabulary Teaching Exercises in Textbooks

Context	Number (n)	Percentage (%)
Sentence	53	46.49
Picture	33	28.95
Dialogue	14	12.28
Text	8	7.02
Listening	6	5.26
Total	114	100

On the other hand, user activities such as “sentence transformation” and “sentence production” were rarely employed for vocabulary education. Furthermore, various user behaviors such as ordering, translation, error spotting, and text marking were not encountered to be employed in textbook vocabulary exercises.

To conclude, the findings of mapping out the exercises in textbooks revealed that there were three basic dimensions, each of which provided a variety of alternatives in the set. In an exercise, linguistic targets, user actions, and their

contexts all appeared no more than three times. Sentence transformations and multiple-choice questions were the two types of exercises that were completed the most frequently for linguistic targets. The most common linguistic objectives offered in the majority of the cases with a sentence context were syntactic rules, including both open and closed categories.

4.5.6 Conclusions

This phase was intended to assist the researcher through the assessment and feedback stages outlined by Gagne (1971) and create an understanding of the variety of exercise types utilized in textbooks. For this purpose, this research evaluated the dimensions used in textbook exercises. It was carried out to discover the most prevalent ones for overall subjects and "vocabulary" teaching linguistic targets. As a result, three major dimensions were identified as framing the overall types of exercises: linguistic targets, user actions, and contexts. The researcher initially identified the subdimensions of each dimension through analysis. Once those subdimensions were authorized after a mutual decision, they were added to the list.

When the linguistic target was filtered to vocabulary, the most frequent user actions were "choice between options" and "open choices," particularly in sentence and picture contexts. In addition to that, a few additional uncommon user actions and contexts were uncovered throughout the course of the exercises.

To that end, the tool developed for this research sought to encompass all the relevant user actions and contexts necessary to actualize the pre-existing characteristics of exercises found in textbooks. With this purpose in mind, the researcher moved on to the design of "test your vocabulary" exercises in order to put into action steps 6, 7, and 8 of Gagne's nine events of instruction. In order to finish this process, the performance of the learners needed to be elicited by providing them

with feedback, and then their performance needed to be evaluated. The contribution of this study to the developed tool was that it identified the most typical implementations and established the framework of existing exercise types.

4.6 Phase IV. Overall evaluation of components

4.6.1 Introduction

The intended outcome of this research was to provide students with a final product that could be used as a second language vocabulary learning tool. During the research, a contextual analysis was performed, a literature review was conducted, worldwide apps and platforms were researched, and the effectiveness of optimal solutions was reviewed. In the final version of the design, it was projected that the vocabulary learning scores of students would improve after using the developed e-learning platform. Additionally, this custom e-learning design was intended to assist students in enhancing their affective variables. In this phase, the final draft was evaluated, and the effectiveness of the planned content was investigated. As a result of this procedure, the design was finished, and the researcher moved on to the query and feedback phase. This model was demonstrated to increase both affective factors and achievement levels. However, in order to obtain results that had a significant statistical significance, modifications were necessary for the self-efficacy-increasing interventions that were being employed.

In Phase IV of the research, the focus was on evaluating the impact of the designed vocabulary learning tool on students' cognitive and affective variables. The main research question was how the tool would affect students' vocabulary learning scores, self-regulated capacity in vocabulary learning, self-efficacy, and motivation towards instructional materials. The research method employed was experimental

and the intervention used was a novel tool combining Oxford's Strategies with Bloom's Taxonomy and Gagne's instructional steps. The findings presented in Table 61 indicate that the experimental group recorded elevated vocabulary learning scores in comparison to the control group.

Table 61. Phase IV. Research Questions and Process Details

DBR Step	Implementation/Evaluation
Research Question	How does the use of the designed vocabulary learning tool impact cognitive variables (such as vocabulary learning scores and self-regulated capacity in vocabulary learning) and affective variables (such as self-efficacy and motivation towards instructional materials) among students?
Data Collection Instruments	VLT, SE, SRCVoc, Achievement Test, IMMS
Research Method	Experimental
Intervention	Novel tool using Oxford's Strategies combined with Bloom's taxonomy considering the Gagne's instructional steps
Results Obtained	Higher achievement scores for experimental group Higher self-efficacy score among experimental group compared to the control group, but they were not statistically significant Significantly greater SRCVoc and IMMS scores oberserved in experimental group

The current phase aimed to investigate the impact of the designed vocabulary learning digital tool on cognitive variables, such as vocabulary learning scores and self-regulated capacity in vocabulary learning, as well as affective variables such as self-efficacy and motivation towards instructional materials among students. To collect data, the researcher used several instruments including the Vocabulary Learning Test (VLT), the Self-Efficacy (SE) scale, the Self-Regulated Capacity in

Vocabulary Learning (SRCVoc) measure, an achievement test, and the Instructional Material Motivation Survey (IMMS). The research utilized an experimental design, where a group receiving the intervention used a new tool that integrated Oxford's strategies and Bloom's taxonomy and followed Gagne's instructional steps. This group was compared to a control group that followed traditional exercises. The results showed that the experimental group had higher achievement scores compared to the control group, as well as higher self-efficacy scores, although these were not statistically significant. However, the experimental group had significantly greater scores on the SRCVoc and IMMS measures compared to the control group. These findings suggest that the designed vocabulary learning tool may be effective in improving both cognitive and affective variables among students.

4.6.2 Research Goal

The research that was carried out during this phase had two primary objectives: the first was to investigate the degree to which the final iteration of the designed product was successful in enhancing L2 vocabulary learning of the participants; the second was to determine whether or not the findings accord with the assumptions placed on the research goal that had been pursued throughout the entirety of the study. In order to achieve this goal, research was conducted to investigate vocabulary learning scores in terms of the cognitive and affective variables of the learners who participated in the study, all with the goal of developing a defensible theoretical framework. The theoretical underpinnings were applied to the initial design in order to structure it, and their usefulness was assessed at the earlier stages of the process. Therefore, the previous phases of the research led to the completion of an ultimate draft version of the designed product, and the goal of the current phase was to test the effectiveness of the designed ultimate product with regard to the following three

aspects of learning i) achievement scores; ii) self-efficacy results; and iii) self-regulated capacity in vocabulary learning. As a consequence of this, it would be feasible to report both the efficacy of the overall design and the results of its implementation.

4.6.3 Participants

At the start of this study, 85 participants were enrolled. They were all enrolled in the first year of a bachelor's degree program at a state university in Turkey. Five international students were not included in the study. In addition to them, five participants were excluded from this study since their VLT levels were above the research's threshold. Therefore, the study had a total of 75 participants, all of whom were required to fill out all of the questionnaires and tests. The average score on the third part of the vocabulary size test for the 75 students who took all the surveys was 19.32. On the other hand, the self-efficacy question that was presented at the end of the sect'on demonstrated that the participants did not have confidence in the answers that they provided, as the average expectation for accurate responses was 16.87.

4.6.4 Materials and data collection instruments

Earlier stages of the study led to decisions regarding the design, which were finalized following an in-depth investigation of the materials that were used. It was decided that an LMS would be necessary for the research because the number of people who responded to each survey was unpredictable. In order to establish which learning management system (LMS) was the most suitable for the requirements of the research, the researcher examined a number of LMSs. There were many conditions that needed to be met in order for an LMS to be considered successful, including universality, free access for learners, and a version that did not require membership. Each possible course of action was researched and analyzed. Because

of the modality, flexibility, and reproducibility of its design, the learning management system that was embedded inside a content management system was chosen as the best option for achieving dissemination goals. In addition, the LMS was ultimately implemented on a platform that was designed to be as user-friendly and intuitive for students as it was possible to make it. Because of this particular reason, three unique iterations of an application were developed: a hybrid version, a native version, and a progressive web application (PWA). During this phase, the PWA version was utilized, which ensured that the option to use additional settings was preserved. In order to achieve this objective, the final version of the PWA design was developed. This design incorporated a CMS that contained an LMS within its structure. In this study, both the efficacy of the cognitive model that was constructed for the activities and the likely change in affective variables were studied.

Within the learning management system, a course was developed with different modules and lessons, all of which had embedded surveys. The program curriculum was followed by the Vocabulary Level Test (VLT), the Self-efficacy test (SE), and the Self-regulation capacity in Vocabulary Learning (SRCVoc) test, all of which were sequentially placed in the course's pre-test section in the curriculum page of the course. The course concluded with an evaluation of the student's ability to self-regulate their vocabulary learning. For the purpose of determining how well each data collection material adhered to predetermined standards of internal consistency, Cronbach's alpha was utilized as a statistical tool. In terms of the statistics about reliability, the values of Cronbach's alpha for the scores on the multiple-choice items on each and every test were greater than.75.

Table 62. SE, SRCVoc and IMMS: Item-Total Statistics

SE		SRCVoc		IMMS	
Question	Cronbach's Alpha if Item Deleted	Question	Cronbach's Alpha if Item Deleted	Question	Cronbach's Alpha if Item Deleted
Q1	.762	Q1	.806	Q1	.837
Q2	.767	Q2	.795	Q2	.837
Q3	.756	Q3	.780	Q3	.839
Q4	.754	Q4	.788	Q4	.830
Q5	.765	Q5	.727	Q5	.826
Q6	.738	Q6	.729	Q6	.825
Q7	.758	Q7	.726	Q7	.823
Q8	.751	Q8	.726	Q8	.824
Q9	.775	Q9	.729	Q9	.833
Q10	.769	Q10	.737	Q10	.816
Q11	.771	Q11	.737	Q11	.821
Q12	.771	Q12	.730	Q12	.815
Q13	.766	Q13	.729	Q13	.816
Q14	.760	Q14	.729	Q14	.816
Q15	.757	Q15	.726	Q15	.817
Q16	.764	Q16	.732	Q16	.820
Q17	.773	Q17	.726	Q17	.815
Q18	.769	Q18	.772	Q18	.825
Q19	.787	Q19	.806	Q19	.824
Q20	.764	Q20	.776	Q20	.824
Q21	.759			Q21	.825
Q22	.763			Q22	.822
Q23	.765			Q23	.823
Q24	.761			Q24	.820
Q25	.767			Q25	.820
Q26	.761			Q26	.825
Q27	.755			Q27	.825
Q28	.753			Q28	.824
Q29	.748			Q29	.824
Q30	.755			Q30	.840
Q31	.752			Q31	.837
Q32	.753			Q32	.828
				Q33	.840

For the SE test scores in this study, Cronbach's alpha was found to be .768, while for the SRCVoc and IMMS tests, it was .762 and .830, respectively. Table 62 displays Cronbach's alpha reliability coefficients for scores on the questions used in all tests. Following the analysis of internal reliability, the reading passages were organized using Gagne's nine instructional events approach. A post-test, in addition to a QR code and a link, was included at the very end of the LMS course in order to prevent the participants from running into any roadblocks when they were taking the test. Finally, the post-test was used to make a comparison of the vocabulary accomplishment results.

