Towards Blockchain-based Learning Management System for Adaptive Self-regulation Development in ELT

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ABSTRACT

The study of online higher education learning and academic achievement has increasingly emphasized self-regulated learning (SRL). Few studies so far have investigated the blockchain-based learning management system (LMS) and adaptive SRL intervention in English Language Teaching (ELT) online higher education. This study aimed to develop a blockchain-enabled LMS as a metacognitive tool in ELT online higher education with SRL adaptive intervention to improve planning, monitoring, reflection, collaboration, zone of proximal development (ZPD), and scaffolding towards self-regulation development and learning achievement. To do that, based on the benchmark data of 33 ELT Master of Art (MA) students, the blockchain-based LMS is developed that provided three phases of planning, action, and reflection SRL adaptive intervention throughout the ELT MA online program. Data were collected quantitatively by utilizing SRL pre- and post-test questionnaire which were analyzed along the t-test and qualitatively by adopting reflective essays and semi-structured interview which were analyzed through the content analysis method. The findings and the development of the blockchain-based LMS with adaptive SRL intervention contributed to the development of ELT MA students' SRL skills in realistic goal setting, self-monitoring, self-reflection, and self-awareness through SRL adaptive intervention in planning, monitoring, reflection, ZPD, and collaboration. Also, ELT MA instructors tracked students' activities and in case of failure to comply with SRL adaptive interventions, they could provide feedback to the students. In addition, this study showed that the integration of blockchain technology in ELT online higher education with adaptive SRL appears to be a promising trend in the development of SRL.

Keywords: adaptive learning, blockchain technology, collaborative learning, learning management system, metacognitive tools.

ÖZ

Çevrimiçi yükseköğretim öğrenme ve akademik başarı çalışması, öz-düzenlemeli öğrenmeyi giderek daha fazla vurgulamaktadır. Şimdiye kadar çok az çalışma blok zinciri tabanlı öğrenme-yönetim sistemini (LMS) ve İngiliz Dili Öğretimi (ELT) çevrimiçi yükseköğretiminde öz-düzenlemeli öğrenmeyi uyumlaştıracak müdahale programlarını araştırmıştır. Bu çalışma, öz-düzenlemeli öğrenmeyi uyumlaştıracak müdahale programları ile çevrimiçi ELT yüksek lisans öğretiminde üst bilişsel bir araç olarak blok zinciri etkin bir öğretim ve yönetim sistemini geliştirmeyi hedeflemiştir. Bu müdahale programı özellikle planlamayı, izlemeyi, yansıtmayı, işbirliğini, yakınsal gelişim bölgesini ve yakınsal gelişim bölgesi içerisindeki destekleyici araçları (scaffolding) öz-düzenlemeyi ve öğrenmeyi geliştirecek şekilde etkinleştirmeyi amaçlamaktadır. Bunu yapmak için, 33 ELT yüksek lisans öğrencisinin karşılaştırma verilerine dayanarak, ELT MA çevrimiçi programında öz-düzenlemeli öğrenmeyi uyumlaştıracak müdahale programının üç aşaması olan planlama, eylem ve yansıtmayı sağlayan blok zincir tabanlı bir öğrenme yönetim sistemi geliştirilmiştir. Nicel veriler, t-testi ile analiz edilen öz-düzenlemeli ön ve son-test anketi kullanılarak, nitel veriler ise içerik analizi yöntemi kullanılarak analiz edilen katılımcıların yazdığı yansıtıcı kompozisyonlar ile elde edilmiştir. Öz-düzenlemeli öğrenmeyi uyumlaştıracak müdahale programı ile blok zinciri tabanlı öğretim yönetim sisteminin geliştirilmesi, ELT MA öğrencilerinin gerçekçi hedef belirleme, kendi kendini izleme, yansıtma ve öz farkındalık konularında öz-düzenlemeyi uyumlaştıracak program müdahalesinin planlama, izleme, yansıtma, yakınsal gelişim bölgesi ve iş birliği ile öz-düzenlemeli öğrenme becerilerinin gelişimine katkıda bulunmaktadır. Ayrıca, ELT MA öğretim elemanları öğrencilerin etkinliklerini takip edebilecek ve öz-düzenlemeli öğrenmeyi

uyumlaştıracak programların müdahalelerine uyulmaması durumunda öğretmenler öğrencilere geri bildirim sağlayabilecektir. Ek olarak, bu çalışma, blok zinciri teknolojisinin ELT çevrimiçi yüksek öğrenimine uyarlanabilir öz-düzenlemeli öğrenme ile entegrasyonunun, öz-düzenlemeyi uyumlaştıracak bir müdahale programı geliştirilmesinde umut verici bir yenilik olduğunu göstermiştir.

Anahtar Kelimeler: uyumsamalı öğrenme, blok-zinciri teknolojisi, işbirlikçi öğrenme, öğrenme yönetim sistemi, öz-düzenlemeli öğrenme

To my Family

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INTRODUCTION

This chapter provides a background of the study by elaborating online higher education, learner-centered education, and self-regulation learning. It discusses the statement of the problem, importance of SRL in ELT, adaptive SRL intervention and explains the reasons why blockchain-based adaptive learning management system is significant for self-regulation learning development in ELT online higher education. As part of this chapter, the researcher presents an overview of the research context, key concepts, limitations, and a summary of the dissertation structure.

1.1 Background of the Study

The quality of higher education requires us to see what lies behind the binary between the completer and non-completer learners. The binary division fails to consider learners' characteristics, backgrounds, goals, and abilities which determine learners' success in an online learning environment (Littlejohn et al., 2016; Wong et al., 2019). Therefore, it is necessary to consider cognitive, contextual, and behavioral factors that impact students' performance. In other words, student qualities are a critical factor in the quality of online education (Matcha et al., 2020).

It is evident that online education has revolutionized and changed the way people look at knowledge and skill acquisition. Thereby, there is an increasing demand for learning management system (LMS) to systematically implement and manage online education. LMS is a concept that emerged directly from online education. An

educational software application is used to manage, document, track, report, automate, and deliver learning material, administration, and development of training programs (Cavus, 2015).

In the present day, given the rapid technological, professional, and societal changes of the twenty-first century, ELT higher education programs essentially require the fostering of new forms of knowledge and skills while teaching students to take responsibility for their own learning and develop autonomous learning (Van Eekelen, Boshuizen, & Vermunt, 2005). Although many ELT higher education reforms have focused on schools' charters, curriculum design, and other forms of school changes, more emphasis needs to be placed on learner-centered educational systems (McCombs & Whisler, 1997).

Learner-centered higher education programs provide opportunities to evoke students' curiosity about constructing their practical knowledge, meet their needs, adapt their learning strategies, practice independently of their school and cultivate learner autonomy, and help them develop their self-regulatory skills toward professional learning. ELT Higher education must adopt corresponding curricula to meet all the requirements mentioned above (McCombs & Whisler, 1997).

Self-regulated learning (SRL) is a proactive rather than inactive process through which learners set their own goals, regulate their pace of learning, control their progress, develop various learning strategies, and enhance their learning achievement (Zimmerman, 1986). The concept of SRL is increasingly emphasized in the study of learning and academic achievement, particularly in higher education, where quite distinctive demands are placed on ELT.

Self-regulation places significant demands on ELT program. ELT higher education programs are increasingly considered inadequate to prepare students for today's knowledge-based society. A hallmark of ELT that is closely associated with students' professional learning, is not only oriented primarily towards knowledge assimilation, but ought to involve ELT students in the process of constructing their own knowledge, engaging in learning activities that students taking responsibility of their own learning and self-reflecting in and on action during their learning process which are important elements of self-regulation learning. Therefore, ELT program is expected to encourage ELT students to acquire knowledge and skills, construct their practical knowledge, and to develop an attitude of planning, self-monitoring, and self-reflection towards lifelong learning. Since self-regulated learning is imperative for the preparation of prospective ELT instructors, it is essential to consider this concept in ELT online higher education program.

1.2 The Statement of the Problem

The importance and necessity of SRL as a valuable principle in the higher education setting has led to extensive researching on learners' SRL in this context (Nückles et al., 2020). Numerous studies investigated individual differences in the SRL process and learning outcomes. Initially, research on SRL in online learning utilized questionnaires, surveys, and reflective essays considering the correlations between self-reported SRL activity and its effectiveness on students' achievement. Empirical considerations have linked demographic variables such as age, gender, race, background knowledge, educational level, and motivation with the SRL process (Hood et al., 2015; Littlejohn et al., 2016) and indicated higher course achievement (Kay et al., 2013). Besides, work status is an important factor in SRL and learning achievement. Studies found out male and female, or workers and non-workers might

be different in online learning because they have different responsibilities in daily life, they need to manage and keep a balance between their family responsibilities, their work, studying hours, and they might need to focus more on their professional career, and may not had enough time for studying (Kizilcec & Halawa, 2015; Yukselturk & Top, 2013).

Above all, learners from a less-developed country (LDC) suffer from structural barriers like internet access, English proficiency, and insufficient prior knowledge alongside socioeconomic and sociopsychological burdens (such as minimal social belonging and social identity threat) which leads to a global achievement gap. Social identity threat is defined as a fear of being judged negatively based on students' race, gender, and social status (Kizilcec et al., 2017a, 2017b).

Nevertheless, in a context with a highly heterogeneous learner population with different individual needs, goals, background, and motivation not everyone who gains access to the online higher education have the same opportunities to succeed (Kizilcec et al., 2017a, 2017b; Moreno-Marcos et al., 2020). So, it is important to consider how online higher education system face with this challenge to develop self-regulation learning.

This highlights the need to design a smart learning management system (LMS) to record learners' SRL from all backgrounds (Wong et al., 2019). These data can be used to design SRL adaptive interventions for the global and diverse learner population. Moreover, it can establish equal opportunities for all the learners, reduce the disparities, and better support the learners to feel welcome in the online learning environment.

Yet how can the "Internet of things" provide adaptive SRL LMS without compromising the students' privacy? So far, the previous personalized/adaptive learning system was a tradeoff between loss of privacy data and the benefit of adaptive learning. To avoid manipulations, data related with the students' SRL scores and learning development should be acquired, stored, managed, disseminated, and kept securely by a platform that is not controlled by authorities, since misuse of the sensitive data may threat personal privacy. Blockchain is a newly merged peer to peer network data management system that can be applied as its technical features derived some advantages such as reliability, trust, security, efficiency, and faster processing (Lung-Guang, 2019).

Recently, the educational system has been impacted by COVID-19 epidemic. There are currently many university students unable to attend classes due to this health crisis. Although higher education institutes were reluctant to shift to online learning system yet during this period, online education was not an option, it was a necessity. Online learning as a panacea provides many advantages such as flexibility and accessibility to educational system. But how do ELT higher educators deal with the above-mentioned challenges in online higher education learning and how do they try to engage students in SRL development?

As a result, the desire of contributing this research study emerged from both the importance of training self-regulation learning in ELT program and the needs of designing adaptive SRL in ELT online higher education in a secure, reliable, and decentralized platform. So, all this view generates the idea to design blockchain-based adaptive SRL adaptive intervention system to develop students' SRL in ELT online higher education.

1.3 Purpose of the Study

This PhD research contributes to design blockchain-based LMS with adaptive SRL intervention in ELT online higher education. To do so, first, ELT MA graduate candidates' self-regulatory skills development before and after attending ELT MA program analyzed. Next, ELT MA graduate candidate's reflection of the effect of their graduate course(s) content, structure, and requirements promote graduate candidates' self-regulation is explored, as well as their MA graduate instructors' perception of the effect of their courses on the promotion of ELT MA graduate candidates' self-regulatory skills development is discussed.

Second, the result of ELT MA students' data which was collected quantitatively by utilizing SRL pre- and post-test questionnaire and were analyzed along the t-test and the data which were collected qualitatively by adopting reflective essays and were analyzed through the content analysis method and used as a benchmark data for developing the blockchain-based SRL adaptive LMS.

Third, this study developed an SRL adaptive LMS embedded by blockchain technology to facilitate SRL development processes, by integrating/involving set of tools and strategies for fostering SRL through three phases of Zimmerman's SRL model (planning, action, and reflection) to improve the quality of ELT online higher education learning. The proposed blockchain-based SRL adaptive metacognitive LMS can gain the background information, individual needs, goals, and SRL level of the learners through pre and post-test SRL questionnaires, reflective essay, and SRL indicators during the course activity by trace data. Furthermore, by identifying learners' background information, pre-test and traces data can predict learners'

weaknesses and failures. Thus, this approach provides desired SRL adaptive intervention and teachers' feedback to support learners at the beginning and throughout the course towards learning achievement.

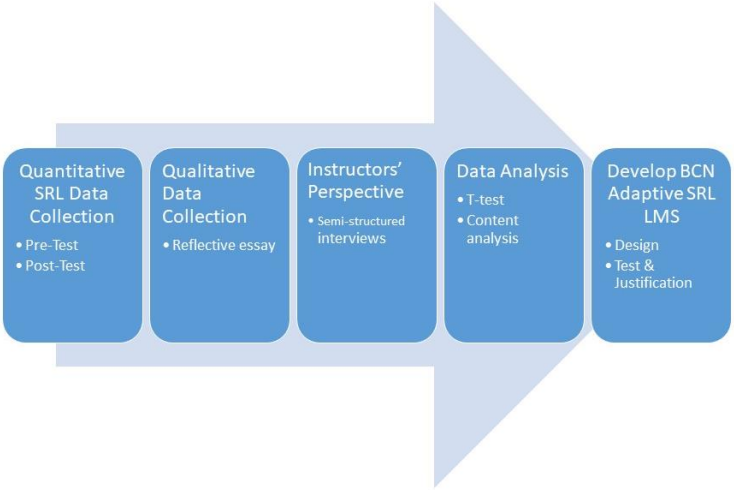

Figure 1.1: Overview research design

The purpose of this study is to address the following research questions:

1. How do ELT MA graduate candidates perceive their self-regulatory learning strategies at the start and towards the completion of their graduate studies?
2. To what extent do ELT MA graduate candidates believe the course they are enrolled provide opportunities for self-regulated learning?
3. How do ELT graduate instructors believe/perceive of the effect of their courses on the development of MA graduate candidates' self-regulatory skills?
4. How blockchain-based LMS with adaptive SRL intervention system can develop ELT MA students' self-regulation learning in ELT online higher education?

1.4 Significance of the Study

The importance of self-regulation learning in ELT cannot be overstated when it comes to training prospective ELT instructors in ELT departments over the course of their MA graduate studies and the impact of ELT MA instructors on the promotion or

inhibition of their graduate candidates' self-regulatory skills development. So, in the view of these needs, this qualitative and quantitative research study designed to implement in ELT department of Eastern Mediterranean University to consider ELT MA graduate candidates' self-regulatory skills development over the courses of their graduate studies. And then, based on the benchmark data of ELT MA students, blockchain-based adaptive SRL LMS is developed in ELT online higher education.

This research can be considered to be significant since there is almost no study conducted on the use of blockchain technology and adaptive self-regulation intervention LMS at tertiary level of ELT online education with graduate students. The findings of the study might provide insights into the design and implementations of graduate courses to promote ELT students' adaptive self-regulatory skills since higher education and society requires from students and prospective ELT academicians to develop new forms of knowledge, skills, and responsibilities.