4.6.5 Procedure

Participants were first instructed to examine the designed product and pose any pertinent questions. After then, a presentation on the program's curriculum and course structure was given. Following that, students were asked to complete one reading each week as well as thorough exercises following each reading. Learners were instructed not to move on to the next exercise if they did not feel competent enough to complete the current assignment. Each exercise was allocated three class periods. The first module began with a warm-up, introduction, and "remembering exercises," followed by "understanding" and "application" exercises in the experimental group, and the readings in other weeks followed the same procedure. The control group simply followed the instructions in their individual breakout rooms, where they performed the standard exercises. After completing the program, participants were required to complete a post-test and an achievement test.

4.6.6 Responses from participants

In this phase, the major hypotheses of this dissertation research were tested after they had been modified by analyses of each step that focused on different components of the design with various approaches. All affective and cognitive aspects were investigated and incorporated into the research, as the purpose of the study was to replace textbooks with an all-encompassing model for teaching vocabulary in a digital learning environment. This phase entailed evaluating these factors and comparing the experimental and control groups' accomplishment scores. In all phases, learners were found to have low self-efficacy and vocabulary levels. Thus, it is significant to mention that the characteristics of the learning environment were fairly stable. In light of this fact, the procedure was designed using the results of a needs analysis in mind. Nonetheless, each step evaluated the efficiency of different aspects, and the design was deemed insufficient until an effective methodology was identified.

In each phase, the Vocabulary Size test was administered to evaluate the efficacy of the methods employed in that phase. In this test, there were five vocabulary levels, with 30 questions per level. The participants were requested to make an estimation of the number of questions they answered correctly out of 30 in the final level of the vocabulary exam. This was done to verify the result of low self-efficacy level obtained from the self-efficacy test.

Table 63. Distribution of Overall Perceived Confidence Levels

SE LEVEL	N	%
Unconfident	51	68.00
Confident	4	5.33
Overconfident	20	26.67
Total	75	100.00

Only the third level of the vocabulary size test, which consisted of 30 questions, was utilized in this phase to identify learners. This is owing to the fact that the majority of students in the learning environment were discovered to have a limited vocabulary, and it was determined that the low vocabulary level of learners would be the focus of this study. At this level, the number of unconfident learners (N=51) outnumbered those who were confident and overconfident combined (N=24).

This study comprised a reading passage with vocabulary targeted for learners as well as activities based on a method that accounted for the cognitive step required to learn vocabulary. As it was believed that the cognitive and affective characteristics of learners were equally important for the development of an educational design, it was intended that the material would be presented in such a way that learners would experience higher levels of positive affect as a result of the exposure. The efficiency of this cognitive method and the affective components were evaluated.

Table 64. Descriptive of Sample Groups

Groups			Independent Samples Test				
		N	Range	Minimum	Maximum	Mean	Std. Deviation
Groups	Experimental	38	14	16	30	24.11	3.540
	Control	37	19	9	28	21.62	5.230

In total, there were 75 participants, and through a random assignment process, 38 of them were given to the experimental group. The results of the post-test vocabulary mean score comparison showed that the experimental group had a higher score (24.11) compared to the control group (21.62).

Table 65. Comparison of Control and Experimental Group

Groups			Independent Samples Test				
		N	M	SD	t	df	p
Groups	Experimental	38	24.11	3.54	2.414	73	.018
	Control	37	21.62	5.23			

There was a statistically significant difference between the scores of those in the experimental group (M=24.11, SD=3.54) and those in the control group (M=21.62, SD=5.23); t(73) = 2.41, p=0.018. The findings of this comparison indicated that the utilization of this design solution in settings analogous to those used for learning could result in improved vocabulary achievement scores for the students.

In addition to comparing performance on achievement tests as above, this stage aimed to assess whether the intervention had the desired effect on a range of affective characteristics as well.

Table 66. Means of Self-efficacy Scores by Subsegment

	n of items	Average	Experimental Group	Control Group
Productive Skills	8	5.80	5.68	5.93
Receptive Skills	24	5.55	5.52	5.57

There were 32 questions on the self-efficacy test, eight of which assessed producing abilities and the remaining 24 assessing receptive skills. In terms of both productive and receptive skills, the experimental and control groups had comparable mean scores.

Table 67. Descriptive Analysis of the Sample Groups in SE Comparison

Groups			Independent Samples Test				
		N	Range	Minimum	Maximum	Mean	Std. Deviation
Groups	Experimental	38	91	120	211	173.24	15.843
	Control	37	29	157	186	170.16	7.132

Mean scores from both the experimental and control groups showed that the experimental group performed better on the self-efficacy measures in this comparison.

Table 68. Self-efficacy Level Comparison of Control and Experimental Group

Groups			Independent Samples Test				
		N	M	SD	t	df	p
Groups	Experimental	38	173.24	15.843	1.079	73	.284
	Control	37	170.16	7.132			

The results of the independent sample t-test showed that there was not a significant difference in the SE scores of the experimental group (M=173.42, SD=15.843) and the control group (M=170.16, SD=7.132); t(73) = 1.079, p=0.284. This was the case despite the fact that the means were higher for the experimental group. The outcome suggests that the learners may not have achieved statistically significant levels of self-efficacy if they received instruction based on the final model, such as that provided in this phase, rather than the conventional method utilized, and assessed in the control group. The study also examined the students' ability to self-regulate the vocabulary learning process, as well as their perceived confidence in their own abilities as students.

The goal of this study was to see how much learners used metacognition in their vocabulary learning. In other words, the study sought to assess not only the learners' confidence in their abilities, but also their ability to monitor and control

their own learning processes, which is a necessary component of successful vocabulary acquisition. The study aimed to assess the impact of metacognitive exercises on vocabulary learning and the extent to which learners used metacognition to improve their learning outcomes by examining the learners' capacity to self-regulate.

Table 69. Descriptive Analysis of the Sample Groups in SRCVoc Comparison

Groups			Independent Samples Test				
		N	Range	Minimum	Maximum	Mean	Std. Deviation
Groups	Experimental	38	33	78	111	90.61	8.029
	Control	37	28	70	98	84.95	7.888

The results of the SRCVoc demonstrated, as a consequence of the metacognitive exercises component, that design choices greatly contributed to learners' greater capacity for self-regulation in vocabulary learning.

Table 70. SRCVoc Comparison of Control and Experimental Group

Groups			Independent Samples Test				
		N	M	SD	t	df	p
Groups	Experimental	38	90.61	8.029	3.078	73	.003
	Control	37	84.95	7.888			

The experimental group had a significantly higher mean score for SRCVoc values than the control group. The results of the independent sample *t*-test indicated that there was a statistically significant difference between the SRC scores of the experimental group (M=90.61, SD=8.029) and the control group (M=84.95, SD=7.888); t(73) =3.078, p=0.003. Considering the points stated in table 65, 68 and 69, it can be asserted that the components and methods employed in design contributed to both the achievement and affection levels of students. This test

revealed a statistically significant difference between the two groups' achievement results. Even though the difference between the experimental and control groups was not statistically significant, post SE test scores were also higher in the experimental group. With regard to SRCVoc outcomes, it was evident that students' self-regulation skills improved as a result of the methods presented in this design.

The last questionnaire was the instructional materials motivation survey (IMSS), which revealed the dispositions about the motivation of learners towards the tool (hence the e-learning platform) generated in this research in comparison to the materials utilized in conventional ways. The results of this survey are displayed in Table 71.

Table 71. Descriptive Analysis of the Sample Groups in IMSS Comparison

Groups			Independent Samples Test				
		N	Range	Minimum	Maximum	Mean	Std. Deviation
Groups	Experimental	38	90	63	153	121.16	23.525
	Control	37	96	48	144	100.84	28.498

The range and standard deviation variations between the experimental and control groups were relatively small. Still, the means showed that there was a statistically significant gap between the two groups. When compared with the control group, the experimental group had an IMSS value mean score that was significantly higher. The results of an independent sample *t*-test revealed that there was a statistically significant difference between the IMSS values of the experimental group (M=121.16, SD=23.525) and the control group (M=100.84, SD=28.498); the value that indicated the significance of the difference was t(73) =3.371, p=0.001. The IMSS values of the experimental group were significantly higher than those of the control group, and this was easily observable over the course of the research.

Table 72. Comparison of IMSS Between Control and Experimental Groups

Groups			Independent Samples Test				
		N	M	SD	t	df	p
Groups	Experimental	38	121.16	23.525	3.371	73	.001
	Control	37	100.84	28.498			

In conclusion, the developed tool resulted in increased motivation toward the instructional material, increased values of self-efficacy and self-regulated learning ability and improved vocabulary achievement scores. However, due to the fact that self-efficacy scores were significantly lower and did not reach statistically significant levels, it is possible that the self-efficacy theories and/or their application in the design will need to be revised in order to achieve the desired level of effectiveness.

4.6.7 Conclusions

The current study at Phase IV aimed to evaluate the overall effectiveness of all design components and inform the inquiry and feedback phase of the research. This study helped the researcher comprehend how the final version of the designed tool functioned in a learning environment and what might improve and enhance it. The researcher was also interested in determining the changes in learners' affective characteristics. As the design proposed a different model for teaching vocabulary in a digital learning environment, it incorporated a variety of methodologies and theoretical knowledge from the literature. For this reason, the theories of Oxford, Bloom, Gagne, and Mayer were deemed fundamental for integrating the digital learning environment. The format of this investigation accorded equal weight to cognitive and affective variables; hence, the cognitive component attempted to raise achievement scores initially. After testing this, the researcher focused on the change in affective variables.

Participants in this phase had higher achievement scores in the experimental group than in the previous phase, confirming the effectiveness of the exercises that combined theories. In terms of affective variables, the experimental group of students scored higher on self-efficacy and self-regulation capacity in vocabulary learning. However, the experimental group's higher self-efficacy score did not correspond to statistically significant values. In response to this, the researcher decided to incorporate reflection questions following each lesson to emphasize the importance of mastery learning and apply the theoretical information. That is to say, the researcher came to realize the significance of adding formative assessments to the final step of each module, in addition to the summative assessment that was included in each module.

Finally, the design ideally suits the learning environment as it shows the potential to take the place of textbooks (in the domain of vocabulary learning) and boost efficiency on both cognitive and affective levels. Even if the scores consistently verify that the increase is occurring, the changes that have been made to the learning environment should still be carefully considered, and a higher impact should be determined while taking into account a variety of theories.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

5.1 Overview of the study

Presently, there are hundreds of language teaching services available on various digital platforms. These services prompt academics to assume that the market is saturated with numerous method applications and their combinations with different theories. However, the results of the research in the market, as this project reveals, indicate that strategy-based instruction and cognitive steps were not considered to be particularly important in the currently available platforms. Instead, interactive exercises and behaviorist models were found to be popular for reasons germane to the pursuit of commercial interests. The primary goal of this design-based research, therefore, was to examine and evaluate the feasibility of providing learners with a novel design approach to enhance second language vocabulary learning in a digital environment embedded with cognitive strategies that would provide cognitive and affective scaffolds to learners. Therefore, the study's overarching research questions that addressed the vocabulary achievement and affective variables were developed with a focus on the cognitive and affective dimensions of the strategy-prompted scaffolding methods to enhance L2 vocabulary learning in a digital environment, as well as the levels of vocabulary achievement scores. Due to this, the investigation's main concerns were split into two categories: understanding the design's influence on concepts related to cognitive and affective variables and understanding the design's impact on vocabulary achievement levels. The researcher aimed to achieve these objectives by incorporating important elements from various theories to create a new, cross-platform language learning solution. This was because there have been

numerous studies on language learning strategies (LLSs), cognitive processes in language learning (Bloom's taxonomy), and computerized language learning (CALL). Contextual and statistical studies were conducted to inform the development of the platform, a Progressive Web App, as a solution. The research was divided into four phases, each with specific objectives aimed at answering the research questions. These phases were designed based on research methods. The initial phase consisted of a site visit, and the second phase involved mapping out the various existing solutions. During the third phase, which also encompassed the development of the platform, various scaffolding methods were tested to increase the effectiveness of the design. Finally, the fourth phase evaluates the effectiveness of the overall instructional tool that was developed.

At the initial stages of the study, a site visit to explore the gap in achieving educational objectives paved the way for the creation of digitalized instruments. Therefore, this research aimed to incorporate computer-assisted language learning applications into learning environments. The goal was to do this through collaborative learning management systems embedded in a hybrid/native mobile app. The purpose was to apply, evaluate, and improve adult English as Foreign Language (EFL) learners' digital language learning experiences. The aimed implementation of best practices for EFL learners' vocabulary studies resulted in the development of a progressive web app (PWA). Prior to the implementation step of this design-based research, an exploratory study to conduct context analysis was carried out to inform the learning environment (Phase I) in the analysis step. Following this, worldwide language learning apps and platforms were examined, analyzed, and mapped within the scope of a 'Cost - European Cooperation in Science and Technology Action' project in order to form the pattern of the features of the recent worldwide digital

language learning solutions (Phase II). In the development phase of the project, the researcher looked into the usefulness of providing individualized strategy help through hints instead of regular comprehension exercises. The study aimed to fill the critical gap in e-learning solutions by focusing on the role of cognitive steps as enablers (Phase III). In the implementation stage of the research, implications of e-learning literature were applied, and the instructional tool was developed. For this purpose, the concept of digital language learning and adult EFL learners was introduced to a transformative solution of an innovative hybrid learning environment in all digital platforms (Phase IV). Each phase of the research project served a specific and distinct purpose towards contextualizing the entire project and ultimately creating a useful instructional tool.

To set the stage for the comprehensive study of learning environment aspects and characteristics, the researcher investigated the learning environment's context in Phase I. In order to achieve this objective, a needs assessment was conducted to identify the educational requirements and gaps on the route to achieving the intended goals. This visit was deemed essential to direct the research path and comprehend the consistency in the learning environment.

The researcher conducted an investigation into the learning environment's context to identify the informational gaps that need to be filled in order to understand the educational goals that need to be prioritized. As a result, it was determined that it was necessary to review the relevant literature for digital solutions. In this particular instance, Phase II was carried out to gain an understanding of the parameters of digital solutions. These parameters included platform sizes, service bases, business models, interactive exercises, and so forth. This research was carried out with the assistance of a group of researchers from various nations, and the researchers'

primary objective was to collect as much information as possible regarding participants' e-learning preferences. In addition, the researcher attempted to evaluate native, hybrid, and web view apps with regard to the levels of performance, flexibility, and universality that each possessed.

Phase III commenced with a series of studies, the first of which concerned language learning strategies. The researcher, well-versed in the nuances of learning environment settings and the digital tools already on the market, set out to evaluate the efficacy of several novel approaches. Therefore, the path that needed to be taken in this stage was to evaluate the efficacy of cutting-edge methods after gaining knowledge about the variables present in learning environments. Despite investigating hundreds of digital channels, the researcher was unable to identify a solution centered on enhancing language learning strategies. In several activities on a few platforms, there were some strategy aids and prompts, but no platform was found to make considerable and detailed use of these. As a result, the researcher had the intention of determining whether or not Oxford's substantial study on language learning strategies would be helpful in an environment conducive to e-learning. Language learning was divided by Oxford (1990) into six kinds of strategies, three of which were direct and three of which were indirect. The research design encompassed each group in order to evaluate the efficacy of each strategy and gain an understanding of how effective they were in an online setting compared to conventional methods. It was expected that the findings of this comparison would provide input into the early stages of the design process for the digital language learning platform.

It was revealed at this stage that the experimental group of learners who were given strategy prompts that were intended explicitly for classroom settings were not,

in most cases, more successful than the participants in the conventional training methods. The group that received instruction with the inclusion of metacognitive strategies scored higher, but the difference was not statistically significant. In light of this finding, the investigations of Phase III continued with meetings to discuss the findings and propose and test novel solutions. At this point, it was observed that the strategies offered to the experimental group participants involved exercises that did not take into account the cognitive processes that had been constructed in accordance with Bloom's taxonomy. Then it was decided to compile all of Oxford's strategy-improving questions and categorize them using Bloom's taxonomy. As such, Phase III Study II set out to investigate and evaluate how well anchoring concerns about cognitive stages could improve performance.

After incorporating Bloom's taxonomy into the Oxford language learning strategy prompts, the researcher continued with the creation of the instructional tool as the statistically significant threshold was attained. For this purpose, Phase III Study III was designed. Since Gagne has made significant contributions to the field, this study intended to use his work by incorporating his suggestions into the development process. The objective at this stage was to apply his suggestions, known as nine events of instruction, to this particular study. To conclude the development phase of the tool, it was intended that the data gathered at this stage would be used for the subsequent processes of “eliciting performance”, “providing feedback”, and “assessing performance” steps. This study, therefore, attempted to reveal the differences between textbook exercises and digital platform exercises, taking into consideration the dimensions of user actions and versatilities for each different linguistic target with the aim of developing assessment steps. To achieve this objective and bring the instructional tool creation process to a planned conclusion,

the researcher expanded the Phase II research that studied worldwide digital language learning platforms. The enlisted entities of digital platforms were revisited, and the interactive exercises in them were captured to investigate their dimensions.

The research that was carried out in Phase IV was the final stage, and it had two primary objectives: (a) to determine how successful the final design of the developed product was, and (b) to examine whether or not these results were consistent with the assumptions that were made about the research goal throughout the course of the study. To attain this purpose, the researcher examined vocabulary acquisition scores between the control and the experimental groups in terms of cognitive and affective factors to construct a viable theoretical framework.

Due to obligations and preferences, the modern world's opportunities may extend the usage of digitalized language learning alternatives, and even traditional ways of learning may be considered old-fashioned in a short time. In light of these presumptions and potential long-term changes in educational implications, a PWA solution considering cognitive and affective variables that brought together multiple theories on language learning/teaching was proposed, expecting that its more robust design could be disseminated to all students.

5.2 Summary of research findings

This dissertation study aimed to develop a new approach to teaching L2 vocabulary by identifying the needs of the target group, investigating existing solutions and services, implementing and evaluating strategy-boosting models, gauging the efficacy of incorporating cognitive elements into the strategy-boosting model, and employing e-learning application techniques to the developed tool. The findings from each phase and study conducted as part of this research were used to inform the

decisions on this tool's components and overall design. Consequently, each phase and study influenced the rest of the research in order to boost the efficacy of the developed tool. Each round of data collection revealed to the researcher a path toward a more effective design for achieving previously unmet educational goals.

In Phase I, the context analysis was conducted, which included need assessment, learner analysis, learning environment analysis, learning environment description, and learning objective selection. The primary objective was to establish the framework of training modules and objectives in the instructional tool. Identification of the gaps and profiling of the learners who would participate in the research was deemed essential in order to achieve this.

Learners were given a number of questionnaires to complete in order to gain a more profound knowledge of the cognitive and affective factors relevant to them. To profile learners, a vocabulary level test (VLT) was administered to determine their vocabulary levels, and a self-efficacy (SE) questionnaire was used to determine their productive and receptive self-efficacy levels. Apart from them, a survey on self-regulation in vocabulary learning capacity (SRCVoc) was applied to determine if there was any distinct subcomponent of controlling abilities among commitment, metacognitive, satiation, environment, and emotion control factors. Last but not least, learners were also provided with a strategy inventory to assist them in identifying the least-used strategies in the Oxford-framed strategy sets. With the help of this data, the researcher expected to sketch a profile of learners and locate the gap in their cognitive and affective factors.

The results of the Learners' Vocabulary Level Test revealed that 90.83 percent of all participants fell within the first three of five levels. Each level made reference to understanding the most common 1000 English-language words, making

up 5000 in total. That means 58.95 percent of students only knew around 1,000 most common words, 25.33 percent had a firm grasp for the 2,000 most common words, and lastly, 6.55 percent of all of them understood the 3,000 most common words in English, for a grand total of 90.83%. Lower levels of vocabulary teaching in the target language were hence concentrated in the design.