The findings of ELT program framework with adaptive SRL intervention based on blockchain in online higher education are considered to be significant to various stakeholders for several reasons. Foremost, the design of blockchain-based technology LMS with adaptive SRL intervention is essential because it not only improve SRL, equity, and learning achievement but also it creates adaptive SRL intervention in a secure, decentralized, and reliable online education platform which could better prepare ELT students for SRL development and professional learning and make it more enjoyable for all learners locally and globally.

Besides, in comparison with other limited online learning platform, blockchain technology enable ELT online higher education to provide a full picture of a students'

SRL development process, learning achievements, mastery level, trace data activities, and formative assessment towards students' lifelong learning. In addition, the massive SRL data can be securely organized in blockchain system to build smart platform which is accessible for further personalized/adaptive SRL in ELT online higher education learning. In addition, this is the first study to examine the use of blockchain technology in education, and there is almost no research on adaptive self-regulation intervention in ELT online higher education.

Equipping ELT graduate students with these essential forms of knowledge, skills and responsibilities during their online graduate studies seem to be almost impossible whereas developing adaptive self-regulatory skills will enable students to steer their own learning processes and acquire the knowledge and skills they need throughout their lifelong learning. Self-regulation brings with itself learner autonomy which enables students learn how to learn.1.5 Definitions of Key Terms

The terms adopted throughout the study are used to refer to the definitions specified in the following way:

Self-regulation: Zimmerman (1986) stated that students are self-regulated to the degree that they meta-cognitively, motivationally, and behaviorally active participants in their own learning process. SRL refers to awareness and knowledge of one's learning and cognition and the control of one's cognition that renders this ability essential in learning and development (Kremer-Hayon & Tillema, 1999).

Pintrich (2000) defined self-regulation as goal-oriented process, proceeding from a forethought phase through self-monitoring and self-control to self-reflection. SRL can

foster deep and meaningful learning as well as significant gains in student achievement.

According to Zimmerman (2000), self-regulation (SR) is not an academic performance skill or a mental ability, but rather a self-directed process that helps learners to transform their mental abilities into academic skills.

Learner-autonomy: Dam et al. (cited in Smith, 2007) defined Learner autonomy as 'a capacity and willingness to act independently and in cooperation with others, as a social, responsible person' (p.102). Holec (1981) defined learner autonomy as the "ability to take charge of one's own learning", noting that this ability "is not inborn but must be acquired either by 'natural' means or (as most often happens) by formal learning, i.e. in a systematic, deliberate way", and pointing out that "To take charge of one's learning is to have […] the responsibility for all the decisions concerning all aspects of this learning […]" (p.3).

Online Education is a web-based teaching method for content dissemination and fast learning information technology and internet technology. With the internet as a medium online teaching transcends the limits on venue, environment, time, and teachers, and offers students quality teaching activities anytime, anywhere (Sun, Wang, & Wang, 2018).

Learning Management System (LMS) is concept that emerged directly from online education. An educational software application is used to manage, document, track, report, automate, and deliver learning material, administration, and development of training programs (Cavus, 2015).

Blockchain: (also called a distributed ledger) is a peer-to-peer network data management system. It is a long chain of linked data, also called ledger, which is stored on every participating computer. All the nodes in this network have access to a ledger that holds many blocks of transactions. To add a new block of a transaction to the ledger, all or at least some of the nodes should endorse the block and reach to a consensus using a predefined algorithm. The distributed consensus method to agree on whether the new transaction is legitimate and should be added to the chain is called proof of work. As soon as a new block of a transaction is added to the ledger all the ledgers on the nodes automatically will be updated. To invoke a ledger in a node, a chain code (i.e., smart contract) should be used on the node. A smart contract is a segment of computer code that acts as a tool for performing an activity on a node and defines the rules and penalties around an agreement. A smart contract enacts blockchain transactions when certain conditions have been met. Once all the conditions for action are ready, the smart contract of the peer will do the action automatically (Sharples & Domingue, 2016).

1.6 Research Context

This study implemented in the Department of English Language Teaching at Eastern Mediterranean University, an accredited higher education institution in North Cyprus, Turkey.

The study group included 33 graduate (MA) students who are enrolled in English Language Teaching program and 4 ELT instructors working in the Education Faculty Eastern Mediterranean University, North Cyprus. The blockchain-based adaptive SRL LMS implemented in online higher education at Hacettepe University, Ankara. This research employed mixed method of qualitative and quantitative approach to

determine graduate candidates' perceptions and views on their development of their self-regulation over the courses of their graduate studies and the interplay between students' and teachers' self-regulation strategies towards self-regulatory skills development. And based on the benchmark data of this study, the blockchain-based adaptive SRL LMS developed to support self-regulation learning in online higher education.

1.7 Structure of the Dissertation

The dissertation will be organized as follows: Chapter 1 introduces the background of the study, statement of the problem, purpose of the study and research questions. In addition, it emphasizes the significance of self-regulated learning in ELT online higher education program, research context, and limitations of the study. Chapter 2 provides an initial review of the literature related to the definition of the concepts online learning education, self-regulation learning (SRL), SRL model, process of SRL, learning management system, blockchain technology, importance of SRL in teacher education, SRL model in teacher education, and the role of teacher in constructing self-regulated learning environments, and related study. Chapter 3 presents the research design of the study; it explains research questions, context of the study, the participants, data collection methods and instruments and data analysis methods adopted in this study. In Chapter 4, the findings and results of the study are presented and discussed. And chapter 5 summarizes conclusions, discussions, pedagogical implications of the study and by closing up with the suggestions for further research.

The result of this dissertation is published as following:

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Chapter 2

LITERATURE REVIEW

In this chapter, the researcher attempts to examine ELT online higher education first by defining online learning education, self-regulation learning strategies, SRL model, process of SRL, learning management system, and blockchain technology, the advantages and application of blockchain in education. Then consider the importance of SRL in ELT and the SRL model in ELT program designed as seven process-oriented principles. After that, it also discusses the role of teacher in constructing self-regulated learning environment. The chapter ends with empirical studies in adaptive self-regulation learning in online higher education.

2.1 Online Learning Education

Online learning has become popular in the past decade and the abundant evidence demonstrated considerable growth of online learners, particularly in higher education (Li, 2019). Online learning provides some advantages over traditional face-to-face settings such as flexibility and accessibility in which time and place are not barriers for the students (Lee et al., 2019).

Despite the increasing demand for distance learning in higher education, concerns regarding the effective delivery of the course remain. Many students experience the feeling of being isolated and lost during their online education (Lee et al., 2019). The main challenges of online learning are minimal contact with peers and instructors and lack of collaboration and feedback; therefore, students get frustrated because they do

not realize what to do and how to overcome their issues and they may drop out of the course (Carpenter, 2020). Thus, the quality has begun to matter (Kim, Kwon & Cho, 2011).

The prevalence of online learning has prompted the development of new instructional methods, techniques, and strategies to enhance its efficiency and quality. Garrison, Anderson, and Archer in 2001 designed a new and crucial framework called Community of Inquiry (CoI). It is the framework wherein the teachers and learners are involved in the synchronous and asynchronous interaction of social, technological, and pedagogical processes to pursue the building of knowledge in an online collaborative learning environment. Knowledge building is a set of activities that all members do collaboratively in an online learning environment to discuss, evaluate, assess, and share their idea with different perspectives. Constructed knowledge contributes to the learning process (Garrison et al., 2000; Yucel & Usluel, 2016).

CoI explains an effective educational experience with the intersection of three constructs within a learning community: social presence, cognitive presence, and teaching presence (Garrison et al., 2000). Most of the studies investigating the CoI framework found that three-presence are interrelated, and they have positively and significantly affected each other. The studies showed that teaching presence predicts the perception of social presence, which in turn contributes to the cognitive presence (Aykol, 2009; Kilis & Yildirim, 2018; Shea and Bidjerano, 2010).

The CoI theoretical framework was established in social constructivism which required the interaction between participants in an online setting (Garrison & Aykol, 2015). It is outlined that the three key interactions between participants are as student-

teacher, student-student, and student-content interaction which are all interrelated (Montgomery et al., 2019). Meaningful learning is connected to one of the three forms of interaction. While significant studies considered the reciprocal interaction between student-student and student-teacher interaction few studies investigated the interaction of student-content so far and how students would learn independently without interaction in the online learning context (Al Mamun, Lawrie, & Wright, 2020; Papamitsiou & Economides, 2019).

Self-directed online learning is challenging, and students' success relies on their ability to autonomously and actively engage in the learning process. Online students required to be more independent, as the very nature of online setting promotes self-directed learning (Broadbent & Poon, 2015). It is therefore particularly important that online learners compared to their traditional classroom, have the self-generated ability to control, manage, and plan their learning actions. Such a self-regulatory process has been referred to as self-regulated learning (SRL) (Zimmerman, 2008; Azevedo & Gašević, 2019; Cerezo et al., 2020). In other words, to successfully deal with the autonomy offered in online education, learners have to engage in SRL (Jansen, Leeuwen, Janssen, Conjin, & Kester, 2020).

2.2 Self-regulation Learning (SRL)

About three decades ago, the idea of how learners construct their learning-initiated studies on self-regulation and theories related to that emerged. For the first time, in 1986, research on self-regulation was introduced in a symposium at the American Educational Research Association annual meeting which later was published in Contemporary Educational Psychology (Zimmerman, 1986). Pintrich (2000) defined self-regulation learning as "an active constructive process whereby learners set goals

for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guide and constrained by their goals and contextual features of their environment" (p. 435). To put it simply, they take a proactive approach towards their own learning rather than an inactive one.

In this approach, not only the self-directed learning is emphasized but also the social aspects of learning such as asking for assistance and help from peers, teachers and others are also underscored. Finally, it boils down to the learners' self-initiatives perseverance and adaptive skills which Zimmerman and Schunk (2001) argued that motivation, attitude, beliefs, and metacognitive strategies are of high significance in that regard.

2.2.1 Zimmerman Self-regulation Learning Model

From a social-cognitive perspective, self-regulation views learning from a triadic perspective of person, behavior, and environment. In this socio-cognitive model, motivational variables are integrated with metacognitive process in three stages of forethought, performance, and self-reflection (Fig. 2.1). It should be mentioned that motivation has a significant role in SRL research and instruction.

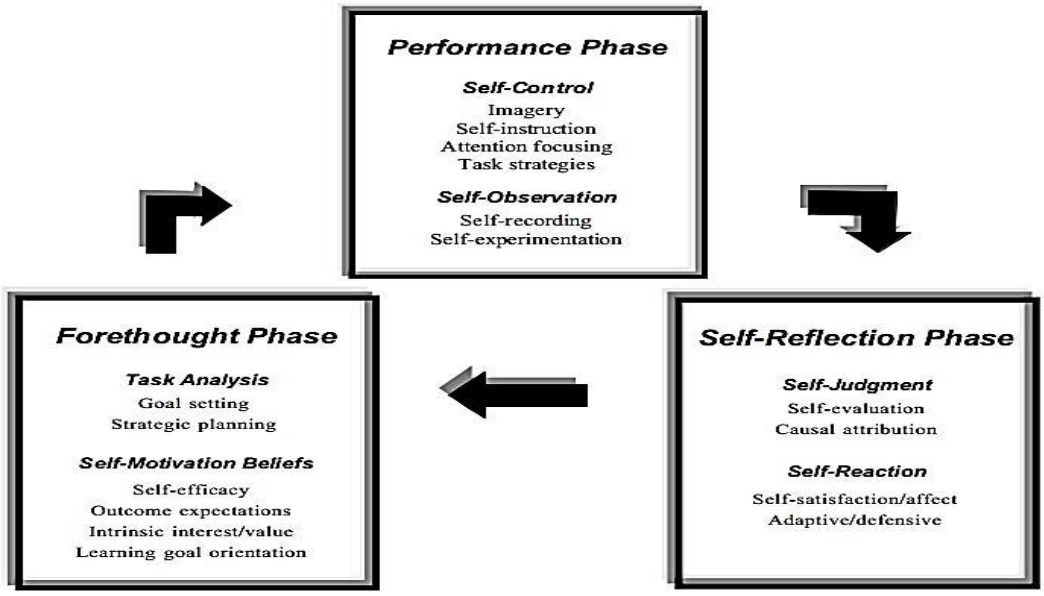

Figure 2.1: Phases and sub-processes of self-regulation. Reprinted from "Becoming a self-regulated learner: An overview," by Zimmerman, B. J. 2002, Theory into practice, 41(2), pg. 67.

In this model, variables are interrelated and are causally influenced by one another in the three aforementioned phases. That is, in each phase a certain motive for self-regulation exists such as beliefs of self-efficacy, goal-expectation, goal setting, strategic planning and etc. This model has been very popular in empirical research. For example, research findings have revealed the positive effect of self-efficacy on writing performance (Zimmerman & Bandura, 1994).

The second phase while performing or during performance involves two main processes: self-control and self-observation. By self-control, the learners focus on the physical aspect of the task through various strategies including imagery, self-instruction, paying attention, and optimize their solution efforts. In the self-observation phase, a learner observes and tracks each aspect and conditions of his or her performance as well as the effects that his performance produce (Zimmerman & Paulsen, 1995). A point worth noting in this regard is that in case of simple problems,

self-observation is easier as the amount of information to be remembered and recalled is not much, however, in case of complex problems, a great pressure is exerted on the learner or individual as he or she has to remember and recall massive amount of information which in case of novice self-observers, it may lead to disorganization or careless self-monitoring.

Finally, similarly the last phase, post self-regulation also involves two major groups self-judgement and self-reaction. In self-judgement, the learner evaluates one's performance by attributing the results obtained or gained to the efforts made, while in self-reaction, the individual or the learner compares one's previous self-monitored performance with a goal or criterion. It should be mentioned here that self-judgement is easier when the intended goal is a simple objective such as driving or playing football, however, in cases where high level of expertise is required such as taking part in a rally race, refined criteria need to be defined against which to judge one's performance. Furthermore, a learner can adapt or adjust one's self-reactions based on his or her self-judgement, that is, expert learners set challenging criteria for themselves.

Additionally, the available research indicates that learners' performance-phase strategies and goals are causally linked with self-reflection-phase (Zimmerman & Kitsantas, 1997) and that learners' self-reflection-phase feelings of satisfaction with their skill performance is due to forethought-phase sources of motivation such as self-efficacy, task interest, and enough efforts (Zimmerman & Kitsantas, 1999). Therefore, the higher the quality of self-regulated learning process, the higher the motivation to continue further phases of learning.

2.2.2 The Process of Self-regulation

Zimmerman Self-regulation' model involves three components of planning, action, and reflection. The components interact with each other and make successful learning possible. It is worth mentioning here that these components can dynamically interact with each other on multiple occasions.

2.2.2.1 Planning

Three steps need to be taken before embarking on a task namely: task requirements such as what and how materials need to be learned; learners' personal resources (the kind of knowledge that they possess and the type of skills and strategies that they use); and possible matches between the two for example mnemonic techniques and strategies to remember the names of planets. For instance, if a learner believes that taking notes and highlighting the main parts of an article (task) are the key strategies for understanding the article content and thinks that he is good at highlighting not note-taking the most appropriate match can be highlighting the main parts of the article for him or her.

Gollwitzer and Beyer (1999) claimed that planning ahead can help the learners in three ways by facilitating the task execution, increasing the chance of successful task completion, and producing a quality outcome or results such as decision or solution. Anticipatory planning involves setting a clear target or goal for oneself, selecting a number of strategies or skills to reach the desired outcome, and identifying the possible barriers that can stop one to reach his goals. It should be mentioned here that strategies are not only confined to cognitive ones and encompasses all the other types of strategies such as motivational and environmental strategies that we described in detail in the previous sections.

2.2.2.2 Action

Action is a complicated learning process involving the awareness, understanding, anticipation and planning of the learner over one's learning process which is usually accomplished when the learner is doing the learning act itself.

Learner usually monitors his/her mental learning process to see whether the plan he or she has made leads to the accomplishment of the expected goals or not. While the learner ensures that the implementation steps are followed, he or she also monitors the selected cognitive, metacognitive, motivational, and environmental strategies to see that they work properly towards the achievement of the desired goals. To achieve such an expert state, Gollwitzer and Beyer (1999) argued that the person involved in the learning process checks and monitors to see whether the predefined steps are followed correctly and whether the steps will be followed in order as the learning process continues while focusing on the learning process at the moment. The learner ensures that steps are followed effectively and accurately as he or she completes the steps while deciding whether to continue or terminates the learning process, that is, he or she is constantly monitoring oneself by attending to the obtained feedback on whether the selected strategies are effective enough and if not he or she makes the necessary adjustments. In case of any problems or obstacle, the expert learner makes the necessary adjustment and ensures that the same problem do not reoccur in the future.

2.2.2.3 Evaluation and Reflection

Both the process and product of learning are assessed by the learners upon the completion of a given task. Dembo and Eaton (2000) argued that learners seemed to be evaluative learners to a number of factors such as evaluating the product resulted

from the learning task to see whether the goals have been achieved, the whole process of learning, evaluating the effectiveness of steps in the accomplishment of the goal, the anticipation and management of possible obstacles, the determination of the efficiency and the effectiveness of the plan and the necessary adjustments made, as well as evaluating whether the same procedures can be applied to the future tasks.

Also, reflection allows the learner to use his metacognitive knowledge to guide him with various strategies during his self-regulation processes such as planning, action and evaluation. Reflection helps the learner to review his or her previous plans, make the necessary adjustments to the current learning task and to consider revising the upcoming learning activities or tasks. As a result, some consider the metacognitive knowledge of self, task, and strategies as static (Garcia & Pintrich, 1994) while considering reflection as a more "active process of exploration and discovering" (Boud, Keogh & Walker, 1985, p. 7).

2.3 Learning Management System

Learning management system (LMS) is a platform for presenting course content, related online resources, supplying assignments and quizzes, communication and discussion among teachers and students, evaluation, and developing collaboration and teamwork in an online learning environment (Dabbagh & Kitsantas, 2004). Some of the commonly used LMS in the higher education are Moodle, Docebo, TakentLMS, and Loop.

Several pieces of research argued that LMS can support students' self-regulation skills and self-regulated learning development which are crucial for online learning achievement (Dabbagh, 2003). Research also suggested that LMS can be used as a metacognitive tool to customize learning content to meet individual learner needs,

abilities, and goals and to integrate learning and motivational strategies to help students become more self-directed learners (Dabbagh & Kitsantas, 2013; Jansen, 2019).

In this research we classified metacognitive LMS into six categories: collaborative and communication tools, assessment tools, administrative tools, course content creation and delivery tool, learning tools and finally, SRL adaptive intervention (AI) tools. Collaborative and communication tools include synchronous and asynchronous communication tools and group tools. Group tools support both synchronous and asynchronous communication which provide opportunity for students to work together, inspire critical thinking, and sharing the ideas. Assessment tools provide abilities to learners to monitor and control their learning performance and allow them to do self-assessment and peer-assessment through different types of test types like quizzes (multiple choice, fill-in-the blank, short answers) with video, audio, and images, writing essays and assignments during learning process). Administrative tools manage administrative information such as course registration, username and password, course log activity, creating course, uploading course content, quizzes, assignments, rubric, grade change, course calendar, and also providing provide opportunities for teachers and students to communicate and collaborate with each other. Course content creation and delivery tools enable teachers to present course content and online resources and also tools which enable students to contribute with to course content, access online resources, and submit their assignments. Learning tools allow the students to search online resources and create personalized learning network based on their learning needs and goals. They enable the students to perform do tasks such as online bookmarking, notes-taking, compiling, aggregating content,

and using social networking tools to set up optimized networks according to their needs during learning activities, and SRL adaptive intervention (AI) tool provide the personalized sequence of strategies to help students plan, monitor, control, and reflect their action in the learning process toward achievement. The theoretical basis of SRL adaptive intervention is grounded on Zimmerman' model 2002 (Jansen et al., 2019) and includes three phases: of preparation, action, and reflection which aimed to support students' SRL and their engagement during learning activities.

2.4 Blockchain Technology

With the advancement of internet technology, online education has become a modern form of learning. Yet, online learning faces many issues such as lack of results certification, low privacy, and lack of sharing system. Blockchain technology has some features of decentralized, de-trusted, reliability, and security which address the aforementioned issues of online learning. Therefore, this study integrates blockchain-technology with online learning by designing smart system of blockchain technology in LMS to develop SRL in higher education.

Blockchain technology is (also called a distributed ledger) is a peer-to-peer network data management system. It is a long chain of linked data, also called ledger, which is stored on every participating computer. All the nodes in this network have access to a ledger that holds many blocks of transactions. To add a new block of a transaction to the ledger, all or at least some of the nodes should endorse the block and reach to a consensus using a predefined algorithm. The distributed consensus method to agree on whether the new transaction is legitimate and should be added to the chain is called proof of work. As soon as a new block of a transaction is added to the ledger all the ledgers on the nodes automatically will be updated. To invoke a ledger in a node, a

chain code (i.e., smart contract) should be used on the node. A smart contract is a segment of computer code that acts as a tool for performing an activity on a node and defines the rules and penalties around an agreement. A smart contract enacts blockchain transactions when certain conditions have been met. Once all the conditions for action are ready, the smart contract of the peer will do the action automatically (Sharples & Domingue, 2016).

The structure of the nodes in private Hyperledger Fabric network is represented in figure 2.2. As shown in this figure, the nodes are called as normal node (i.e., Node XX), orderer, and committer and endorser nodes. All the nodes hold a copy of ledger and its smart contract (chain code). A normal node is capable to read/write information on the ledger through an external interrelated Application Programming Interface (API). API is a computing interface that is in connection with a normal node in the network to accomplish read and write activities from/into the ledger. An endorser node checks the details of a broadcasted proposal (by a normal node) and certificate details of the requester to validate the transaction. The orderer and committer nodes provides mining services to the network. They package transactions into blocks and commits/saves the transaction in the ledger to be delivered to all the nodes in the network. In the network smart contracts are installed to the nodes to perform related operations, such as instantiating, invoking, packaging, querying, and upgrading chaincode. A channel is considered in which channel nodes are sharing the same ledger and the smart contract. In the network five Certificate Authority (CA) are considered to issue a digital certificate for the nodes. In a learning management system, the normal nodes can be considered as the learners' computers, endorsers are teachers, ordering

and committing services might be accomplished by the department and university, respectively.

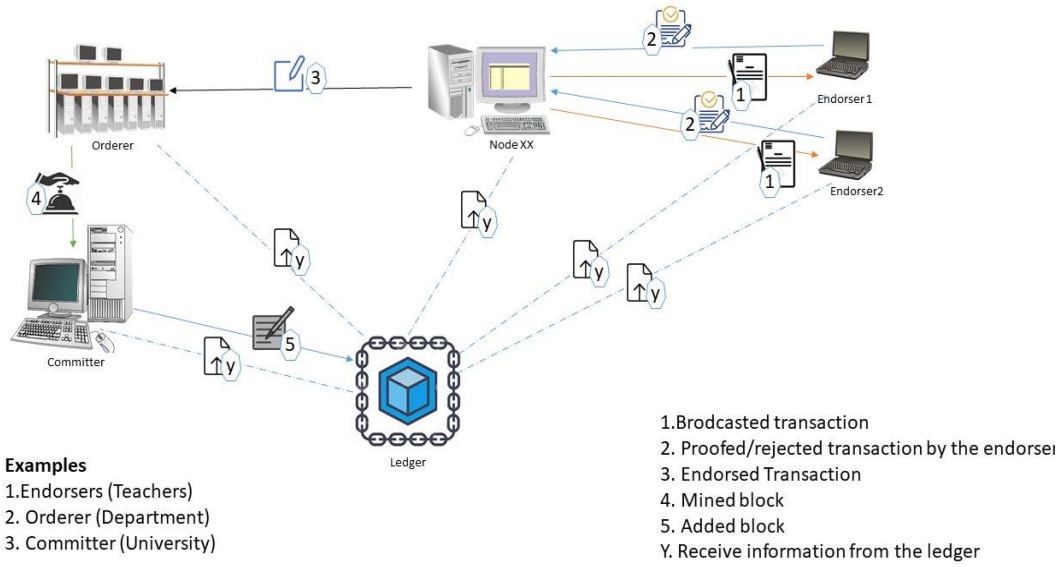

Figure 2.2: The structure of nodes in private hyperledger fabric network

Each block can hold a small amount of data, which is required to be kept secure, yet distributed. That information is stored across all participating computers and can be viewed by anyone processing by cryptographic “public key” but cannot be modified. The data records are timestamped, providing trusted and time records of added data. There are public, private, and hybrid blockchains. A public blockchain is completely transparent which anyone can access and potentially add to, A private blockchain can only be seen by the users who have access, and a hybrid blockchain combines both public and private blockchain, which means that some processes remain private, while others are made public (Sharples & Domingue, 2016). Hyperledger Fabric is an open source of blockchain which keep the data privacy and has become the de facto standard for enterprise blockchain demand. Figure 2.3 represent a schematic structure of a blockchain blocks and their interactions.

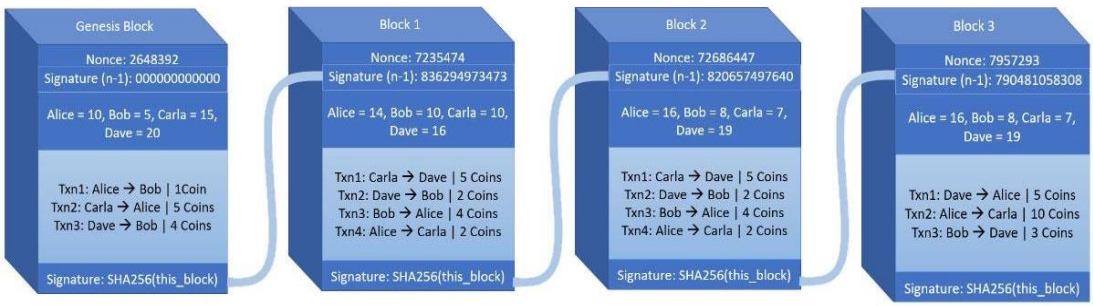

Figure 2.3: Blocks and their interactions

2.4.1 Blockchain Technology Advantages in Education

Blockchain technology features bring some advantages in their application using as described below:

1. Decentralized: relying on distributed system structure of peer-to-peer network, the process of transmission of data network can directly exchange through distributed nodes based on the data trust system.
2. Trust: blockchain network makes the trust decentralization too. Blockchain technology generate the linked blocks based on the cryptographic hash value, and by employing digital signature ensure transaction safety without third party.
3. Reliability: decentralized blockchain network by employing distributed ledger ensure data are collectively maintained. This capability brings the reliability to the application use because the failure of one node does not impact the data of whole network.
4. Security: Digital certificate algorithm of blockchain by using public and private key transmit data without disclosing the node identity. Hence, the user identity is invisible in the transmission process (Sun et al., 2018; Chen, Xu, Lu, & Chen, 2018).

2.4.2 Blockchain Application in Higher Education

Blockchain technology application in education are still in nascent stages but quicky they are being used in various educational fields. Recently, some universities have incorporated to apply blockchain technology in education to support diploma management and summative evaluation (Chen et al., 2018). In another research work, a blockchain-based e-learning platform has been developed to increase transparency in assessments and facilitate curriculum personalization in a higher education context (Lam & Dongol, 2020). There are several projects using blockchain technology in education like Blockerts, Sony Digital Education, and Openlearn Blockchain from the Open university.

As a systematic review by Alammary et.al (2019) studied blockchain technology for SRL adaptive intervention in metacognitive LMS, highlighted that blockchain technology has potential application in many innovative ways in the education sector great educational potential to move beyond and can be employed in many innovative ways.

Blockchain technology can be applied to education in many innovative ways beyond just diploma management and achievements assessment. For both learners and teachers, blockchain technology has a great potential for broader application prospects on formative evaluation, learning activities design and implementation, keep tracking the whole learning processes.

Formative assessment is a problematic issue in the education system because it is not easy to track every detail of teaching and learning. Applying blockchain and smart contract can respond to this challenge. Blockchain-based data management system can

provide detail of students' SRL activity in learning process by using smart contract platform. Teachers can track students' SRL activity during the course, predict their failure/weakness and support the students by staying informed about the students' progress and providing feedback throughout the course. All details should be monitored by smart contract platform and recorded in blockchain ledger. Traceability and immutability of blockchain technology will record both students and supervisors' behavior in blockchain ledger.

Overall, blockchain can be used to construct a balance to measure learning process and outcomes. At the same time, blockchain brings challenges and opportunities to researchers, developer, and educators.

For developers, applying blockchain technology keeps a massive educational transaction data and integrate blockchain technology into existing educational tools and systems. It helps them to build a smart platform that meets users' personalized needs and develop a predictive SRL model intervention. Personalized course content allows the learners to customize their learning needs and they can work at their own pace. It also brings challenges for developers to combine hardware with blockchain technology to create an environment for data acquisition and recording.

For educators, blockchain technology can be utilized for teachers' evaluation. Applying blockchain and smart contract record all teachers' activity and performance. The smart contract will verify the consistency of the teaching design and practice, which is going to be an important instruction evaluation indicator. It is very good reference for teachers who have done a good job. It serves as both an appreciation and encouragement for teachers' teaching skills (Chen, Xu, Lu, & Chen, 2018).

2.4.3 Barriers in Adopting Blockchain Technology in Education

Blockchain technology brings many advantages in education, but it also faces various challenges that need to be considered when adopting to technology-based educational system.

Alammary et al. (2019) discussed some barriers associated with using blockchain technology in education such as data unavailability, scalability, immaturity, cost, immutability, setting the boundaries, trust, and weakening traditional school credentials.

Educational setting has massive students' data, and they need to keep track of every student and all of the records during different semesters and different schools in blockchain network. Hence, as the data grows it increases the block size and the transaction records which lead to slow speed blockchain transaction due to peer-to-peer verification to retrieve the records data and makes scalability problems.

The other concern of using blockchain technology is that it is costly venture that need to be considered before adopting to blockchain technology system. The cost of implementation, managing big size of data network, transactions, and mining power cost are all very high.

For certificate verification, there is a need that all institutes should come to agree to share their data. The problem is that many institutes are reluctant to share all data on a blockchain network and it makes very complicated. The institutes are unclear about types of data to share or accept the risk of sharing their students' credential data in

blockchain network and in turn the services will be offered through blockchain over traditional network.