An additional question was included at the end of each level in order to test the learner's self-assessment of their level of knowledge (judgement of learning, JoLs). In this question, learners were asked to estimate how many correct answers they had given, and if their estimates were greater than the number of correct answers, they were labeled overconfident. In reality, however, the exact opposite was the case. There were a greater number of underconfident students than the total of confident or overconfident ones. Learner profiling, therefore, continued by identifying students with low self-efficacy and poor academic performance. Following this, the two factors (receptive and productive skills) from the SE questionnaire were compared to determine if there was a statistically significant difference between them. The comparison revealed that students had greater perceived confidence in their ability to perform tasks requiring the use of their productive skills than those requiring the use of their receptive abilities.

The strategy inventory for language learning, often known as SILL, was the third instrument employed in the data collection process. Its purpose was to gain an understanding of the distribution of strategy utilization among learners. Based on the SILL data, it was found that participants relied on metacognitive techniques the most, and those affective methods were employed the least. Comparative analysis of direct and indirect strategy groups revealed that compensation strategies were the least prevalent among direct strategies, whereas affective strategies were the least

prevalent among indirect strategies. This result was additionally backed by the fact that each strategy group had the smallest number of high-level users who claimed to utilize a particular method extremely actively. Instead, low and medium users were mainly found to outnumber the high-level users.

Self-Regulated Capability in Vocabulary Learning (SRCVoc) was the final questionnaire administered to participants. This material was used to determine whether significant differences existed among the subfactors. The parts of this questionnaire were commitment control, metacognitive control, satiation control, environment control, and emotion control. It was found that individuals engaged with less metacognitive and emotional control compared to other factors, although there was no discernible pattern across components. This result indicated that the variables pertaining to the capacity for self-regulation were nearly equally utilized. With this in mind, design choices were made accordingly, and metacognitive and emotional controls were incorporated into the design.

According to Blumenthal (2014), there are two primary lenses through which researchers examine the process of second language acquisition: the cognitive or psychological lens, in which language acquisition is viewed as primarily an internal process, and the sociocultural or critical lens, in which researchers focus on the impact of the learner's social surroundings. Focusing on cognitive and affective variables in this study was based on the assumption that the aforementioned lenses could be either a facilitator or a barrier in learning processes, depending on the extent to which they were utilized. Gahunga (2009) investigated the relationship between language abilities, and cognitive and affective variables among intermediate-level foreign language learners. His study highlights the importance of using language learning strategies and having a positive attitude towards language learning tasks, as

it demonstrates how strategies and self-efficacy can help students improve their language skills. The study also emphasizes the idea that self-beliefs play a crucial role in language learning. The results of the study show that strategies can enhance students' self-efficacy and language abilities, while self-efficacy can boost language skills. The study in Phase I displays similar results to the aforementioned studies in that it suggests that low self-efficacy, low knowledge, and usage of language learning strategies may negatively impact learner experiences and hinder learning achievement. In contrast, numerous researchers have found that high self-efficacy is effective in language learning (Kitikanan & Sasimonton, 2017; Mahyuddin et al., 2006). As for the relationship between strategy usage and self-efficacy, Shi (2018) found that self-efficacy has a positive relationship with cognitive, compensation, memory, metacognitive, and social strategies. Therefore, the site visit phase in this research also detected the existing levels of these variables as it assumed that by increasing self-efficacy and implementing language learning strategies, learners might be able to improve their experiences and achieve greater success in their language learning.

With all this in mind, the findings of the Phase I study show that poor usage of cognitive factors and other variables such as self-efficacy frame the features of the learning environment. Likewise, another factor that has been studied extensively is the role of self-regulation in the context of vocabulary learning with digital technologies. Studies have shown that in order to fully benefit from using the internet for vocabulary development, students need to have the ability to manage their online actions and avoid distractions. One notable study by Ebner and Ehri (2016) describes the development and research on the benefits of teaching students structured thinking procedures to remain metacognitively engaged when learning vocabulary online.

This is important as self-regulation is crucial in order to fully reap the benefits of using the internet for vocabulary learning, and avoid the distractions that the internet can pose. It highlights the importance of self-regulation in order to fully reap the benefits of utilizing digital tools for vocabulary learning and reveals the benefits of using the internet for vocabulary development and the importance of teaching students self-regulation strategies to maintain focus and engagement when learning vocabulary online. The authors discuss the advantages of using the internet as a tool for learning, such as the ability to access textual, visual, and auditory information about a word in different contexts and how it provides opportunities for students to interact with words instantaneously and multimodally. The study also emphasizes the importance of teaching students structured thinking procedures to remain metacognitively engaged when learning vocabulary online. As a result, the findings from Phase I provide a solid foundation upon which to base future decisions regarding how best to leverage technology to aid with lexical expansion and self-regulatory practices in second language acquisition.

In Phase II, to address the obstacle hindering the attainment of educational goals, additional data about the learning environment was collected to inform more effective design decisions. As a potential solution, the creation of a digital alternative to textbooks designed for vocabulary teaching was planned to take place. Therefore, within the confines of a project, a study was conducted to map the existing global digital solutions provided as a service to students. The platforms' user bases, interactive exercises, automatic feedback mechanisms, business models, service platforms, platform languages, and the number of languages taught were all annotated in the reference links provided by participants.

Bączkowska (2021) made an extensive study of website platforms and mobile apps for language learning and found that the majority of the input material supplied by the platforms is at the text/discourse level (58%), exhibiting foreign vocabulary and grammar in a broader context; 26% is presented at the grammatical structure level (phrasal or sentential); and 16% is presented at the word level. According to findings, vocabulary (with some classes dedicated solely to lexis) is covered in two-thirds of the courses, while grammar is covered in the remaining third. So, most language systems were developed for studying and memorizing words. Lastly, the most common sorts of games and exercises are flashcards, brief videos, listening passages, and matching and multiple-choice quizzes. This finding is consistent with the findings of the current phase of the study, and it provides a broader context for the findings of Backowska's earlier analysis.

After filtering out the irrelevant data (such as invalid references or links that failed due to language obstacles or registration hurdles), there were 393 entities out of the original 595 answers. The service bases of digital platforms were discovered to vary largely in operational systems, but the distribution for them revealed that online websites (42.53%), Android applications (28.84%), and iOS apps (26.97%) make up the grand total of all platforms (98.34%). In terms of business models, just 5.38 percent of all organizations were partially free. This means that some payment is required to access extra content or features or to make more frequent usage of the service possible. In addition to that, it was discovered that the top five most popular languages that were taught in digital environments were English, German, Spanish, Portuguese, and French. Based on the findings, it can be concluded that future research direction should focus on developing an instructional tool that is consistent and provides comparable capabilities across various platforms and operating

systems. Therefore, universality and flexibility were deemed vital requirements for an application to be accessible and available to all students. This led to the pursuit of hybrid systems as opposed to native versions. Furthermore, the researcher was unable to access some services for various reasons, and this included credit card registration, membership restrictions, and the medium of instruction. As a result, the design attempted to establish a learning management system that did not require membership and was entirely open and free to users. It was also decided that the medium of instruction would be in English, with some Turkish translations included wherever it was deemed necessary. As the most adaptable and cross-platform option, a progressive web app was built with the designed learning management system embedded into a content management system. Herein, as the development of the material was viewed as an engineering problem, the most optimal solution with the most cost-effective method was sought, and a "PWA with LMS in CMS" was discovered to be the cheapest, quickest, and highest-quality option. Case, Steeve, and Woolery (2020) contend that Progressive Web Apps (PWAs) have the potential to revolutionize app development by providing mobile installability, offline capabilities, interactivity, and customizability. Similarly, Majchrzak, Biørn-Hansen, and Grønli (2018) also examine the benefits of PWAs and the difficulties of creating cross-platform apps that can work seamlessly on various operating systems and device types, such as Android and iOS. They point out that the complexity of multi-platform support has grown with the emergence of new device categories beyond smartphones and tablets. PWAs, the authors suggest, could be a potential solution for unified development, and they analyze the fundamental principles of PWAs in cross-platform development. Furthermore, they argue that PWAs may bridge the gap between industry and research and provide answers to unresolved issues.

Phase III sought an effective method of instruction in an e-learning environment that is significantly more efficient than conventional approaches. To arrive at this conclusion, the researcher conducted a series of studies to put concepts learned in the classroom to use and understand how they would affect the tool that would be created. This stage necessitated the investigation of three separate studies. The first study incorporated Oxford's strategy suggestions to evaluate their usefulness on an e-learning platform, whereas the second study added cognitive stages to these strategy ideas and adjusted how Oxford's suggestions were presented to learners. In the first study, Oxford's approach recommendations were presented as a stand-alone lesson; in the second study, all recommendations and suggestions were cataloged, sorted according to Bloom's taxonomy, and rearranged to fit the instructional goals better. Following that, the third study was carried out to design the items in modules in the instructional tool after it was found that Bloom's taxonomy with Oxford's strategy utilization boosting model was effective in the learning environment. As design-based research, each study in this phase played a crucial role in contributing to the development of an effective instructional tool. The studies constituted various components of the tool under development, collectively working towards the creation of a functional and useful machine.

In Study I, the administration of the VLT, SE, SRCVoc questionnaires, and the strategy inventory for language learning, as previously conducted during the site visit phase, served dual purposes. These assessments aimed to assess the consistency of factors in the learning environment and gather data for the research design. The vocabulary size test revealed the same pattern among students, as the majority of students were in the first three categories, which correspond to the lower achievement levels in vocabulary. This is consistent with the findings of the studies

by Wharton (2000) and Rao (2016), in which students who reported being ineffective at implementing language-learning techniques had low achievement scores. In the current research, learners' self-judgments of their accuracy for each vocabulary level also displayed the same trend as during the site visit, with underconfident learners outnumbering the total of confident and overconfident learners. In addition to this, the learners' self-reports of their degrees of self-efficacy revealed the same pattern of congregation among the mid-levels, and the mean score for productive skills was higher than the mean score for receptive skills. Finally, SRCVoc had lower mean scores for the components in the areas of metacognition and emotion control than in other domains. The researcher then ensured that the characteristics associated with this particular learning environment were consistent, and the design may be based on these findings. Consequently, the number of learners in each strategy group was determined by the inventory results for language learning strategies.