For most of the institutions, managing educational activities has already been established as a standard procedure, and blockchain technology would require changes to existing procedures. The blockchain system is designed to integrate student and educational data into ledgers on the blockchain. In schools, the immutability of the data makes it difficult to install new systems of storage or to improve the accuracy of data. Due to a lack of usability and complex settings, blockchain technology has immaturity issues. As the public key is publicly visible, it does not offer transactional privacy. Also due to the complicated setting, complicated terminology, and lack of technical expertise, educational stakeholders may find it difficult to understand (Alammary et al., 2019).

2.5 Toward the Importance of SRL in ELT

Self-regulation should be an inevitable aspect of teacher education and teachers should be prepared first as self-regulated learners. Teacher education programs have not been able to satisfy all the needs of the teachers and as a result new programs have been devised to meet the needs of various teachers in different programs by establishing partnerships between universities and schools, offering reflection-oriented programs, as well as empowering the practitioners in various contexts. Further, teacher education programs usually emphasize creating meaningful and active learning situations in which pre-service and in-service teachers are encouraged to monitor their learning and knowledge acquisition. Therefore, teacher education programs encourage pre-service teachers to regulate their learning process through developing themselves professionally, constructing their practical knowledge, reflecting on the teaching

activities, and collaboration with various practitioners. Such practices would require regulating one's learning which is to do with self-regulated learning (Kremer-Hayon & Tillema, 1999). The aim of most teacher education programs is to prepare teachers as teachers while ignoring the teacher as a learner. In this regard, Feiman-Nemser (2001) argued that teacher education should prepare the teachers as learners by instructing the pre-service teachers to learn the necessary skills and strategies by focusing on the learning aspects of teaching. The recent teacher professional development programs have been able to assist the new teachers to concentrate on the learner aspects of the teaching process by encouraging teachers to reflect on their actions and finding better techniques to learn. Student-centeredness to some extent has been able to bridge the distinction between teaching and learning aspects to some degree by setting up appropriate learning tasks and by providing the conditions through which the learners or students can participate in the interactional and communicative activities. Likewise, the teacher education program should encourage the novice or pre-service teachers to seek guidance from mentors and teacher educators by asking them to provide them with their feedback and by keeping themselves up to date through following the professional journals and attending the conferences. In such cases, self-regulation can be of significance use to teachers as it can help them to experience learning through devising self-regulated learning strategies.

Feiman-Nemser (2001) further emphasized that teacher education programs need to instruct the teachers to learn from their teaching by providing them with effective pedagogical skills and critical learning and teaching skills. They can also create the appropriate opportunities for the teachers to benefit from self-regulated skills.

Little (2003) believed that the contemporary teacher professional development can help the teachers to reflect on the available resources in their respected environment which can ultimately lead to their professional development. To make this happen, Renyi (1996) noted that teachers need to take charge of their own learning. Therefore, self-regulation can help teachers to take charge of their own learning by offering the teachers the appropriate strategies, though the role of classroom environment should also not be forgotten in this regard.

Lunenberg and Korthagen (2003) believed that pre-service teachers are required to self-regulate their activities such as portfolio writing about their progress, evaluation of their learning, and monitoring their achievement or success. Therefore, this necessitates a good amount of planning and restructuring by the teacher educators so that pre-service or student teachers gain enough expertise and knowledge to self-regulate their learning process. As a result, in the last decades, self-regulation has gained momentum to a large extent, and this has been manifested in different ways. Kremer-Hayon and Tillema (1999) stated that although the notion of self-regulated learning is not new in ELT context, but recently it has gained a considerable impetus due to several reasons: Firstly, regarding the rapid technological development needs and new knowledge replacement, education program is unable to provide all updated information within graduation studies. Consequently, self-regulated learning development is a vital goal of continual life-long education. Secondly, two key components in professional success are autonomy and accountability, this success is unlikely to happen unless teachers train self-regulated learners. In other words, students can be autonomous or accountable if they plan and organize the learning process by themselves. Thirdly, new education program should provide opportunities

for learners to learn on their own and develop self-regulated learning. Likewise, teachers and learning environments should be adapted for supportive and conductive self-regulated learning context. Fourthly, regarding process-oriented learning, teachers' role has changed from transmitting knowledge to supporting self-regulated learners. In other words, nowadays teachers do not need to teach their students directly, rather in the new roles they need to help their students to learn on their own.

2.6 SRL Model in ELT Program

A number of researchers believe that in order to have an SRL-based instructional environment, teachers need to professionally develop their skills and expertise (Kline, Deshler, & Schumaker, 1992; Perry et al., 2002). Some also argue that teachers also need to practice various self-regulated skills in their teaching such as planning, monitoring, reflecting, and changing their practices as they can guide their students much better this way (Butler & Schnellert, 2012). A number of other researchers have also supported this fact by acknowledging that teachers who are self-regulated learners can effectively guide their students to deal with various problems and challenges hence helping the students become effective self-regulated learners (Duffy, 1993; Hilden & Pressley, 2007; Randi, 2004).

According to the sociocultural approaches, social interaction is the crucible in which the self-regulation takes place and as a result teachers and students need to interact together in a constructive manner so that learning can take place in the best possible way. In this regard, researchers working in the Social-cognitive domain have examined the role of interactional activities such as modeling, feedback provision and counselling on the development of self-regulation skills (Schunk & Zimmerman, 2007). For example, Vrieling, Bastiaens, and Stijnen (2010) proposed a SRL model in

ELT program which is designed based on seven process-oriented principles (Figure 2.4). A process-oriented model facilitates self-regulation skills (Vermunt & Verloop, 1999) which are afforded through social processes such as negotiation and interaction between students and their teachers.

The model includes theoretical findings on SRL in the seven process-oriented principles. The process-oriented approach is concerned with how learners learn through focusing on their self-regulated learning strategies (Vermunt & Verloop, 1999). Six out of seven principles are concerned with successful application of SRL in ELT program and the one of them is concerned with evaluation of the SRL in learning tasks. The model can be used to help the implementation of self-regulation skills in teacher education.

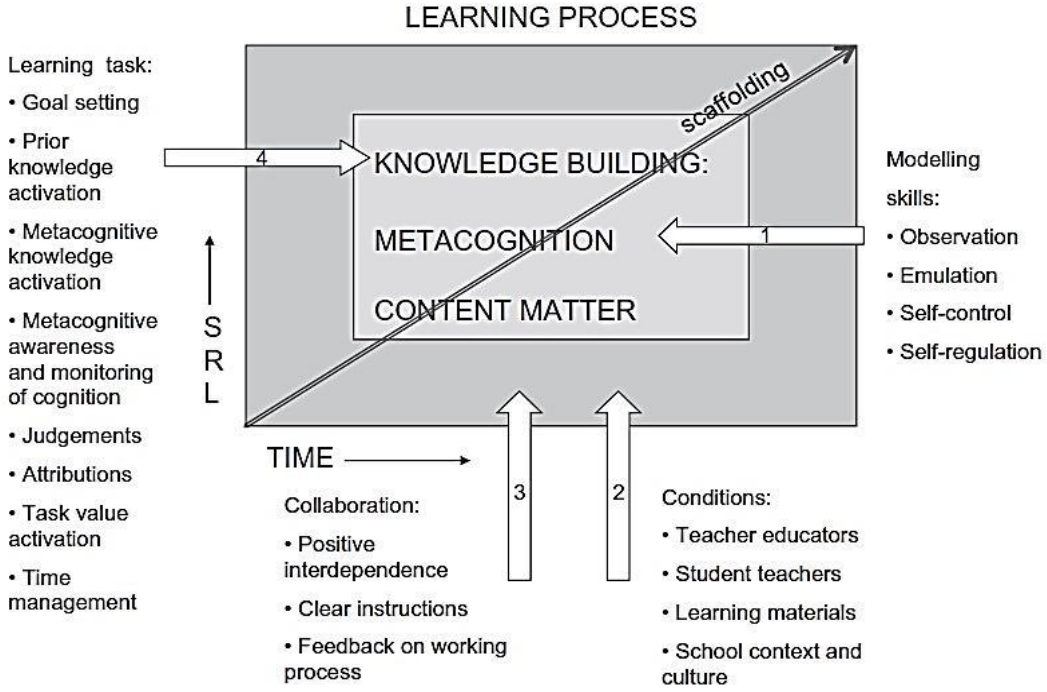

Figure 2. 4: SRL model in teacher education. Reprinted from "Process-oriented design principles for promoting self-regulated learning in primary teacher education," by Vrieling, E. M., Bastiaens, T. J., & Stijnen, S., 2010, International Journal of Educational Research, 49(4-5), pg. 143.

In what follows, findings from relevant studies on the inclusion and implementation of SRL will be discussed. Further, the seven process-oriented principles will be explained. The model sketches out the learning process of pre-service teachers. In the center of the model, knowledge building indicates that the component is an important aspect of self-regulation skills in teacher education, therefore, teacher trainers and educators in the field are required to provide the pre-service teachers with a solid knowledge base. To achieve such a goal, teacher educators have to integrate the required meta-cognitive skills and content knowledge in their teacher education programs. The arrow 1 signifies the importance of the modeling in terms of meta-cognitive skills which involves four skills levels namely observation, emulation, self-control and self-regulation. The significance of scaffolding as giving control to the learners by the teachers is also shown in the figure by the diagonal arrow. This arrow indicates that as teachers' hand in the control to the learners, self-regulation skills gain more importance since the learners have to regulate their learning processes.

Moreover, awareness over conditions affecting SRL development is also the next factor to be considered in this regard which is shown by arrow two. As the arrow indicates some conditional factors play an important role in this regard which are teacher educators, student teachers, learning materials, and school context and culture. Teacher educators have to be well-trained for their job which is educating the student teachers to employ the most suitable materials and resources for SRL and to create an appropriate context and culture conducive to their better skill acquisition.

Furthermore, collaboration is another main component of this model which emphasizes a collaboration and cooperation between teachers and students in an

engaging and constructive manner. Arrow three shows this component which encompasses some subcomponents such as positive interdependence, clear instruction, and feedback on working process. Therefore, in this respect, teacher educators are required to create a positive atmosphere in their classrooms in which students benefit from clear instruction and adequate constructive feedback so that they can learn to be independent in the end through the use of self-regulation skills. These components are discussed further below.

2.6.1 Knowledge Building

Self-regulated learning not only contributes to academic success and achievement but also can afford valuable opportunities and conditions inside the classroom such as effective instruction. In this regard, Eshel and Kohavi (2003) argued that classroom condition can extensively facilitate academic achievement and success. Therefore, teachers should provide the appropriate conditions in which no student is left alone in the classroom. Teachers should also ensure that their students achieve the specified goals and objectives in the best possible way. They should help the pre-service teachers to become familiar with meta-cognitive skills and strategies to become their own masters of learning as a lack of such skills can impede their learning outcomes and results (Stijnen, 2003).

Some studies have also suggested that teachers can help their students to gain and build the required knowledge of certain knowledge domains as teachers are usually masters of their certain domain knowledge (Bolhuis & Voeten, 2001).

2.6.2 Meta-cognition and Content Matter

The role of teacher has changed as learning has come to be defined as self-regulated knowledge (Vermunt & Verloop, 1999). As the model is a process-oriented model, the

focus is on the knowledge construction and how pre-service teachers develop their cognitive strategies therefore, teachers should include metacognitive strategies in their instruction as the students are engaged in knowledge sharing and building (Vermunt & Vermetten, 2004).

2.6.3 Modelling Skills

Teachers should model meta-cognitive skills to student teachers. This can be performed through following the four-phased teacher modeling process proposed by Schunk and Zimmerman (2007) as observation, emulation, self-control, and self-regulation. In the first phase, as the name suggests learners are engaged in the process of observation of their model in the classroom which is usually the teacher or in some cases a capable or successful language learner. Next comes the emulation or imitation stage in which learners imitate the model and receive feedback accordingly either from the teacher or his or her peers. After these two stages, in the self-control stage, the learner internalizes the skills and strategies although he or she has not fully and independently mastered those skills and strategies. Finally, in the self-regulation stage, the learner masters the skills and strategies in their own peculiar way and contexts. In this regard, Lunenberg et al. (2007) suggested that teacher educators employ the model in their educational programs so that pre-service teachers can effectively master the self-regulation skills and strategies as in teacher education, teacher educators can train, teach, and help the learners to develop themselves professionally and personally.

2.6.4 Scaffolding

It is believed that scaffolding approach in education was first introduced by Wood and Middleton in 1975 and the idea is based on Vygotsky's zone of proximal development (Windschill, 2002). According to the notion of zone of proximal

development (ZPD) learners can develop their cognitive abilities through collaboration with others such as teachers and learners and through participation in problem solving and task accomplishment in which they are assisted by other individuals. The principal idea is that learner learns something which she or he cannot learn by oneself alone.

In teacher education, the idea of scaffolding is learning skills and strategies through interaction with peers and teachers. That is teacher educators need to provide the necessary assistance to the learners and when they realize that pre-service teachers can act on their own, teacher educators should decrease their control level and allow them to monitor and control each other (Kirschner et al., 2006). Therefore, teacher educators can gradually hand over the control of learning to the learners through scaffolding.

2.6.5 Conditions

The conditions of learning can affect the learning process in various ways. Vermunt and Verschaffel (2000) listed a number of obstacles which negatively affect process-oriented instruction namely teacher and student characteristics, the materials and resources to be used, and the context of the school. Therefore, teacher educators should raise their students' awareness over such obstacles and encourage and guide them to understand the value of self-regulation in a process-oriented approach (Vrieling et al., 2013). They should also help the pre-service teachers to maintain positive beliefs, attitude and motivation towards SRL and also make efforts in providing a suitable context and environment by decreasing the negative impact of the factors likely to cause disruption in the pre-service teacher' learning process.

2.6.6 Collaboration

Collaboration and cooperation in the classroom can help the pre-service teachers develop their self-regulated learning (Wigfield, Hoa, & Klauda, 2007). Therefore, teacher educators should provide a classroom context in which pre-service teachers can collaboratively negotiate their knowledge and membership. Such negotiation of knowledge, opinions, and ideas can help them to benefit from one another feedback and contributions which can ultimately help them develop their SRL strategies and skills. This can be possible in a social setting in which pre-service teachers interact with each other on various issues in a constructive manner. Positive interdependence, clear instructions and feedback on the working process can help student teachers master the self-regulated skills and strategies and become the master of their own learning process (Vrieling et al., 2013).

2.6.7 Learning Task

2.6.7.1 Goal Setting

Goal setting is considered to be a sub-process of self-regulation as it determines a number of other self-regulatory sills such as planning, control, and monitoring (Zimmerman,1999). It is further classified into setting various goals such as learning processes, personal learning goals, goals set for a short or a long time, goals that the learners themselves are aware of, difficult goals, specific goals and proximal goals (Eccles & Wigfield, 2002). Setting such goals is a main component of successful self-regulation learning.

2.6.7.2 Activation of Prior Knowledge

In learning and understanding goal setting and task, as it was mentioned in the previous sections, prior knowledge should be activated. In this regard, Butler and Winne (1995) argued that students should be engaged in cognitive activities through

which they can develop procedural and declarative knowledge on how to accomplish a task. They also believed that students should also develop conditional knowledge about the application of various strategies in their better future performance. Conditional knowledge helps the students to evaluate their outcome and results before embarking on another phase of task accomplishment.

2.6.7.3 Activation of Meta-cognition Knowledge

Activation of Meta-cognition knowledge, as the name suggests, is concerned with both knowledge activations of cognitive tasks and cognitive strategies (Pintrch, 2000). Vermunt and Verloop (1999) noted that meta-cognitive regulation activities are to do with higher levels of thinking that control the lower thinking level processes such as controlling cognitive, affective and other related activities as well as exerting control over one's learning and context. They further argued that meta-cognitive regulation activities determine the course and the results of their learning. To become an affective self-regulated student, they need to activate meta-cognitive knowledge of various task components such as purpose, structures and components of the tasks introduced by Cartier, Butler and Bouchard in 2010.

2.6.7.4 Meta-cognitive Awareness and Monitoring of Cognition

The next component of learning task section is concerned with Meta-cognitive monitoring skills which are the main elements in information processing models of self-regulation. Nicol and Macfarlane-Dick (2006) asserted that formative assessment and feedback can help develop SRL and that effective self-regulated students make the best use of feedback to reach their goals. That is, especially when they are engaged in learning activities, they usually assess themselves by evaluating their internal feedback that they themselves generate. They also compare their internal feedback and external feedback that they receive from others such as

teachers and peers and use in monitoring their internal goals (Butler & Winne, 1995). It should be mentioned here that external feedback should be clear, meaningful, and purposeful so that students could connect their prior knowledge with the new task (Hattie & Timperly, 2007). Such feedback should help the students' active information processing, be less anxiety-provoking, less threatening, constructive and affective, be related to specific and clear goals and be simple enough to be understood and performed (Vrieling et al., 2013).

2.6.7.5 Judgments

Judgment and attribution are introduced as two main SRL self-reflection processes (Pintrich, 2000) which will be explained here. Judgment is concerned with judgment and evaluation that students make over their performance of the task (Nicol & Macfarlane-Dick, 2006). As we stated in earlier sections, teacher educators should provide appropriate task criteria or standards against which good task performance can be evaluated or judged. They should also encourage students to develop some kinds of self-assessment through which they can easily evaluate and assess the way they handle and perform tasks.

2.6.7.6 Attribution

Next comes the attribution process in which students reflect on their performance by attributing their performance or success to certain sources (Pintrich, 2000). Schunk and Zimmerman (2007) argued that attributions are concerned with students' beliefs system regarding the causes of outcomes. In this regard, teacher educators can help their pre-service students to develop their self-regulation skills through offering constructive attributional feedback. Schunk and Zimmerman (2007) claimed that attributional feedback can help students to control their own educational achievement and success by making the necessary effort and using the appropriate strategies.

2.6.7.7 Task Value Activation

Another component of learning tasks is the task value, which is further categorized into four subcomponents of attainment value, intrinsic value, utility value, and cost (Eccles & Wigfield, 2002). Attainment value is concerned with the value that the student attaches to the successful accomplishment of the task (Varieling et al., 2013). The next subcomponent is the intrinsic value which is concerned with the value or importance that the student ascribes to a certain subject matter or inner joy or enjoyment that he or she receives through performing the task or activity. The third subcomponent, utility value is to do with the value that a learner ascribes to the usefulness of the task in current and future goals such as better performance goals in other courses. Finally, the last subcomponent, cost, is the value that a student attributes to not being able to perform the task or activity which involves mostly the negative aspects of engagement in a task such as fear of failure, anxiety or stress related to the task, the amount of effort needed to succeed, and the previous failures that have occurred due to making certain options or choices.

2.6.7.8 Time Management

The last component of learning task is to do with time management in which student manages and controls the time on the task. Dembo and Eaton (2000) viewed this component as one of the main components of SRL. In time management, students' awareness needs to be raised over their current time usage and then its importance needs to be considered into account as it colossally affects one's academic performance and achievement. Varieling et al. (2013) argues that prioritization is the most important factor in time management as the student decides which activities to spend more time and to focus more and which to spend less time and energy on.

Therefore, through time management, students can learn regulatory skills which greatly affects their future achievement.

2.7 The Role of Teachers in Constructing Self-regulated Learning Environment

Learning and teaching theories are usually originated separately and independently from each other. In what follows, we bring both theories together in a meaningful manner. One of the theories posit that learning is an active, constructive and self-initiated process in which a learner constructs internal knowledge representations based on one's interpretations of various personal experiences (Bednar, Cunningham, Duffy & Perry, 1991). Such a perspective towards learning as self-regulated (self-inititaed) also affects the teaching theories as transformation of knowledge through self-regulated knowledge construction rather than through transmission of knowledge from teachers to students (Lonka, 1997).

Students' self-regulation can be affected by teacher's external regulation of learning processes. They can also be compatible when students' and teachers' strategies are similar however sometimes teaching strategies may negatively affect students' learning goals and their cognitive skills. Therefore, teaching strategies may have either constructive or destructive influence on their students' learning and cognitive strategies. In case of constructive effect, teaching strategies help the students to increase their learning skills and cognitive strategies. This way also students learn to practice a new strategy or skill or to use learning or thinking activities that they do not like. While in case of destructive effect, teaching strategies may make the students to use fewer or less effective strategies or skills (Vermunt & Verloop, 1999).

Table 2.1 shows how student's and teacher's self-regulation affect each other (Vermunt & Verloop, 1999). As we can see in this table, students' self-regulation rate can range from very low to very high, teachers' self-regulation can fall into the three aforementioned categories strong, shared, and loose and the effect of these two on each other can be expressed in three levels congruent, constructive, and destructive friction. For instance, in case when a student cannot regulate his learning, the teacher takes care of it for the student which in this case a balance of strategies is maintained between the teacher and students. As the table indicates, most of the cells in the table show friction between teaching and learning, of which some are constructive, and some are destructive. For example, when a student can self-regulate one's learning very well and the teacher asks him or her to do otherwise, a case of destructive interplay takes place while if the teacher challenges the student to practice new ways of learning and thinking, a case of constructive interplay between teacher and student strategies occur.

Table 2. 1: Interplays between three levels of teacher-regulation and three levels of student-regulation of learning processes (Vermunt & Verloop, 1999, p. 270)

Degree of student-regulation of learning	Degree of teacher-regulation of learning		
	Strong	Shared	Loose
High	Destructive friction	Destructive friction	Congruence
Intermediate	Destructive friction	Congruence	Constructive friction
Low	Congruence	Constructive friction	Destructive friction

- Strong teacher-regulation: in case of strong teacher-regulation, congruence between learning and teaching takes place leading to lack of acquisition of a certain type of learning activity by student. For instance, such congruence happens when the students lack the necessary motivation and teacher's

strategies or activities in helping them become motivated do not produce any outcome.

- Shared regulation: a shared regulation teacher strategy can bring about congruence and harmony between teaching and learning when the students reach an intermediate level in terms of use learning activities. Lonka and Ahola (1995) reported that a shared regulation teacher strategy can work best when students are put into groups where they can discuss the subject matter critically with one another. However, a constructive friction can still take place in the shared-control strategy if the students do not master a particular learning or thinking activity of a certain subject matter.
- Loose teacher-regulation: teachers usually use a loose teacher-regulated form of instruction when the students have already mastered certain learning and thinking activities and use them independently and effectively in their learning processes which in this case congruence occurs between learning and teaching (Simons, 1993). In these cases, the teacher acts as a guide on the side without interfering with their students' learning processes such as studying their texts as the students have learned the self-regulatory skills.

In summary, such strategy is suited best in cases where particular learning activities have been mastered and mastery to do so continues by the students. It saves the teacher's and students' time and energy and as a result the teacher can invest and capitalize on other learning activities that students have not mastered or are not familiar with. However, when students' self-regulation skill is low, such teaching strategy cannot work well.

Finally, the strategies can be combined in various cases and in different situations depending on the proficiency, level of mastery and competence in a certain learning or thinking activity to help the students develop their general and specific knowledge in various academic domains and areas. The essential issue is moving from teacher-regulation towards students' self-regulation, therefore, as our study concerns the university setting students, instructors and professors need to stay aside and allow their students to explore new ways of thinking and learning activities while not leaving them quite to their own devices.

2.8 Review of Literature

According to recent studies, self-regulated learners (SRL) found to be more successful in online education and tend to plan, monitor, control, and regulate their learning process than less self-regulated learners. Kilis and Yildirim (2018) highlighted the importance of self-regulation in terms of CoI and added a new construct called a regulatory presence. Shea and Bidjerano (2010) stated that self-regulation act as a mediator between the three presence types in the CoI framework. Cho, Kim, Choi (2017) considered the impact of self-regulation in an online course and found a significant positive effect on the CoI framework. The study concluded that students with higher self-regulation are higher in social, cognitive, and teaching presence of the CoI framework. The importance of SRL for successful online higher education has led researchers to measure SRL with trace data, but they have also begun to study the effectiveness of SRL interventions in this context.

Recently, trace data and intervention are increasingly used in SRL research studies (Van Halem et al., 2020). Studies show that SRL activity can be identified in trace data and thus predict learners' achievement in online learning environments. Trace data

includes all students' activities in the learning process, it stored all log information when they watch videos, answer quizzes, search resources, navigates pages, and ask for help (Xiao & Yang, 2019; Dindar et al., 2020). Lan and Lu (2017) classified online learners into more effective self-regulated learners (SRLers) and less effective SRLers based on the criteria of three SRL phase behavioural sequence patterns (planning, monitoring, and regulating). More effective SRLers as their trace data indicated more activity in all three phases in trace data, whereas less effective SRLers trace data did not indicate activities in all three SRL phases. The result showed that more effective SRLers persisted longer and performed better than less effective SRLers on a significant level.

The extensive meta-analysis showed that SRL intervention is effective both in improving learners' SRL learning strategies, course performance, and academic achievement (Van Laer & Elen, 2019; Daumiller & Dresel, 2019). Bruijn-Smolders, Timmers, Gawke, Schoonman, & Born (2016) investigated the effects of SRL intervention on higher education students' outcomes (N=906). The study examines SRL as a self-regulatory process, and results of the study revealed that SRL intervention positively effects on self-regulation process as well as learning outcomes in higher education learning.

In the study by Kizilcec, Perez-Sanagustin, and Maldonado (2016), 17 successful online learners shared study tips for those starting the MOOC. In the pre-course survey, half the learners received the tips as an intervention. They asked learners to rate how useful these tips were. Students in the control group were not presented with tips; they were presented with course topics. Then they were asked how useful they believed the topics were to their careers. To evaluate the effectiveness of the

intervention, students' persistence (i.e., the number of video lectures they watched) and achievement (i.e., the number of assignments they completed with a passing grade) were measured. There were no differences between learners who were given study tips and those who were not. According to the authors, there could have been insufficient integration of the intervention within the rest of the course and too little intervention to explain why significant differences failed to occur.

In addition, Yeomans and Reich (2017) implemented an intervention in a pre-course survey. Using the same methodology as Kizilcec et al. (2016), they measured course completion and course verification. While Yeomans and Reich (2017)'s interventions were focused on course content, learners required to provide more input. Learners were randomly assigned to either a control group or a planning group in the voluntary pre-course survey. The planning condition asked learners to describe how they planned to learn course content and complete quizzes and assignments. The results of the study revealed that, completion and verification rates increased due to the implementation of planning prompts. Therefore, SRL interventions in online education was effective; achievement was increased by connecting intervention to course content and obtaining learners' engagement in SRL.

Dörrenbächer and Perels (2016) investigated how SRL can be more effectively develop in higher education college students (N=173). The study used 2×2×2 designs to compare the effects of SRL intervention with the training program, learning diary, and their combination. They found that SRL can be improved by content-integrated intervention and a combination of training and diary are the most effective SRL intervention. The result showed that the combination group significantly influenced SRL while the diary group alone had no effects.

The authors Davis, Triglianos, Hauff, and Houben (2018) further outlined how the intervention is linked to the course material by integrating the intervention in the course rather than building it into the pre-course survey. All learners were exposed to the intervention. A comparison was made between learners who complied with the intervention with those who did not (self-selection candidate of control group). Participants were asked to express their motivations for following the course as part of the intervention. As learners studied the course content, this motivation expression was presented to them. As part of the intervention, learners were also asked how many videos they intend to watch, how many quizzes they intend to complete, and how much time they intend to spend in the course throughout the coming week. Throughout the course, students were visually tracked in their progress toward these goals. Participants who followed the intervention (e.g., submitted at least one weekly motivation expression and a weekly plan) engaged with the course to a greater extent (e.g., time spent, videos viewed, quizzes taken), than those who did not follow. The intervention was offered to all learners, however, causality was impossible to establish. In the self-selected control group, learners with more activity in the course might have self-selected to also engage in the intervention. However, learners who complied with the intervention were different from those in the control group before the intervention.

Jansen et al. (2020) considered the effect of SRL intervention in a Massive Open Online Course (MOOC) on both learners' SRL and course completion. The study employed pre- and post SRL questionnaire to measure learners' course intention and course evaluation, and all learner's SRL activity in trace data. The SRL interventions consisted of all three parts: forethought, performance, and appraisal phase. The results

indicated that learners who complied with SRL intervention, are more self-regulated whereas majority of students who did not comply with the intervention, drop out the course. So, they concluded that the SRL intervention not only supports learners' SRL but also encourage them in course completion.

2.9 Summary

In light of the literature review, online learners need to regulate their own learning to succeed. However, students often struggle to effectively engage in SRL. Since prospective ELT instructors are required to train self-regulated students, it is important to learn how to develop their own SRL skills first in their ELT higher education studies. Recent studies considered the impact of SRL intervention in online education and the result of the study showed that self-regulation development is linked positive in learning achievement and course completion. In addition, the study found that incorporating SRL intervention into the course content is most likely to be effective that will encourage learners to develop their SRL. Yet in the heterogeneous learning context with different students' needs, goals, and background knowledge, there is a need to provide adaptive SRL intervention in online higher education. Adaptive Self-regulation learning systems use a data-driven approach to adjust the path and pace of SRL learning through three phases of planning, action, and reflection SRL enabling the delivery of personalized SRL learning at scale. In addition, while collaboration, scaffolding, and ZPD are emphasized in SRL development, the previous study did not consider the effect of collaboration and scaffolding intervention in SRL development. To the best of our knowledge there is almost no study to consider adaptive SRL intervention in ELT online higher education so far.

Apart from that, the previous research in adaptive higher education learning were less concerned with privacy and are more enthusiastic about personalized benefits. To develop decentralized, secure, and reliable platform with adaptive SRL intervention in ELT online higher education, the current study is expected to fill the gap in this field by utilizing blockchain-based LMS with adaptive SRL intervention in ELT online higher education. Blockchain technology is a peer-to-peer network system that maintains a digital ledger of transactions across several computers that makes it impossible to hack, change, or cheat. So, all this view generated the idea to design blockchain-based LMS with adaptive SRL intervention system to develop students' SRL in ELT online higher education.

Chapter 3

METHODOLOGY

This chapter intends to explain about the research design, rationale for choosing case study, the research questions, context of the study, and the participants of the study. And the next section presents the data collection methods and the procedure for data analysis, and the last section, discuss about the design of blockchain-based LMS with adaptive SRL.