The outcomes of this study were notable in that the group of learners that participated in metacognitive activities was the one with the fewest number of participants, but they were also the only one to outperform the control group. The same pattern of number distribution between strategy groups was observed in Hong-Nam and Leavell's (2006) study. The comparison between the control group and the experimental group revealed that no individual approach was able to produce better results than the control group, with the exception of the metacognitive strategy group. As a result, metacognitive strategies received increased emphasis. However, despite this, the research design still required adjustments to the existing procedure.

Actions taken by students in vocabulary-building tasks during the strategy-boosting model were found to be ineffective in allowing them to overcome learning new words. Thus, the origin of this phenomenon was analyzed, and it was discovered

that the cognitive levels of the exercises recommended by Oxford were neglected. In particular, activities from lower cognitive levels in Bloom's taxonomy were intermingled into each strategy group. To be more specific, tasks from the remembering, understanding, and applying levels were included in each strategy group. The proposed exercises were then categorized according to each level of Bloom's taxonomy. It was determined that all students would be assigned to the same activities in accordance with this taxonomy. In this scenario, the learners engaged in activities concentrating first on the recalling level, then comprehending level, and ultimately applying level in the correct sequence. Instead of focusing on the usefulness of each strategy, the design of this approach required learners to do the exercises in a cognitive order.

Results from vocabulary size tests, student self-judgments, and the site visit statistics all followed the same general pattern, as indicated in the earlier phases of this research. The comparison between the control group doing the standard exercises in accordance with the conventional method and the experimental group completing the exercises derived from the combination of theories revealed a significant difference, with the experimental group achieving higher scores. This led to the conclusion that integrating cognitive concerns is more effective for learners than focusing exclusively on the strategy they use the least and attempting to strengthen it with prescribed activities.

After careful consideration and analysis, the final design decisions were made in order to determine the most effective method for teaching vocabulary in an e-learning environment. Phase III Study III, in this sense, was carried out to advance the data gathered thus far, their findings, and their contributions to design decisions. In the designed tool, the modules and items in them were incorporated in an

organized order. For this reason, the first item was given the title "Let's get started," and its objectives were to gain learners' attention, inform them of the objectives, and stimulate recollection of prior learning, as proposed by Gagne (1965). Following that, in accordance with the taxonomy of cognitive levels, three items were then produced with the titles "Build Vocabulary," "Comprehension Exercises," and "Practice in Everyday Context" to correspond to remembering, understanding, and applying steps proposed by Bloom. These items also aimed to present the stimulus and provide learning guidance. Eliciting performance, providing feedback, and assessing performance were additional procedures that needed to be devised to cover nine events described by Gagne (1965). To achieve this objective, a new item titled "Test Your Vocabulary" was designed, and a study was conducted to determine how to create assessment materials that met or exceeded textbook criteria.

On the basis of the data gathered in Phase II, where interactive exercises in global apps and platforms were discovered, the elicitation and evaluation of performance with useful feedback were next investigated. As a result, screenshots from interactive exercises from digital language teaching services were broadened to include the analysis of exercises from textbooks. The researcher applied for a virtual mobility network project to study the dimensions of exercises and collaborate with a colleague who oversaw the procedure. To this end, the researcher combed through textbooks in quest of exercise types until he could discover nothing but the same types over and over again. This led to the discovery that textbook exercises could be categorized along three dimensions: linguistic target, learner behavior, and contexts provided to learners. That is to say, twelve distinct user actions were identified for nine distinct linguistic objectives, yet these activities were only found in five distinct settings. Furthermore, syntactic rule open and closed categories were the most

frequently encountered language targets, followed closely by vocabulary teaching linguistic target. The most frequent user action was selecting from available alternatives. This was followed by sentence transformation and production. Regarding contexts, sentence context was the most popular in terms of frequency. The combination of these factors resulted in the creation of the exercise types, the most common of which was a sentence transformation that involved syntactic rule-open category user activity inside the context of the sentence. As the research focused solely on vocabulary teaching as a linguistic target, user actions and contexts were restricted to this objective. As a direct consequence of this, it was found that the exercises in textbooks and apps most frequently use the "choice between options" and "open choice" user actions inside the sentence context. In addition, user actions such as “sentence transformation”, “listening”, and “sentence production” were observed in picture, dialogue, text, and listening contexts. With this in mind, it was decided that the tool would include various user actions in various contexts while taking into account the most typical ones covered in printed and digital media.

The Analysis-Design-Development-Implementation-Evaluation (ADDIE) model was utilized for this design-based research project, and the phases of analysis, design and development were completed up until Phase III. After that, the phases of implementation and assessment were jointly planned, designed and carried out. The vocabulary size test, self-efficacy questionnaire, self-regulation capacity in vocabulary learning questionnaire, and instructional materials motivation survey were administered to evaluate the effectiveness of the overall design. The primary objective of this stage was to evaluate the performance of the tool that had been developed in previous stages, in terms of its ability to meet the objectives set out in the design. This evaluation considered the various factors that had been taken into

account at earlier stages of the design process, such as the learning environment, the students' needs, the instructional strategies, and the technology used. The outcome of this evaluation would inform any necessary modifications to the tool in order to ensure its effectiveness in meeting the goals of the design. As a result, it was discovered that the experimental group that was given the instructions using the developed tool achieved higher scores in vocabulary learning. The comparison revealed that this difference was statistically significant. In another comparison that tested the effectiveness of the tool in terms of self-efficacy, the data showed that the experimental group had higher mean scores. Nonetheless, this difference was not statistically significant. Comparing the improvement in self-regulated capability, emphasis on metacognitive prompts also had an impact on the self-regulated capacity in vocabulary learning. Last but not least, it was discovered that learners' motivation toward the developed instructional tool was significantly greater than their motivation toward the materials utilized by the control group when performing exercises in line with standard procedures. In conclusion, the developed tool was effective with respect to both vocabulary achievement scores and affective variables. Nonetheless, the aspect of self-efficacy required additional testing and study, which then needed to be reviewed, monitored, and improved upon further.

5.3 Implications for practice

The tool developed as a result of this research posed a challenge to the conventional approaches that have been employed in vocabulary instruction for decades. Incorporating strategy-based training into cognitive skills was an innovative method for evaluating the efficacy of a digital learning environment. It was anticipated that students who were introduced to the PWA tool would encounter a novel method for

supporting their vocabulary learning on their familiar devices. In an era characterized by a search for novel language-teaching techniques, the focus of this study was primarily on those that are compatible with technological gadgets. The objective was for learners to have greater self-efficacy and display improved self-regulation in vocabulary learning. The designed tool serves as a substitute for traditional textbooks, offering a more personalized and updated approach to language learning through various exercise types. Additionally, the tool is customized to cater to the individual cognitive and affective variables of each learner, ensuring a more effective and engaging learning experience. In addition to the conventional exercises found in vocabulary-learning textbooks, students were given the opportunity to perform a variety of user activities in specially developed exercises in the application. The researcher analyzed the learners' desire toward the instructional content, discovered a statistically significant difference compared to the control group, and noted that learners engaged in the learning process with greater enthusiasm and eagerness. The researcher's approach to incorporating vocabulary learning into a web-based learning environment consisted of the following components:

i. Pedagogical agent as a digital language learning assistant,
ii. Setup page for learner profiles,
iii. Follow-up automation system for notifications and learners' further engagement throughout the course,
iv. Live lessons,
v. Easy access to the instructor for inquiries,
vi. Articles on the efficacy of language learning,
vii. A tool for forming habit loops to be a continuous learner,

viii. A notetaking tool for keeping notes on anything studied in the target language,

ix. Access to multimedia materials geared toward language students,

x. Access to materials related to the class, from the electronic version of the syllabus to the attendance forms,

xi. Metacognitive prompts in the form to aid students in completing learning progress to ensure that their new knowledge sticks.

The tool was developed with the intention of serving all students in the classroom. Therefore, it is compatible with a wide variety of operating systems and smart devices without affecting the quality or content of the information presented. Additionally, the platform was made available for free usage by all educators and students for dissemination reasons. For users' convenience, tutorials demonstrating how to use the PWA and locate courses were provided.

In short, the PWA tool developed as a result of this research has made a significant contribution to the field of vocabulary instruction. By incorporating strategy-based training into cognitive skills, the tool provides a novel approach to evaluating the efficacy of digital learning environments. This study demonstrates that the use of the tool results in heightened self-efficacy and enhanced self-regulation in vocabulary acquisition among students. The tool's personalized and updated approach to language learning, combined with its compatibility with technology, makes it a valuable resource for educators and students alike. In terms of its application, the PWA tool can be utilized by teachers or curriculum developers in teaching vocabulary. It offers a comprehensive range of features, including a pedagogical agent as a digital language learning assistant, live lessons, easy access to the instructor, multimedia materials, and metacognitive prompts. These features

provide a comprehensive support system for students to engage in vocabulary learning effectively. The availability of the platform for free use also makes it a valuable resource for educators and students in developing countries who might not have access to traditional textbooks or language-teaching resources. The results of this research could be taken into account by policymakers and curriculum developers in designing language education policies and programs. In conclusion, the PWA tool serves as a valuable resource for language educators, students, and policymakers to enhance the vocabulary learning experience and achieve better outcomes.

5.4 Limitations of the study

The overall purpose of the research, optimization strategies, and environmental conditions all led to the conclusions of this study having various barriers, or limitations. The main goal of the study was focused on limited aspects of vocabulary instruction and the design of the PWA was developed with a primary emphasis on vocabulary acquisition. It is important to note that, although the study primarily focused on vocabulary learning, it took into account both cognitive and affective factors in its design, which may have added complexity to the research process but also resulted in a more comprehensive solution. The researcher's approach to optimize the design, in terms of cost-effectiveness and simplicity, also served as a constraint that helped lead to a more refined solution. The focus was on creating a system that was cost-effective, simple, and easy to implement, and this consideration was incorporated into the design process at every stage. Thus, it could be argued that ignoring optimization in design may lead to inadequate outcomes. The underlying principle of the project was that the final product would be accessible to everyone and would be offered at no charge. In order to accomplish this goal, for example,

numerous learning management systems (LMSs) and content management systems (CMSs) were evaluated, but the more cost-effective versions were chosen since they met the basic criterion. In other words, the fittest alternative with optimum solutions was designed, not the ideal solution. Considering the limitations of the educational setting, the preferred solution was viewed as having a simple and straightforward design, while still being readily accessible and attractive for further investigation of optimized methods. This gave rise to restrictions, as it caused the research to lose some e-learning environment elements. As an example of this, the domain and hosting plans that were chosen to serve as the design's foundation did not make it possible for researchers to develop membership plans, because the web tool became extremely sluggish whenever user registration was permitted. This resulted in the case that information provided by students had to be manually recorded as there was no accessible feature to log learner information.