3.1 Overall Research Design

This study aimed to develop blockchain-based LMS with adaptive SRL intervention in ELT online higher education. Since it focused on ELT MA students' SRL development and their instructors' view about the effect of their course on the development of SRL at EMU university, it can be described as a case study.

Case study research is concerned with the complexity and particular nature of the case in question. The most common use of the term associates the case study with a location, such as a community or organization. The emphasis tends to be upon an intensive examination of the setting like a single community, a single school, a single organization, a person, or a single event. In this study, the researcher focused on the ELT MA programme with its instructors and enrolled students as a single community. Yin (1984, p.23) defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which

multiple sources of evidence are used. The question under examination was the self-regulation skills of ELT MA students; therefore, the students' experiences as the phenomenon were attempted to be evaluated within the context of ELT MA Curriculum/programme and those who implement the programme as instructors.

The rational for choosing a single school case study to understand the self-regulation learning experiences of ELT MA students during their studies are described as following:

The research process of a case study allows the researcher to examine the contemporary real-life phenomena in a real-life context through detailed contextual analysis of limited number of events or conditions, and their relationships. According to Merriam (2002, p. 19), a case study design allows researchers to focus on "the process rather than outcome, in context rather than specific variables, and in discovery rather than confirmation". Case studies provide an opportunity to observe participants, observe what they do, and analyze what they do within a context. They strive towards preserving the embeddedness of social truth, or how people behave in a highly contextualized setting, as opposed to uncontextualized analysis (Johnson, 2006, p.24). In the current research, the researcher attempted to interpret the process ELT MA candidates' development of their self-regulatory skills within the context of ELT MA programme and to what extent the programme with its instructors contributed to this development. Comparatively to cross-sectional quantitative approaches, this research design provides rich and vivid, subtle, and complex accounts (Cohen, Manion, & Morrison, 2000). By studying a specific, bounced case, researchers may gain a deeper understanding of contextual impacts on given

phenomena. Understanding contextual impact can aid the researchers in understanding the learning process issues and self-regulation development process.

Using case studies has several advantages, First, the data are often examined within the context of their use (Yin, 1984), i.e., in the context in which they are used. Second, case studies can be categorized as intrinsic, instrumental, or collective, which allows quantitative and qualitative data analysis. Finally, the detailed qualitative accounts often provided in case studies not only provide an overview of the data in real life environment, but also assist in explaining the complexities of real-life situation which are difficult to capture in experimental or survey research (Bryman, 2004).

There are several categories of case study. Yin (1984) notes three categories namely exploratory, descriptive, and explanatory case studies. This study situated in a descriptive framework. Descriptive research was defined as "Research that describes group characteristics or behaviors in numerical terms" (Brown & Rodgers, 2002, p. 288) and deals with 'the characteristics of an existing phenomenon' (Salkind, 2006. P. 11).

In this study, descriptive case study type has been used to describe the natural phenomenon which occurs within the data in question and the goal set by the researcher is to describe the data as they occur (Zainal, 2007). Narrative accounts of ELT MA Instructors as interview transcriptions and ELT MA Students' as reflective essays were used to describe the case.

Case studies are frequently sites for the employment of both quantitative and qualitative research. A subtle realist approach, utilizing multiple data collection

methods and member checking, allows for the generation of triangulation of knowledge about a single phenomenon. This can provide more valid interpretations if methods and data collected from different paradigms, different sources, and at different times (Torrance, 2012; Birt et al., 2016). In this study, both qualitative and quantitative data have been collected to provide a thick description of the case under question and the concurrent triangulated strategy has been adopted for this purpose to determine the reliability and validity of the results. It is characterized when a researcher uses two different methods in an attempt to confirm cross- validate or corroborate findings within a single study. As the models suggests the quantitative and qualitative data were collected concurrently in one phase of the study and the priority was given equally to both methods. Questionnaire was administered, the interviews were held, and reflective essays were assigned with the same priority and the results of both qualitative and quantitative data were integrated during the interpretation phase. This was done to stress the convergence of the findings in strengthening the results of the study and to explain any lack of convergence that may result (Zeki & Güneyli, 2014).

This study employed mixed method of qualitative and quantitative approach to find ELT MA graduate candidates' self-regulation development over the courses of their graduate studies and their MA instructors' idea of the effect of their courses on their ELT MA graduate candidates' self-regulation development.

3.2 Research Questions

This research study aimed to design blockchain-based LMS with adaptive SRL in online higher education. To do so, first this study contribute ELT MA graduate candidates' beliefs on their self-regulation development before and after attending

ELT MA program, and to consider the effect of ELT MA graduate course(s) content, structure, and requirements on ELT MA graduate candidates' self-regulation development and also consider the ELT MA graduate instructors' perception of the effect of their courses on the promotion of ELT MA graduate candidates' self-regulatory skills development, and finally based on the benchmark data, blockchain-based adaptive SRL intervention were provided to the students in three phases of planning, action, and reflection throughout the course . The research questions of this study are as following:

1. How do ELT MA graduate candidates perceive their self-regulatory learning strategies at the start and towards the completion of their graduate studies?

To do this, MA graduate candidates will be categorized in 3 groups as following:

   a) 1st year Novice MA graduate candidates (within 1st semester or 1st year of their graduate studies).
   b) 2nd year experienced MA graduate candidates (Already in program who are about to complete their courses and right at the beginning of thesis writing).
   c) 3rd year MA graduate candidates (last year candidates who are about to finish and defend their thesis) and recent alumni.

2. To what extent do ELT MA graduate candidates believe/perceive the course they are enrolled provide opportunities for self-regulated learning?
3. How do ELT graduate instructors believe/perceive of the effect of their courses on the promotion of MA graduate candidates' self-regulatory skills?
4. How blockchain-based LMS with adaptive SRL intervention system can develop ELT MA students' self-regulation learning in online higher education?

3.3 Context

This study implemented in Department of English Language Teaching at Eastern Mediterranean University, an accredited higher education institution in North Cyprus, Turkey.

The study group included 33 MA graduate students who are enrolled in English Language Teaching program (ELT) and 4 ELT MA instructors of the Education Faculty in Eastern Mediterranean University, North Cyprus. This research employed mixed method of qualitative and quantitative approach to find graduate candidates' self-regulation development over the courses of their graduate studies and the interplay between students' and teachers' beliefs on the development of self-regulatory skills.

In the second part of the study, blockchain-based LMS with adaptive SRL designed and implemented in Spring semester 2019 and Fall semester 2020 in online higher education program at Hacettepe University, Ankara, Turkey.

3.4 Participants

In the first part of the research, the study carried out in three phases during fall 2014 to spring 2015 semester of the study. In the first phase, the participants of the study were 33 ELT MA graduate students at different semester of their graduate studies. Yet the researcher distributed both pre- and post- SRL questionnaire in the same group of research study at the beginning and ending of the fall semester 2014. In the second phase of the study in Spring semester 2015, only 15 out of 33 of the same ELT MA graduate students were asked to write reflective essay in terms of their self-regulation development towards the end of the semester, and in third phase of the study 4 of ELT MA graduate instructors lecturing to the same 33 ELT MA students were attended for

the interview. The interview conducted with the 4 ELT MA instructors to consider how they believe/perceive of the effect of their courses on the promotion of ELT MA graduate candidates' self-regulatory skills development.

This study adopted total population sampling which is a type of purposive sampling where the whole population of interest (i.e., a group whose members all share a given characteristic) is studied. In practice, total population sampling is done when the target group is small and set apart by an unusual and well-defined characteristic (Stephanie, 2018). Total Population Sampling is more commonly used where the number of cases being investigated is relatively small (Etikan, Musa & Alkassim, 2016). All the students enrolled into the ELT MA programme during 2014-2015 academic year have been used as the participants of the case study.

And in second part of the study, Blockchain-based LMS with adaptive SRL intervention designed and implemented in Spring semester 2019 and Fall semester 2020 with 76 Master students in online higher education program at Hacettepe University, Turkey.

The following section explains methodological and epistemological basis for implementing the three phases of the study: the data collection methods and instruments, the data collection procedure, and data analysis methods. And the last part of this chapter explains about the blockchain-based LMS with adaptive SRL intervention in ELT online higher education.

3.5 Data Collection Methods

The data were gathered from three sources: SRL questionnaires (pre- and post-test), semi-structured interviews, and reflective essays. All semi-structured interviews, the end-of-the-semester reflection essays, and the pre- and post SRL questionnaires were conducted in English. Importantly, in accordance with its research ethics, all participants granted their consent to participate in this study (see appendix 2).

3.5.1 Self-regulation Learning Questionnaire

Self-regulated learning opportunities questionnaire (SRLOQ) categorizes items into 5 different SRL parts (planning, monitoring of the learning process, coaching/judging Zone of proximal development (ZPD), and collaboration) in 5-point Likert scale which is adapted for teacher education. For creating these categories Vrieling, Bastiaens, and Stijnen (2013) developed a SRLOQ which is appropriate for the purpose of this study. The SRLOQ assesses the level of ELT MA graduate candidates' self-regulatory skills in the educational programs. They were also asked to write about their background information such as gender, age, education, nationality, and cultural background.

3.5.1.1 The Reliability Analysis of SRLOQ

It is possible to determine the reliability of a test by performing the Cronbach Alpha test. To measure the internal consistency reliability, a Cronbach Alpha coefficient was calculated. According to Dornyei (2007), for reliability to be considered acceptable in most research, reliability coefficient of (0.70) or greater need to be achieved. A questionnaire not reaching a Cronbach Alpha of 0.60 is considered unreliable. The Cronbach alpha coefficient for this study exceeded 0.89, thus meeting the internal consistency requirement for the effectiveness.

As reported by Vrieling et al. (2013), the Cronbach alpha values for sub-scales of the SRLOQ ranged from *a*=.0.71 to a=0.86. Taking from the lowest to highest number, all alpha values are high enough to be considered as reliable. In addition to that of alpha coefficients, researchers also reported on confirmatory factor analysis. As indicated, the chi-square ($\chi 2$) was calculated as 3571.57 and the ratio of this chi-square to its degrees of freedom (df=892) was calculated as found to be lower than 5. Kline (2005) asserted that every ratio calculation below 5 is a sign of good fit although the chi-square was found to be significant. This happens to be viewed in cases of big samples and this ratio calculation gives clue if there was any sampling bias or not. In their case, though, no bias was observed, and fit indices were taken into consideration. As a follow up procedure, they provided statistics regarding parameters such RMSEA=0.080 (Root Mean Standardized Error of Approximation), CFI=0.96 (Comparative Fit İndex), and SRMR=0.073 (Standardized Root Mean Residual). Their results of confirmatory factor analysis yielded that the SRLOQ has a high discriminant validity and high construct validity based on the evidence derived from the empirical analysis.

3.5.2 Semi-structured Interviews

In this study, the aim of the conducting the semi-structured interview with ELT MA graduates' instructor is to examine the instructors believes of the effect of their courses on the promotion of ELT MA graduates' candidates' self-regulation strategies development.

Semi-structured interview is a qualitative method of inquiry with pre-determined set of open questions. Researcher have pointed out that semi-structured interview is dominant method of data collection, or it can be used along with other methods. An

interview is described as a process for gathering descriptive data about a subject by asking the subject to describe the topic using his or her own words. It is pertinent for the purpose of this study to understand instructors believes about the impact of their courses on their students SRL development. Data is collected from multiple perspective, using triangulation approach as Smith (1995) described as "collecting data" in a variety of ways using variety of techniques to promote deeper understanding of ELT MA SRL development over the courses of their graduate studies.

In order to provide an opportunity for the interviewee to respond the interview questions, the researcher arranged the appointments with the instructors according to their demanding schedule time set. Semi-structured interviews are more relaxed and friendly since they allow both interviewer and interviewee to speak more freely. Besides, it is also beneficial for the interviewer because it allows him/her to ask the questions in a different way or skip the questions which are already answered by the interviewee.

To do so, first researcher prepared set of interview questions based on the review of related literature in self-regulation studies and the aim of this research study. The content of interview questions from ELT MA instructors is to obtain the ideas of the effect of their course in the promotion of ELT MA graduate students' self-regulation development. Having developed the interview questions, they were piloted by 3 ELT instructors who were specialized in this field. And then, based on their suggestions and comments, the researcher modified the interview questions. Finally, the semi-structured interviews were conducted with 4 ELT MA instructors at their convenient time (Appendix 5).

The interviews held in the middle of the fall semester 2014 based on the MA instructors' schedule appointment and were all voice recorded by their permission. The interview questions aim at getting the instructors' responses into the ideas on the promotion of students' self-regulatory skills regarding the graduate course content, course structure, course requirement, teaching methods and course assessment. Also, they were asked about how they involve their students into the planning, goal setting, task value, and time management, which strategies they use to help their students to be more self-regulated, and how often they provide coaching and judging to evaluate students' progress.

According to Patton (2002, pp. 351-361), the researcher needs to phrase the interview question according to the following variations:

- Identify different types of questions (experience, opinion, feeling and values questions);
- Asking questions that are truly open-ended;
- Asking one question at a time (not more than one idea);
- Asking questions that are clear (terms, language, labels);
- Ordering questions;
- Time period questions (past, present, and future);
- Wording principles of questions (affect the quality of responses).

The questions were formed taking the above given criteria into consideration.

3.5.3 Reflective Essays

One common approach to assess higher education students' reflection is through reflective essay. Reflective essays are documents written by students in which they

consider various concepts, events, thoughts or feeling to gain insight into themselves and their learning (Poldner et al. 2012). Reflective essays need students to draw on their experiences about the skills/knowledge that they have acquired and also, they are aware about the achieved skills/knowledge in their learning process. The content of the reflective essays like think-aloud protocol express students' ideas and experience in their learning process and allow students to demonstrate different dimension of their thoughts subconsciously (Hosein & Rao, 2017). Therefore, within the study of self-regulation development in ELT MA program, the writing of reflective essays could help ELT MA students to reflect on their self-regulation development and share their experience in ELT MA program regarding course content, course structure, teaching methods, and course assessment and furthermore their ideas could help research study in developing adaptive SRL intervention program and future research.

In this study, one of the important sources of data collection was end-of-the-semester reflective essay. To do so, at the end of the semester, 15 out 33 ELT MA graduate candidates of the study group were asked to reflect on their graduate course(s) experiences, specifically in terms of their self-regulation development towards the end of the semester by writing a reflective essay. SRL Reflective essay administered the students with some guiding question which focus on the related issue but also it gives them the freedom to write their essay as they want (Appendix 4). The reason why the researcher provided some guiding questions is in accordance with Scott's study findings (1990 cited in Bayman, 2004) to enhance authenticity, credibility, meaning, and representativeness of the reflective essay.

Reflective essay usually analyzes based on qualitative content analysis procedure (QAC). Poldner et al. (2012, p. 21) stated that qualitative content analysis as a

measurement procedure is very complicated process which is based on some prerequisite framework for valid and reliable test quality assessment because the reflection construct and the reflective essays data are descriptive, context bound and personal, so in order to get test quality both require plausible interpretation before the assessment.

Reflective essay assessment can be summative or formative process. The first approach focuses on determining the quality of each reflection with consequence like grading or certification. The latter approach aims to deliver data to support students' further professional development. This study concentrates on formative assessment (Poldner et al. 2012, p. 21).

3.6 Data Collection Procedures

Three data collection instruments adopted in this part of the study: pre- and post-SRL questionnaire, reflective essays which are gathered from ELT MA graduate students at the end of the semester and semi-structured interview which carried out with ELT MA instructors. Data collection procedure started in the Fall semester 2014 and continued through Spring 2015. The 3 sources of data collection instruments were used to consider ELT MA graduate candidates' beliefs of their self-regulation development before and after attending ELT MA program and their instructors' beliefs on the effect of their courses on the promotion of MA graduate candidates' self-regulatory skills development. As Gaus (2017) pointed out in data collection procedure the timing is extremely important. Therefore, in this study I attempted to make sure whether ELT MA graduate students are eagerly intended to participate in this study without feeling fear of sharing their opinion may affect their course assessment and also whether they are honest enough to express their beliefs and

experiences about their self-regulation development in reflective essay and SRL questionnaire. In this respect, all the data gathered in a very friendly and relaxed atmosphere, and they did not feel like they are obliged to do so.

In data collection procedure, first, at the beginning of fall semester 2014, I distributed 'Information Sheet for the Prospective Research Participants' among ELT MA graduate candidates to give some information about the research topic (Appendix 1). Later, those ELT MA students who agreed to participate in this study were given the 'Participant Consent Form' for signature (Appendix 2). Then, within the same day after signing the consent forms, those ELT MA students were given pre SRL questionnaire (appendix 3). Next, at the end of the fall semester 2014 the same questionnaire as post SRL questionnaire distributed to the same ELT MA graduate students who took part in pre SRL questionnaire. And then, the researcher asked from those participants who eagerly want to participate for SRL reflective essay, those who eagerly accepted invited to write about a two-page reflective essay and share their experiences of self-regulation development before and after attending ELT MA graduate program. And finally, upon completion of these, 4 MA graduate instructors were asked for an approximately 30–45-minute semi-structured interview carried out by the researcher at their most convenient time. Snyder-Ramos et al., (2005) highlighted that a close rapport helps the researcher to keep more informed speech. The study emphasized that creating a friendly atmosphere during the interview help the researcher to acquire more reliable data. Accordingly, in this study, during the semi-structured interview with MA graduate instructors, I made effort to build up a mutual confidence, honesty, and integrity between I as the interviewer and the MA instructors as the interviewee, to create friendly and relaxed atmosphere.

3.7 Data Analysis Methods

In this study, the data which gathered from pre- and post-questionnaire, reflective essays at the end-of-the semester, and the interviews will be analyzed quantitatively and qualitatively through pairwise T-test and content analysis method respectively as explained below.

The data gathered from pre and post SRL questionnaire will be analyzed qualitatively through pairwise sample t-test. Pairwise t-test is a t-test in which each subject is compared with itself or, in other words, determines whether they differ from each other in a significant way under the assumptions that the paired differences are independent and identically normally distributed. Therefore, to analyze the data from pre- and post-SRL questionnaire pairwise t-test run by SPSS to determine whether there is any significant difference between ELT MA graduate candidates' perception of self-regulation before and after attending ELT MA program.

And also, the data that gathered from the ELT MA graduate students' reflective essay and their instructors' interview will be qualitatively analyzed based on content analysis. Content analysis requires to identify, code, categorize, classify, and label the primary patterns and themes in the data (Patton, 2002; Miles & Huberman, 1994). More importantly, in determining the priority of themes, Allwright, Allwright, and Bailey (1991, p. 193) recommend the following criteria which need to be taken into consideration:

- Frequency of mentions: the frequent occurrence of theme mentioned in the essays or interview;

- Distribution of mention: the frequency of different people who mention topic in the essays/interview;
- Saliency: the strength of the expression that topic is mentioned.

In addition, to provide validity and inter-rater reliability in doing content analysis, two raters (the researcher alongside the study supervisor) evaluated the ELT MA graduate candidates' reflective essay and ELT MA instructors' interview together to interpret texting material, decide coding, and obtain perfect agreement (Moretti et al., 2011). To do that, after reading all essays and interview transcriptions twice, we underlined just what stood out as significant and relevant to the research topic. Then, we read through each essay and transcription one by one, but this time we began taking notes on key words and themes based on the literature related to self-regulation strategies. During this process, by observing how frequently significant comments were mentioned and distribution of individuals who made them, assisted us to identify themes (Allwright, Allwright & Bailey, 1991). As we read the students' essays and instructors' interview transcripts, we attempted to compare and contrast them and generalize the various themes into main categories. Upon rereading those notes we wrote in the left and right margins, we found similar topics regarding self-regulation development before and after attending ELT MA programs from the reflective essay and similar themes from the MA instructors' interview regarding the effect of their graduates' course on the development of ELT MA graduate candidates' self-regulation development.

While doing the data analysis, we also borrowed from Rourke and Anderson (2004 cited in Poldner et al.) six prerequisite steps for a valid and reliable qualitative for test quality in content analysis (QCA) procedure which showed in Table 3.1 below. The first three prerequisites are: (1) identification of the purpose of the analysis; (2)

characteristics that represent the construct; and (3) reviewing the accompanying categories and indicators. The fourth and fifth recommendations involve examining the preliminary categories and indicators in the QCA and developing guidelines for administration and scoring, respectively. In addition, empirical evidence for validity is gathered.

Table 3.1: Six prerequisite for a valid and reliable content analysis procedure, based on Rourke and Anderson (2004 cited in Poldner et al., p. 21)

1. Identifying the purpose
   First, a coding protocol should be developed to identify the purpose for which the coding data will be used. QCA designers should use this information to make decisions about scoring and required type of validity evidence.
2. Identifying characteristics that represent construct
   During the step, QCA designers should define the characteristics that represent the construct. This step ensures the construct representativeness of the coding protocol and guards against construct-irrelevant caused by codes in the protocol that are irrelevant for the assessment of the construct.
3. Reviewing categories and indicators
   In this step, the categories and indicators of the coding protocol are evaluated by experts on relevant and representativeness. This step contributes to the content validation of the coding protocol.
4. Try out
   This step involves preliminary testing of the coding protocol to gather information about the feasibility and to tackle shortcomings
5. Developing guidelines for administration, scoring and interpretation of the coding protocol
   Based on the information gathered I steps 1-4 QCA designers develop guidelines for administration, scoring and interpretation of the coding protocol. A well-defined QCA protocol should include explicit information about reached intra-and inter-assessor agreement, training procedures for coding, and examples of coded transcripts.
6. Gathering empirical evidence for validity
   Empirical evidence is required for establishing the validity of an assessment. This information can be delivered by correlation analysis, examination of group differences, and experiment or instructional interventions.

Even though qualitative data analysis developed abundance useful guidelines, studying suggestions and example (Miles & Huberman, 1994) yet they are not

formulated as rules. Because each qualitative study is unique, so the analytical approach might be unique as well. As Patton (2002, p.433) stated at every stage, an inquiry's qualitative quality, is determined by the practitioner's skill, training, insights, and expertise, while qualitative analysis is ultimately determined by the analyst's analytical ability and style. Accordingly, in this study two raters followed the current approaches of qualitative data analysis, yet we came up with our own analysis methods due to the purpose of the study and the research questions, which will be explained in the findings of next chapter.

3.8 Blockchain-based LMS with Adaptive SRL Intervention

In the second part of the research, blockchain-based LMS with adaptive SRL intervention designed. To consider the requirement analysis for designing the smart platform, first we needed benchmark data to identify the needs and expectations of ELT program for SRL development to build blockchain-based smart platform with adaptive SRL intervention in ELT online higher education (Pang et al., 2014). So based on the benchmark data of 33 ELT MA students, the blockchain-based LMS is developed that provided three phases of planning, action, and reflection SRL adaptive intervention throughout the online program to improve the quality of design. Data were collected quantitatively by utilizing SRL pre- and post-test questionnaire which were analyzed along the t-test and qualitatively by adopting reflective essays which were analyzed through the content analysis method.

Blockchain-based LMS with adaptive SRL intervention designed and implemented in Spring semester 2019 and Fall semester 2020 with 76 Master students in online higher education program at Hacettepe University, Turkey. First, Self-regulated learning opportunities questionnaire (SRLOQ) were administered to the MA graduate students

as a pre- SRL test. Second, based on the benchmark data, SRL adaptive intervention was given to each of the students in three phases of planning, action, and reflection throughout the course and third, at the end of semester post- SRL questionnaire was given to see is there any difference in self-regulation development before and after adaptive SRL intervention or not.

3.9 Summary

To understand the self-regulation learning development of ELT MA students during their graduate studies, a single school case study was chosen to gain a deeper understanding of contextual impacts on a given phenomenon by studying a specific rebounded case. As part of the current study, the researcher sought to investigate how ELT MA candidates develop self-regulatory skills within the context of ELT MA program and to what extent program instructors contribute to this process. The ability to understand contextual impact helped the researchers in understanding learning process issues and self-regulation development. Therefore, the study used a mixed method of qualitative and quantitative methods and concurrent triangulated strategy adopted with 33 ELT MA students and 4 ELT instructors at EMU University to examine how self-regulation develops within students in their graduate programs and how instructors perceive their courses to impact on their students' self-regulation development. This study collected quantitative data by utilizing SRL pre- and post-test questionnaires, which were analyzed using a t-test, and qualitative data by adopting reflective essays and semi-structured interviews, which were analyzed using content analysis. Further, the study developed and implemented a blockchain-based learning management system with SRL adaptive interventions through three phases of planning, action, and reflection based on benchmark data of the first part of the study and implemented with 76 MA students enrolled in ELT online higher education.

Chapter 4

RESULTS

This chapter focuses on the findings of the study. The findings include the results of pre and post SRL questionnaire, the end-of-the semester reflective essays, and MA graduate instructors transcribed, and. The chapter presents and discusses the findings of ELT graduate students definition of self-regulation strategies, graduate MA students perception of SRL strategies before and after attending to MA ELT program towards the completion of their graduate studies, the effect of MA course content, course structure, course requirement, teaching methods, and course assessment on the development of SR skills and ELT MA instructors' believe of the effect of their courses on the promotion of MA graduate SR skills. The second part of the chapter discusses about the proposed LMS enabled by blockchain technology and SRL adaptive intervention and explained course entity and prototyping and testing.

The study considered the following research questions:

4.1 Research Question 1

How do ELT MA graduate candidates perceive their self-regulatory learning strategies at the start and towards the completion of their graduate studies?

To do this, MA graduate candidates will be categorized in 3 groups as following:

a. 1st year Novice MA graduate candidates (within 1st semester or 1st year of their graduate studies);

b. 2nd year experienced MA graduate candidates (Already in program who are about to complete their courses and right at the beginning of thesis writing);

c. 3rd year MA graduate candidates (last year candidates who are about to finish and defend their thesis) and recent alumni.

Table 4.1: ELT MA graduate students' pre and post-test SRL questionnaire

Dimensions	Tests	Mean	Std. Deviation	Mean Diff.	S	t	P
Planning	Pre-test Post-test	52,84 56,96	12,22 10,71	4,12121	15,561	-1,521	,138
Monitoring	Pre-test Post-test	15,75 18,54	5,36 4,65	2,78788	6,298	-2,543	,016
ZPD	Pre-test Post-test	36,03 44,00	8,50 12,28	7,96970	12,431	-3,683	,001
Coaching	Pre-test Post-test	50,96 58,00	11,783 9,565	7,030	12,189	-3,313	,002
Collaboration	Pre-test Post-test	13,636 18,545	3,638 3,446	4,909	4,332	-6,509	,000

In order to do so, pairwise t-test run to compare pre and post SRL questionnaire. The findings of the study in Table 4.1 showed that, in terms of planning, there seems to be no significance difference between pre and post-test scores of ELT graduate students.

On the other hand, there are significant differences between pre- and post-test score of ELT graduate students in terms of monitoring (t -2,543/ P ,016), ZPD (t -3,683/ P ,001), Coaching (-3,313/ P ,002), and collaboration (t -6,509/ P ,000). According to the finding the highest significant difference score among the dimensions of the scale is gained at collaboration and ZPD dimensions.

4.2 Research Question 2

To what extent do ELT MA graduate candidates believe/perceive the course they are enrolled provide opportunities for self-regulated learning?

In order to provide data for research question 2, the following reflective essay questions were asked to the ELT MA Graduate candidates:

- Do you believe that you have developed self-regulatory strategies before attending the MA ELT program? If yes, please elaborate on your answer and provide related examples.
- Do you believe that you have been given opportunities during your MA studies so far to improve your self-regulatory strategies? If yes, please elaborate on your answer and provide related examples.

In relation to research question 2, ELT MA Graduate candidates reported their thoughts/beliefs first on whether they had developed self-regulatory strategies before attending the MA ELT program and secondly whether the MA ELT program had provided opportunities for them in developing their self-regulatory strategies during their education/stay in the program. Therefore, the data collected for research question 2 consisted of the following three categories:

Category 1: ELT MA Graduate candidates' beliefs on their self-regulatory skills before attending the ELT MA Graduate Course.

Category 2: ELT MA Graduate candidates' beliefs on their self-regulatory skills after attending the ELT MA Graduate Course.

Category 3: The comparison of ELT MA Graduate candidates' beliefs on their self-regulatory skills before and after ELT MA course.

The data revealed MA candidates' beliefs about their self-regulatory skills before and after attending the MA graduate course. The question further presented a comparison between MA graduate candidates' beliefs about their SR skills before and after attending their MA graduate course.

Each category will be dealt one by one in the order they have been listed above. Following is the presentation of the first category and the themes under that category:

4.2.1 Category 1: ELT MA Graduate Candidates' Beliefs on their Self-regulatory Skills before Attending the ELT MA Graduate Course

Only 4 of the graduate students stated that either they had no idea about self-regulatory learning, or they had no opportunity to develop their self-regulatory skills before attending the MA ELT program (GS11, GS12, GS13, and GS 14). The following quotations can be given as examples:

> GS11: "Before attending any educational course or program, it is necessary to develop some strategies to help students to achieve their goals. This is not a cumbersome task and it is possible by co-operation of instructors and learners. To be honest, in my own MA ELT program, I could not develop self-regulated strategies in some courses, and it can be related to various reasons. Maybe I was not motivated and knowledgeable enough toward the course material because of my insufficient background knowledge or the instructor had not given us a clear cut syllabus or plan about the course at the beginning of the semester".

> GS12: "Before attending MA level classes, due to my previous context (Iran) and major (English language translation), I did not know that such a concept

existed. I always studied at the night of my exam. And I do not believe that I had any kind of strategy for learning".

GS13: "No, I like someone to push me forward to do my best".

GS14: "No, I didn't".

Only 1 student indicated that s/he had minimum level of self-regulatory skill before attending the MA ELT course as exemplified below:

GS10: "I believed that I had a minimum level of self-regulatory strategies in use before attending my MA ELT program, for instance, before that I just went through what I have learnt and hope I have usually learnt".