The study's limitations were also impacted by the outbreak of the Covid-19 pandemic. The research was carried out at the inception of the pandemic when all educational institutions shifted to remote learning. This posed a hindrance to the investigation, as in early preliminary designs, it aimed to assess the effectiveness of collaborative elements within a traditional classroom setting. During the initial phases of the study, webinar technologies, which later proved crucial to the e-learning process, did not yet offer the same level of services. For instance, webinar tools at the time lacked the feature of breakout rooms. The impact of the pandemic was exacerbated by efforts to design an optimal solution with a cost-effective approach, leading to a need for quickly preparing high-quality distance education services at a low cost. Consequently, the limitations may be summed up as the fact that the research was carried out with limited resources due to issues connected to the

learning environment, the influence of the pandemic, and the parameters to attain the opportunities. Their combination constitutes the most major restriction.

5.5 Recommendations for future research

This DBR study offers insights into the digitized implementation of strategy-enhanced learning in personalized and cognitively oriented forms, while also generating new questions. This study provides an opportunity for additional examination into the impact of collaborative techniques, such as utilizing shared documents, on the established model presented in this research, which is a potential area of inquiry. This would allow for the incorporation and examination of the social learning hypothesis. Affective variables such as anxiety or perspectives and attitudes on subjects like language learning could be examined based on the results of this study.

Due to the constraints of this research, the researcher had to devise the best possible solutions and design the instrument taking factors such as time and resources into account. More resources and time, though, may eventually yield improved versions with more robust instruments. For example, the effect of cognitive and affective components on listening or speaking achievement scores might upgrade this study and the developed tool as well as future versions of similar digital language learning tools. Since DBR iterations are perpetual processes, testing other abilities besides vocabulary learning would also be preferable for researchers. Little is known about the impact of new theories on digitalized teaching models, and it is unclear which aspects should be prioritized for particular skills. In conclusion, this research aimed to devise the best possible solutions within the constraints of limited time and resources, and while further resources and time may lead to improved

versions of the developed instrument, it highlights the potential for future research to examine the impact of cognitive and affective components on language learning outcomes and to test different language abilities. The findings of this study add to the growing body of knowledge on digital language learning tools, but more research is needed to fully understand the impact of new theories on digitalized teaching models.

APPENDIX A

DEMOGRAPHIC INFORMATION

DEMOGRAPHIC INFORMATION

Learners Information

Lütfen Aşağıdaki Boşluklara Kişisel Bilgilerinizi Girin
(Please fill in the blanks with your personal information)

Adınız ve Soyadınız *

Doğum Tarihiniz *

Cinsiyetiniz *

Size ait GSM numaranız *

Üniversite Giriş Sınavı'ndaki Yabancı Dil Netiniz Nedir? *

Daha önce Türkiye dışında bir ülkede bulundunuz mu? *

Bulundu iseniz, lütfen ülkeyi ve kaldığınız süreyi belirtiniz.

Lütfen aşağıdaki boşluğa ilgi alanınızı yazınız *

Sağladığınız verilerin gizli tutulacağını ve bilimsel araştırma amacıyla kullanılacağını biliyor ve onay veriyor musunuz? *

APPENDIX B

STRATEGY INVENTORY FOR LANGUAGE LEARNING

"Aşağıda, dil öğreniminde kullanılan stratejilerle ilgili 50 ifade bulunmaktadır. Her bir ifadeyi dikkatlice okuyup, “Hiçbir zaman doğru değil (1)” den “Her zaman doğru (5)” ya kadar uzanan beşli değerlendirme ölçeğini kullanarak size en uygun derecelendirmeyi işaretleyiniz."

This form of the strategy inventory for language learning (SILL) is for students of a second language (SL). Please read each statement and fill in the bubble of the response (1, 2, 3, 4, or 5) that tells HOW TRUE THE STATEMENT IS. 1. Never or almost never true of me 2. Usually not true of me 3. Somewhat true of me 4. Usually true of me 5. Always or almost always true of me. Answer in terms of how well the statement describes you. Do not answer how you think you should be or what other people do. There are no right or wrong answers to these statements.

	Hiçbir Zaman Doğru Değil	**Nadiren Doğru**	**Bazen Doğru**	**Sık Sık Doğru**	**Her zaman Doğru**
İngilizce’de bildiklerimle yeni öğrendiklerim arasında ilişki kurarım	1	2	3	4	5
Yeni öğrendiğim kelimeleri hatırlamak için bir cümlede kullanırım	1	2	3	4	5
Yeni öğrendiğim kelimeleri akılda tutmak için kelimenin telaffuzuyla aklıma getirdiği bir resim ya da şekil arasında bağlantı kurarım	1	2	3	4	5
Yeni bir kelimeyi o sözcüğün kullanılabileceği bir sahneyi ya da durumu aklımda canlandırarak, hatırlarım	1	2	3	4	5
Yeni kelimeleri aklımda tutmak için, onları ses benzerliği olan kelimelerle ilişkilendiririm	1	2	3	4	5
Yeni öğrendiğim kelimeleri aklımda tutmak için küçük kartlara yazarım	1	2	3	4	5
Yeni kelimeleri vücut dili kullanarak zihnimde canlandırırım	1	2	3	4	5

	Hiçbir Zaman Doğru Değil	Nadiren Doğru	Bazen Doğru	Sık Sık Doğru	Her zaman Doğru
İngilizce derslerinde öğrendiklerimi sık sık tekrar ederim	1	2	3	4	5
Yeni kelime ve kelime gruplarını ilk karşılaştığım yerleri (kitap, tahta ya da herhangi bir işaret levhasını) aklıma getirerek hatırlarım	1	2	3	4	5
Yeni sözcükleri birkaç kez yazarak, ya da söyleyerek, tekrarlarım	1	2	3	4	5
Anadili İngilizce olan kişiler gibi konuşmaya çalışırım	1	2	3	4	5
Anadilimde bulunmayan İngilizce'deki "th /θ / hw" gibi sesleri çıkararak, telaffuz alıştırması yaparım	1	2	3	4	5
Bildiğim kelimeleri cümlelerde farklı şekillerde kullanırım	1	2	3	4	5
İngilizce sohbetleri ben başlatırım	1	2	3	4	5
TV'de İngilizce programlar ya da İngilizce filmler izlerim	1	2	3	4	5
İngilizce okumaktan hoşlanırım	1	2	3	4	5
İngilizce mesaj, mektup veya rapor yazarım	1	2	3	4	5
İngilizce bir metne ilk başta bir göz atarım, daha sonra metnin tamamını dikkatlice okurum	1	2	3	4	5
Yeni öğrendiğim İngilizce kelimelerin benzerlerini Türkçe'de ararım	1	2	3	4	5
İngilizce'de tekrarlanan kalıplar bulmaya çalışırım	1	2	3	4	5
İngilizce bir kelimenin, bildiğim kök ve eklerine ayırarak anlamını çıkarırım	1	2	3	4	5

	Hiçbir Zaman Doğru Değil	Nadiren Doğru	Bazen Doğru	Sık Sık Doğru	Her zaman Doğru
Kelimesi kelimesine çeviri yapmamaya çalışırım	1	2	3	4	5
Dinlediğim ya da okuduğum metnin özetini çıkarırım	1	2	3	4	5
Bilmediğim İngilizce kelimelerin anlamını, tahmin ederek bulmaya çalışırım	1	2	3	4	5
İngilizce konuşurken bir sözcük aklıma gelmediğinde, el kol hareketleriyle anlatmaya çalışırım	1	2	3	4	5
Uygun ve doğru kelimeyi bilmediğim durumlarda kafamdan yeni sözcükler uydururum	1	2	3	4	5
Okurken her bilmediğim kelimeye sözlükten bakmadan, okumayı sürdürürüm	1	2	3	4	5
Konuşma sırasında karşımdakinin söyleyeceği bir sonraki cümleyi tahmin etmeye çalışırım	1	2	3	4	5
Herhangi bir kelimeyi hatırlayamadığımda, aynı anlamı taşıyan başka bir kelime ya da ifade kullanırım	1	2	3	4	5
İngilizce'mi kullanmak için her fırsatı değerlendiririm	1	2	3	4	5
Yaptığım yanlışların farkına varır ve bunlardan daha doğru İngilizce kullanmak için faydalanırım	1	2	3	4	5
İngilizce konuşan bir kişi duyduğumda dikkatimi ona veririm	1	2	3	4	5
İngilizce'yi daha iyi nasıl öğrenirim? sorusunun yanıtını araştırırım	1	2	3	4	5

	Hiçbir Zaman Doğru Değil	Nadiren Doğru	Bazen Doğru	Sık Sık Doğru	Her zaman Doğru
İngilizce çalışmaya yeterli zaman ayırmak için zamanımı planlarım	1	2	3	4	5
İngilizce konuşabileceğim kişilerle tanışmak için fırsat kollarım	1	2	3	4	5
İngilizce okumak için, elimden geldiği kadar fırsat yaratırım	1	2	3	4	5
İngilizce'de becerilerimi nasıl geliştireceğim konusunda hedeflerim var	1	2	3	4	5
İngilizce'mi ne kadar ilerlettiğimi değerlendiririm	1	2	3	4	5
İngilizce'mi kullanırken tedirgin ve kaygılı olduğum anlar rahatlamaya çalışırım	1	2	3	4	5
Yanlış yaparım diye kaygılandığımda bile İngilizce konuşmaya gayret ederim	1	2	3	4	5
İngilizce'de başarılı olduğum zamanlar kendimi ödüllendiririm	1	2	3	4	5
İngilizce çalışırken ya da kullanırken gergin ve kaygılı isem, bunun farkına varırım	1	2	3	4	5
Dil öğrenirken yaşadığım duyguları bir yere yazarım	1	2	3	4	5
İngilizce çalışırken nasıl ya da neler hissettiğimi başka birine anlatırım	1	2	3	4	5
Herhangi bir şeyi anlamadığımda, karşımdaki kişiden daha yavaş konuşmasını ya da söylediklerini tekrar etmesini isterim	1	2	3	4	5
Konuşurken karşımdakinin yanlışlarımı düzeltmesini isterim	1	2	3	4	5

	Hiçbir Zaman Doğru Değil	Nadiren Doğru	Bazen Doğru	Sık Sık Doğru	Her zaman Doğru
Okulda arkadaşlarımla İngilizce konuşurum	1	2	3	4	5
İhtiyaç duyduğumda İngilizce konuşan kişilerden yardım isterim	1	2	3	4	5
Derste İngilizce sorular sormaya gayret ederim	1	2	3	4	5
İngilizce konuşanların kültürü hakkında bilgi edinmeye çalışırım	1	2	3	4	5

APPENDIX C

SELF-EFFICACY SCALE

Aşağıda, dil öğreniminde öz yeterlilik algısına ilişkin 34 ifade bulunmaktadır. Öz yeterlilik algısına ilişkin bu ölçek yabancı dil öğrenenler için hazırlanmıştır. Her bir ifadeyi dikkatlice okuyup, “Bana Hiç Uymuyor (1)” dan “Bana Tamamen Uyuyor (5)” a kadar uzanan beşli değerlendirme ölçeğini kullanarak size en uygun derecelendirmeyi işaretleyiniz". Size en uygun olan ifadeyi seçerken seçenekler arasından (1. Bana Hiç Uymuyor, 2. Bana çok az uyuyor, 3. Bana biraz uyuyor, 4. Bana Oldukça uyuyor, 5. Bana Tamamen Uyuyor) bir tanesini işaretleyiniz. Lütfen nasıl olmanız ya da insanların sizi nasıl görmesi gerektiğini düşünerek değil, kendinizi ifade edecek şekilde düşünerek işaretleme yapınız. Soruların doğru ya da yanlış bir cevabı yoktur.

There are 34 items regarding the self-efficacy level of SL learners. This form of self-efficacy f is for students of a second language (SL). Please read each statement and fill in the bubble of the response (1, 2, 3, 4, or 5) that tells HOW TRUE THE STATEMENT IS. 1. Very untrue of me 2. Untrue of me 3. Somewhat true of me 4. True of me 5. Very True of me. Answer in terms of how well the statement describes you. Do not answer how you think you should be, or what other people do. There are no right or wrong answers in these statements.

	Bana Hiç Uymuyor	**Çok Az Uyuyor**	**Biraz Uyuyor**	**Oldukça Uyuyor**	**Bana Tamamen Uyuyor**
İngilizce bir metin okuduğumda anlayabilirim.	1	2	3	4	5
İngilizce akademik metinler okuduğumda önemli noktaları anlayabilirim.	1	2	3	4	5
Okuduklarımı zihnimde canlandırabilirim.	1	2	3	4	5
Okuduğum İngilizce metnin temasını ya da ana fikrini bulabilirim.	1	2	3	4	5
İngilizce bir metinle ilgili soruları cevaplayabilirim.	1	2	3	4	5
Okuduğum İngilizce bir metinde anlamını bilmediğim sözcükleri tahmin edebilirim.	1	2	3	4	5
İngilizce bir metinde aradığım bilgiyi kolaylıkla bulabilirim	1	2	3	4	5
İngilizce sınavlarının okuma bölümlerinde başarılı olacağıma inanıyorum	1	2	3	4	5
İyi bir paragraf ya da kompozisyon yazabilirim.	1	2	3	4	5

	Bana Hiç Uymuyor	Çok Az Uyuyor	Biraz Uyuyor	Oldukça Uyuyor	Bana Tamamen Uyuyor
İngilizce bir paragraf ya da kompozisyon yazarken dilbilgisi kurallarını doğru kullanabilirim.	1	2	3	4	5
İngilizce bir metin yazarken noktalama işaretlerini doğru kullanabilirim.	1	2	3	4	5
İngilizce bir metin yazarken düşüncelerimi tam ve açık olarak ifade edebilirim.	1	2	3	4	5
Bir şeyi İngilizce yazamadığımda, pes etmek yerine sorunu çözmek için çaba sarf ederim.	1	2	3	4	5
İngilizce yazarken önemli noktaları vurgulayabilirim.	1	2	3	4	5
İngilizce bir metni kendi cümlelerimle yeniden yazabilirim.	1	2	3	4	5
Günlük yaşamda kendimi İngilizce yazılı olarak ifade edebilirim (özgeçmiş, başvuru formu, şikâyet mektubu vb.)	1	2	3	4	5
İngilizce herhangi bir şey yazdıktan sonra hatalarımın farkına varabilirim.	1	2	3	4	5
İngilizce yazma ile ilgili verilen etkinlikleri yaparken yardıma ihtiyaç duyarım	1	2	3	4	5
İngilizce konuşulanları anlayabilirim	1	2	3	4	5
Dinlediğim İngilizce konuşmanın ana fikrini çıkarabilirim.	1	2	3	4	5
Dinlediğim bir cümledeki duygusal vurguları anlayabilirim.	1	2	3	4	5
İngilizce bir konuşma dinlediğimde bilmediğim sözcüklerin anlamını tahmin edebilirim.	1	2	3	4	5
İngilizce bir konuşma duyduktan sonra duyduklarımla ilgili soruları cevaplayabilirim.	1	2	3	4	5
İngilizce televizyon kanallarını/filmleri izlediğimde dinlediklerimi anlayabilirim.	1	2	3	4	5
Bir konuşma dinlediğimde resmi dil ile günlük konuşma dilini ayırt edebilirim.	1	2	3	4	5

	Bana Hiç Uymuyor	Çok Az Uyuyor	Biraz Uyuyor	Oldukça Uyuyor	Bana Tamamen Uyuyor
İngilizce bir okuma parçasını dinlerken duyduklarımı doğru olarak yazabilirim.	1	2	3	4	5
İki kişi arasında geçen kısa bir İngilizce konuşmayı anlayabilirim.	1	2	3	4	5
İngilizce sınavlarının dinleme bölümlerinde başarılı olacağıma inanıyorum.	1	2	3	4	5
Günlük yaşamda gerekli ihtiyaçlarımı İngilizce'yi kullanarak karşılayabilirim. (Yurt dışında olduğunuzu düşünün, yer-yön bulma, alış-veriş vb.)	1	2	3	4	5
Bir mülakatta kendimi İngilizce olarak ifade edebilirim. (Üniversiteye giriş, iş başvurusu vb.)	1	2	3	4	5
Amaca ve duruma göre resmi ya da resmi olmayan bir şekilde İngilizce konuşabilirim.	1	2	3	4	5
İngilizce sorulan sorulara cevap verebilirim.	1	2	3	4	5
Karşımdaki beni anlamadığında düşüncelerimi başka şekilde ifade edebilirim.	1	2	3	4	5
Anadili İngilizce olan bir kişinin anlayabileceği şekilde İngilizce konuşabilirim.	1	2	3	4	5
Lütfen dil öğreniminde öz yeterliliğinize dair inancınızı ve bu inancınızın sebeplerini belirtiniz					

APPENDIX D

SRCVOC SCALE

"Aşağıda, kelime öğreniminde özdüzenlemeye ilişkin 20 ifade bulunmaktadır. Her bir ifadeyi dikkatlice okuyup, “Kesinlikle Katılıyorum (1)” dan “Kesinlikle Katılmıyorum (5)” aa kadar uzanan altılı değerlendirme ölçeğini kullanarak size en uygun olanı işaretleyiniz."

This is an educational research project about learning vocabulary. Below is a series of statements about your learning experience of vocabulary. We would like to know how far these statements match your own perceptions, that is, your personal view. There are no ‘right’ or ‘wrong’ answers. Moreover, the data we collect is for research purposes, and your opinions will be respected and kept confidential. There are twenty items in total in the questionnaire. Please tick the appropriate box concerning your personal vocabulary learning experience. Thank you very much for your cooperation!

	Kesinlikle Katılıyorum	**Katılıyorum**	**Kısmen Katılıyorum**	**Kısmen katılmıyorum**	**Katılmıyorum**	**Kesinlikle Katılmıyorum**
Kelime öğrenmenin yeniliği kaybolunca, bu konu ile ilgili hemen sabırsızlanırım.	1	2	3	4	5	6
Kelime öğrenimi ile ilgili sıkıntı yaşadığımda bu stresi nasıl azaltacağımı biliyorum.	1	2	3	4	5	6
Kelime çalışırken öğrenme ortamı uygun değilse problemi çözmeye çalışırım.	1	2	3	4	5	6
Kelime öğrenirken öğrenme hedeflerimi gerçekleştirmek için özel tekniklerim var.	1	2	3	4	5	6
Kelime öğrenirken düşüncelerimi odaklamak için özel tekniklerim var.	1	2	3	4	5	6
Kelime öğrenimi stresini azaltmak için kullandığım metodlardan memnunum.	1	2	3	4	5	6
Kelime öğrenirken hedeflerimi beklenenden daha hızlı başarabileceğime inanıyorum.	1	2	3	4	5	6

	Kesinlikle Katılıyorum	**Katılıyorum**	**Kısmen Katılıyorum**	**Kısmen katılmıyorum**	**Katılmıyorum**	**Kesinlikle Katılmıyorum**
Kelime öğrenme sürecinde bıkkınlığı gidermek için kullandığım yollardan memnunum.	1	2	3	4	5	6
Kelime öğrenirken konsantrasyonumu kontrol etme metodlarının etkili olduğunu düşünüyorum.	1	2	3	4	5	6
Kelime öğrenirken kendime belirlediğim hedeflere ulaşana dek azimliyimdir.	1	2	3	4	5	6
Mesele kelime öğrenmeye gelince işi sonraya erteleme eğilimini engellemek için özel tekniklerim var.	1	2	3	4	5	6
Kelime öğrenimi ile ilgili stres yaşadığımda basitçevazgeçmek isterim.	1	2	3	4	5	6
Kelime öğrenimi hedeflerimi başarabilmek için tüm zorlukların üstesinden gelebileceğime inanıyorum.	1	2	3	4	5	6
Kelime öğrenirken öğrenmeyi daha etkin kılmak için ortamı nasıl düzenleyeceğimi biliyorum.	1	2	3	4	5	6
Kelime öğrenimi ile ilgili stres yaşadığımda bu problemin üstesinden hemen gelirim.	1	2	3	4	5	6
İş kelime öğrenmeye gelince işi sonraya erteleme eğilimini kontrol etme metodlarım etkilidir.	1	2	3	4	5	6
Kelime öğrenirken öğrenme ortamının önem arzettiğnin farkındayım.	1	2	3	4	5	6

	Kesinlikle Katılıyorum	**Katılıyorum**	**Kısmen Katılıyorum**	**Kısmen katılmıyorum**	**Katılmıyorum**	**Kesinlikle Katılmıyorum**
Kelime öğrenme sürecinde herhangi bir bıkkınlık duygusunun üstesinden gelebileceğimden eminim.	1	2	3	4	5	6
Kelime öğrenmekten sıkıldığımda öğrenme sürecini canlandırmak için modumu düzenlemeyi bilirim.	1	2	3	4	5	6
Kelime öğrenirken iyi bir çalışma ortamı ararım.	1	2	3	4	5	6

APPENDIX E

THE INSTRUCTIONAL MATERIALS MOTIVATION SURVEY

INSTRUMENT

"Aşağıda, dil öğreniminde kullanılan stratejilerle ilgili 33 ifade bulunmaktadır. Her bir ifadeyi dikkatlice okuyup, “Doğru değil (1)” den “Çok doğru (5)” ya kadar uzanan beşli değerlendirme ölçeğini kullanarak size en uygun derecelendirmeyi işaretleyiniz."

There are 33 statements in this questionnaire. Please think about each statement in relation to the instructional materials you have just studied and indicate how true it is. Give the answer that truly applies to you, and not what you would like to be true, or what you think others want to hear. Think about each statement by itself and indicate how true it is. Please read each statement and fill in the bubble of the response (1, 2, 3, 4, or 5) that tells HOW TRUE THE STATEMENT IS. 1. Not True 2. Slightly True 3. Moderately True 4. Mostly True 5. Very true. Thank you.

	Doğru Değil	**Biraz Doğru**	**Orta Derecede Doğru**	**Doğru**	**Çok Doğru**
Bu dersi ilk gördüğümde benim için kolay olacağını düşündüm.	1	2	3	4	5
Bu dersin başında ilgimi çeken ilginç şeyler vardı.	1	2	3	4	5
Bu ders materyalini/aracını (bilgisayar, kitap gibi) tahmin ettiğimden daha kolay anladım.	1	2	3	4	5
Giriş bilgilerini okuduktan/dinledikten sonra, bu dersten neler öğrenmem gerektiğinden emin oldum.	1	2	3	4	5
Bu dersin alıştırmalarını yapmak, bana başarı duygusu kazandırdı.	1	2	3	4	5
Bu dersin içeriğinin önceden öğrendiklerimle nasıl ilişkisi olduğu benim için açık ve netti.	1	2	3	4	5
Ders materyalinde/aracında olması gerektiği kadar bilgi vardı. Önemli olan şeyleri ayırabildim.	1	2	3	4	5

	Doğru Değil	Biraz Doğru	Orta Derecede Doğru	Doğru	Çok Doğru
Bu dersteki kullanılan materyal/ders aracı dikkat çekiciydi.	1	2	3	4	5
Bu ders materyalinin/aracının, bazı insanlar için nasıl önemli olabileceğini gösteren resim, hikâye ya da örnekler vardı.	1	2	3	4	5
Bu dersi başarıyla tamamlamak benim için önemliydi.	1	2	3	4	5
Yazıların/seslerin kalitesi, derse dikkatimi vermemi kolaylaştırdı.	1	2	3	4	5
Bu derse çalıştıkça konuları öğreneceğimden emin oldum.	1	2	3	4	5
Bu dersten o kadar keyif aldım ki bu konuyla ilgili daha çok şey öğrenmek istedim.	1	2	3	4	5
Bu materyalde/ders aracında ders anlatımları zevkliydi.	1	2	3	4	5
Bu materyalin/ders aracının içeriği ilgimi çeken konulara göre hazırlanmıştı.	1	2	3	4	5
Bilgilerin ders materyalinde düzenleniş biçimi, dikkatimi vermemi kolaylaştırdı.	1	2	3	4	5
Ders materyalinde, bu dersteki bilgileri insanların nasıl kullandığına dair örnekler ve açıklamalar vardı.	1	2	3	4	5
Bu dersteki alıştırmalar çok kolaydı.	1	2	3	4	5
Bu derste merak uyandıran şeyler vardı.	1	2	3	4	5
Bu dersi çalışmaktan gerçekten zevk aldım.	1	2	3	4	5
Bu derste konu tekrarların sayısı yeterliydi. Hiç sıkılmadım.	1	2	3	4	5

	Doğru Değil	Biraz Doğru	Orta Derecede Doğru	Doğru	Çok Doğru
Bu dersteki bilgiler ve bilgilerin veriliş şekli, bu dersin önemli olduğunu düşünmemi sağladı.	1	2	3	4	5
Bu derste tahmin etmediğim ya da şaşırtıcı ve yararlı bilgiler öğrendim.	1	2	3	4	5
Bu dersi bir süre çalıştıktan sonra, bu dersten başarılı olacağıma emin oldum.	1	2	3	4	5
Alıştırmalardan sonraki dönütler (geri bildirimler/yorumlar) çalışmamın karşılığını aldığımı hissetmemi sağladı.	1	2	3	4	5
Okuma parçaları, alıştırmalar, resimler, videolar, sesler gibi çeşitli öğeler derse dikkatimi vermeme yardımcı oldu.	1	2	3	4	5
Ders materyalindeki yazıların şekli benim için uygundu.	1	2	3	4	5
Bu dersin içeriğini, kendi hayatımdaki şeylerle ilişkilendirebildim.	1	2	3	4	5
Bu dersi başarıyla tamamlamak kendimi iyi hissettirdi.	1	2	3	4	5
Bu ders içeriğinin, benim için faydalı olacağına inandım.	1	2	3	4	5
Bu ders materyalinin tüm bölümlerini anladım.	1	2	3	4	5
Ders materyali içeriği iyi hazırlanmıştı. Bu nedenle derste başarılı olacağıma dair güvenim arttı.	1	2	3	4	5
Ders o kadar güzel hazırlanmıştı ki bu dersi işlemek benim için bir zevkti.	1	2	3	4	5

APPENDIX F

ETHICAL APPROVAL FROM THE KIRKLARELI UNIVERSITY

T.C.

KIRKLARELİ ÜNİVERSİTESİ

BİLİMSEL ARAŞTIRMA VE YAYIN ETİĞİ KURULU KARARLARI

TOPLANTI TARİHİ: 19/02/2020

TOPLANTI SAYISI: 6

Üniversitemiz Bilimsel Araştırma ve Yayın Etiği Kurulu' na Öğr. Gör. Gökhan ÖZKAN' dan gelen 24/01/2020 tarihli ve 52840583656 sayılı yazısı gereği; "İşbirlikli Çoklu Ortam Platformu Aracılığıyla Sunulan Bireyselleştirilmiş İkincil Dil Sözcük Öğrenimi: Tasarım Temelli Araştırma" başlıklı proje detayları incelendi.

Yapılan görüşme ve incelemeden sonra; Kurulumuzca çalışmanın etik açıdan bir sakınca içermediğine oy birliğiyle karar verildi.

{imza}
Prof. Dr Meryem Çamur
Üye

{imza}
Prof. Dr Nadide Seçkin
Üye

{imza}
Prof. Dr Abdüssealm Arı
Üye

{imza}
Prof. Dr Feridun Şengör
Üye

{imza}
Prof. Dr Ayşe Yasemin Karageyim Karşıdağ
Üye

{imza}
Prof. Dr Hatice Şanlıdere Aloğlu
Üye

{imza}
Prof. Dr Rengin Ak
Üye

{imza}
Dr Öğr. Üyesi İskender Gümüş
Üye

{imza}
Dr. Öğr.Üyesi Figen Dığın
Üye

APPENDIX G

ETHICAL APPROVAL FROM BOĞAZIÇI UNIVERSITY

Evrak Tarih ve Sayısı: 26/06/2020-55

T.C.
BOĞAZİÇİ ÜNİVERSİTESİ
SOSYAL VE BEŞERİ BİLİMLER YÜKSEK LİSANS VE DOKTORA TEZLERİ ETİK İNCELEME KOMİSYONU
TOPLANTI TUTANAĞI

Toplantı Sayısı	:	2
Toplantı Tarihi	:	16/03/2020
Toplantı Saati	:	14:00
Toplantı Yeri	:	Skype Sanal Toplantı
Bulunanlar	:	Prof. Dr. Feyza Çorapçı, Dr. Öğr. Üyesi Yasemin Sohtorik İlkmen, Prof. Dr. Özlem Hesapçı Karaca, Doç. Dr. Ebru Kaya, Prof. Dr. Fatma Nevra Seggie
Bulunmayanlar	:	

Gökhan Özkan
Öğrenme Bilimleri

Sayın Araştırmacı,

"İşbirlikli Çoklu Ortam Platformu Aracılığıyla Sunulan Bireyselleştirilmiş İkinci Dil Sözcük Öğrenimi: Tasarım Temelli Araştırma" başlıklı projeniz ile ilgili olarak yaptığınız SBB-EAK 2020/04 sayılı başvuru komisyonumuz tarafından 16 Mart 2020 tarihli toplantıda incelenmiş ve uygun bulunmuştur.

Bu karar tüm üyelerin toplantıya çevrimiçi olarak katılımı ve oybirliği ile alınmıştır. COVID-19 önlemleri kapsamında kurul üyelerinden ıslak imza alınamadığı için bu onam mektubu üye ve raportör olarak Fatma Nevra Seggie tarafından bütün üyeler adına e-imzalanmıştır.

Saygılarımızla, bilgilerinizi rica ederiz.

Prof. Dr. Fatma Nevra SEGGIE
ÜYE

e-imzalıdır
Prof. Dr.Fatma Nevra SEGGIE
Raportör

SOBETİK 2 16/03/2020

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