On the other hand, 10 of the graduate students claimed that they have developed some self-regulatory skills before attending the ELT MA program. These MA candidates stated that their self-regulatory skills were developed in terms of cognitive, affective, reflective, planning and ZPD (strategies) domain/dimensions as presented below:

4.2.1.1 Theme 1: Cognitive Strategies

3 of the ELT MA candidates stated that their self-regulatory skills were developed in terms of cognitive strategies before attending the MA program. They believed that they were able to take notes, ask questions, collect information, think, and analyze related material critically and apply appropriate/effective ways and rules to solve related problems as exemplified in the quotes below:

- Taking notes GS1
- Asking questions GS1
- Collecting information GS3
- Thinking and analyzing critically GS7
- Analyzing material GS7

- Solving problems GS7
- Finding ways / rules for problem solving GS7.

Taking notes, asking question.

Note-taking and asking question is one the most popular cognitive strategies in SRL. Kauffman (2004) indicated that note taking (cognitive strategy) have positive impact on students' achievement. Some participants underlined these skills in SRL development as stated by GS1: "Yes, I developed my self-regulatory strategies because I formed the habit of taking notes, asking questions, guessing the word meaning from the context."

Collecting information.

To learn more effectively, learners use cognitive strategies. A few of these strategies are repetition, memorizing, organizing, summarizing, making inferences from context, and using imagery have positive impact on SRL (Kauffman, 2004). Some of the students reported about the effect of these strategies in SRL development as reported by GS3:

> "Yes, self-regulation it is not only useful for learning language but also you have to use it in your life such as at home, at work, and everything. To be a learner, everyone has a goal for learning, using different strategies to organize, collect information, and take time to memorize them, especially for language learner it is much useful."

Thinking and analyzing critically, solving material, finding ways/rules for problem solving

Critical thinking and problem solving are valuable aspect of cognitive strategies in higher education learning and SRL development (Kauffman, 2004). Some of the

participants reported about the positive effect of these strategies in SRL development. Following is an illustration of GS7 on this matter:

> "I myself developed my own self- regulatory strategies before I entered the MA ELT program, when I was studying in high school. I do believe that learners, who self- regulated, are those students with the ability to think and analysis critically. Once they are able to analyze their materials, the self- regulation process get begin and little by little the students will be fascinated in this process, as problem solving help them to feel more independent. Human being has been always searching for the independency, not only in terms of educational environment, but also in his daily life, where being able to solve your problems tastes sweet just like solving a puzzle by a child. As a matter of fact it is interwoven with human being nature. Intrinsically, a child asks her mother to let the child him/herself to solve his puzzles. This is what we can frequently observe in children's behavior, which stays with them maybe for all of their whole life. For instance, I myself was a student for Iran Language Institute and I used to find ways and rules as well as correlations in order to perform better in my classroom's tasks and in my assignments, which pushed me into higher task- esteem, accompanied with an enormous amount of confidence".

4.2.1.2 Theme 2: Affective Strategies (Motivational Factors/ Self-motivation Beliefs)

Some of the ELT MA candidates (GS6, GS7) focused on the affective aspect of the self-regulatory skills reporting on their self-motivational beliefs and the positive attitudes they have in achieving goals indicated that they had the skills to keep motivated and the self-esteem and self-confidence to achieve goals as given in the excerpts below:

- Keep motivated (motivation) to achieve goals GS6
- Self-esteem, self-confidence, and Positive attitude GS7.

Keep motivated to achieve goals.

Affective strategies also called motivational strategies which help the learner to deal with personality factors in learning achievement process. The results of the studies showed that cognitive strategies and motivation are hallmark of SRL and students success (Kauffman, 2004). GS6 and GS7 articulated these points as follows by GS6:

> "I believe everyone should develop their own self-regulatory strategies to keep motivated in whatever they are learning otherwise, they cannot reach their goals in learning".

Self-esteem, self-confidence, and positive attitude.

Some of the challenges like anxiety, low self-esteem, low self-confidence, and negative attitude are impeded learning achievement. Affective strategies are important strategies to overcome these challenges and develop SRL (Kauffman, 2004) as stated by GS7:

> "I myself was a student for Iran Language Institute and I used to find ways and rules as well as correlations in order to perform better in my classroom's tasks and in my assignments, which pushed me into higher task- esteem, accompanied with an enormous amount of confidence".

4.2.1.3 Theme 3: Reflection (Metacognitive Awareness and Monitoring of Cognition/ Monitoring of the Learning Process)

3 of the MA students (GS2, GS7, and GS9) believed that they had some reflective strategies as part of their self-regulatory skills. They indicated that they had been self-regulative by having an awareness of their strengths and weaknesses; and having metacognitive awareness.

The following quotations can be given as examples for the self-reflective strategies which MA candidates believed they had applied before attending the ELT MA program:

- Being aware of weaknesses and strengths GS2
- Having metacognitive awareness GS2, GS7, GS9.

Being aware of weaknesses and strengths.

You can decide what to do to improve your life if you know who you are. The ability to be aware of your weaknesses can reveal your skills gaps. Being aware of your strengths and weaknesses. Self-awareness helps students overcome weaknesses and exploit their strengths (Schunk, 2008) as stated by GS2: "I was responsible and knowledgeable student when I was in BA. I was aware of my weakness and strengths. Thus, I was considering my weak points and worked strategically for being better within my field".

Metacognitive awareness.

The concept of metacognitive awareness gives students the opportunity to think more explicitly about their learning and to develop their SRL strategies (Schunk, 2008). Student become more aware of what and why they are doing, and how they might apply the skills they learn differently in different context as confirmed in the following:

> GS7: "I myself developed my own self- regulatory strategies before I entered the MA ELT program, when I was studying in high school. I do believe that learners, who self- regulated, are those students with the ability to think and analysis critically. Once they are able to analyze their materials, the self-regulation process get begin and little by little the students will be fascinated in this process, as problem solving help them to feel more independent. Human being has been always searching for the independency, not only in terms of educational environment, but also in his daily life, where being able to solve your problems tastes sweet just like solving a puzzle by a child. As a matter of fact it is interwoven with human being nature. Intrinsically, a child asks her mother to let the child him/herself to solve his puzzles. This is what we can frequently observe in children's behavior, which stays with them maybe for all of their whole life. For instance, I myself was a student for Iran Language Institute and I used to find ways and rules as well as correlations in order to perform better in my classroom's tasks and in my assignments, which pushed me into higher task- esteem, accompanied with an enormous amount of confidence".

> GS9: "During my BA study at EMU I believe that I gained this learning strategy during my education by dealing with various, challenging and fruitful

> assignments, tasks, and projects. Moreover, some of the course contents touched on this issue with different themes. For example, in Special Education course, we learned what learner autonomy is and what the strategies of autonomous learners use are. Moreover, during this 4-year education process the requirements of the courses trained student-teacher to use self-regulatory strategies".

4.2.1.4 Theme 4: Planning

In forethought phase, effective planning, goal setting, time management, and organization is associated with learning achievement and SRL. This strategy helps the students to set their goals, prioritize their work, and finish their assignment on time (Kauffman, 2004). Some participants underlined the planning aspects of self-regulatory skills reporting about their time-management, and organizational skills that they believed they had before attending the MA program. The following excerpts can be given as examples:

- Time management
- Organization.

Time management.

Time management has been defined as "the subjectively efficient use of time to achieve desired outcomes" (Koch & Kleinmann 2002, p. 201). In other words, by engaging in goal-directed activity, one can ensure that time is effectively allocated (Claessens et al., 2007, p. 262). As a result of time management training programs implemented within a variety of organizational settings, Green and Skinner (2005) concluded that these programs tend to help students prioritize, plan, reduce procrastination, and avoid distractions as indicated by GS3:

> "Learning language is long and difficult process; it needs managing your time effectively. My BA and first MA also other language, so I have big experience about learning language, and I think I've developed self-regulation through long way learning time".

Organization.

Study results have shown that student preferences related to organization and attitudes toward following a schedule and time management strategies are positively correlated with SRL development (Wolters et al. 2017) as indicated by GS3:

> "To be a learner, everyone has a goal for learning, using different strategies to organize".

4.2.1.5 Theme 5: Zone of Proximal Development

2 of the MA candidates (GS2 and GS9) reported some self-regulatory strategies which are required as part of learners' zone of proximal development. They indicated that they had the skills of dealing with various, challenging, and fruitful assignments, tasks and projects by cooperating with instructors and their peers. The following can be given as examples:

- Lessons are challenging so that they should develop SRL to survive (Perception of task difficulty perception)
- Dealing with various, challenging, and fruitful assignment, tasks, and projects (Perception of task difficulty perception).

Lessons are challenging so that they should develop SRL to survive (Perception of task difficulty perception).

Task difficulty perception refers to how much efforts learner believe it would require accomplishing a task. It has been hypothesized that perception of task difficulty impact learning achievement through task value activation and influence on self-regulation learning (Bandura, 1997) as stated by GS2: "Throughout my MA studies, the lessons were challenging with their all components so that learners should develop self-regulatory strategies in order to survive in the program. Otherwise, they would fail.

Dealing with various, challenging, and fruitful assignment, tasks, and projects (Perception of task difficulty perception).

Task difficulty perceptions may affect how people perceive their abilities. The recent studies considered the impact of task difficulty perception and cognition, motivation, achievement. The findings of the studies showed that when students are learning new task, perception of task difficulty are potentially important factor to be considered in learning achievement and SRL (Li et al., 2007; Mangos & Steele-Johnson, 2001). As indicated by GS9:

> "During my BA study at EMU I believe that I gained this learning strategy during my education by dealing with various, challenging and fruitful assignments, tasks, and projects".

The following table summarizes the findings regarding ELT MA Graduate candidates' thoughts/beliefs about their self-regulatory skills development before attending the MA ELT program as below:

Table 4.2: Summery of findings regarding ELT MA graduate candidates' beliefs about their self-regulatory skills development before attending the MA ELT program provided in category 1

Category 1: Views on Self-regulatory skills before attending MA program
Theme 1: Cognitive Strategies **Subthemes:** • Taking notes • Asking questions • Collecting information • Thinking and analyzing critically • Analyzing material • Solving problems • Finding ways / rules for problem solving

Theme 2: Affective Strategies (Motivational factors/ Self-motivation beliefs) **Subthemes:** • Keep motivated (motivation) to achieve goals • Self-esteem, self-confidence, and Positive attitude
Theme 3: Reflection (Metacognitive awareness and monitoring of cognition/ Monitoring of the learning process) **Subthemes:** • Being aware of weaknesses and strengths • Having metacognitive awareness
Theme 4: Planning **Subthemes:** • Time management • Organization • Goal setting
Theme 5: Zone of Proximal Development **Subthemes:** • lessons are challenging so that they should develop SRL to survive (Perception of task difficulty perception) • Dealing with various, challenging, and fruitful assignment, tasks, and projects (Perception of task difficulty perception)

4.2.2 Category 2: ELT MA Graduate Candidates' Beliefs on their Self-regulatory Skills after Attending the ELT MA Graduate Course

14 out of the 15 MA candidates stated that their self-regulatory skills were developed after they had been enrolled into the ELT MA Graduate course. They stated that the graduate course provided them with the opportunity to develop themselves in terms of subject matter, goal setting, self-awareness of weak points, development of metacognition strategies, doing presentation, course evaluation methods, teaching methods, course outline, and course requirements. Following are the themes the ELT

MA Graduate candidates believed that they had opportunity to develop themselves in after they had enrolled into the course:

4.2.2.1 Theme 1: Opportunities for Subject Matter

3 of the ELT MA candidates stated that their self-regulatory skills were developed due to the opportunities the MA course provided in terms of the subject matter. They believed that they were able to discuss different dimensions of the subject matter by being involved into the discussions; hence, this provided them with the opportunity to understand the subject matter better as exemplified in the quotes below:

- Different dimensions of the subject matter
- Students' involvement in discussing about the subject matter
- Understanding subject matter.

Different dimensions about subject matter.

It is essential for teachers to emphasize the importance of facilitating, supporting, monitoring, and evaluating ELT students' interaction with the subject matter and not merely transmitting knowledge. Teachers need to prepare their students for lifelong learning by coaching them to become SRL learners (Oosterheert, 2001) as indicated below:

> GS4: "we have a lot of opportunities to involve in the classroom and discuss about different subject matter".

Students' involvement in discussing about subject matter.

> GS4: "we have a lot of opportunities to involve in the classroom and discuss about different subject matter".

Understanding subject matter.

> GS1: "Yes, I have been given opportunities to contribute to the subject matter".

> GS4: “Yes, I think our courses are learner-centered and we have a lot of opportunity to involve in the classroom and discuss about different subject matters.

> GS10: “MA studies has really help me to improve on my self-regulatory strategies, for instance, doing my presentation among my colleagues, I do know how well and how far I have gone in the knowledge of the subject matter”.

4.2.2.2 Theme 2: Planning and goal setting

Some of the ELT MA candidates focused on the importance of goal setting in developing their self-regulatory skills in terms of setting realistic goals in improving learning abilities and receiving guidance/support from instructors in goal setting as given in the excerpts below:

- Realistic goal setting in improving learning abilities
- Guidance/support from instructors in goal setting (coaching, feedback).

Realistic goal setting in improving learning abilities.

SRL strategies require the students to set realistic goals, which are challenging but attainable. The advantage of realistic goals is that students are able to monitor their progress and, if their present task approach fails, switch to a different one. The process of planning, realistic goal setting, and other related forethought processes appear to have a positive impact on efforts, self-regulation learning development, and academic performance (Locke & Latham 2019) as indicated by GS2:

> “During my MA studies, I have been given opportunities to improve my self-regulatory strategies. I was setting goals to be able to improve my learning abilities and success. While I was setting goals, I tried to be realistic, and I got help from my experienced instructors.”

Guidance/support from instructors in goal setting.

Realistic goal setting requires to be trained and supported by teachers. Students usually have difficulty to set realistic goals (Schunk, 1990), teacher's guidance and support help the students to improve their goal setting as explained by GS2:

> "While I was setting those goals, I tried to be realistic, and I got help from my experienced instructors. As I said, I was aware of my weak points, so I was taking advice from my instructors to find out meaningful solutions for my problems. For instance, I was having difficulties at reading, analyzing and understanding the articles. To be honest, I was thinking that the articles aren't useful and enjoyable. Then, one of my instructors taught me some strategies that I can use while analyzing an article and I read many articles to improve my analyzing abilities. Now I'm very fast at reading and finding the necessary information on an article. I can easily eliminate the articles that I need. Thus, in my opinion, ELT MA program has contributed to my self-regulatory learning, most importantly with the help of the instructors".

> GS11: "To be honest, in my own MA ELT program, I couldn't develop self-regulated strategies in some courses, and it can be related to various reasons. Maybe I was not motivated and knowledgeable enough toward the course material because of my insufficient background knowledge or the instructor had not given us a clear-cut syllabus or plan about the course at the beginning of the semester".

4.2.2.3 Theme 3: Self-awareness of Weak Points through Coaching/Judging

1 of the ELT MA candidates stated that their self-regulatory skills were developed in terms of opportunities for self-awareness of weak points after attending the MA program. The student believed that he/she received feedback/coaching from the instructors in coming up with meaningful solutions for weak points as exemplified in the quotes below:

- Received feedback/coaching from the instructors in coming up with meaningful solutions for the weak points.
    - E.g., Analysis and understanding of articles, strategies for article reading
    - E.g., Developed strategies for article reading
- Reading fast

- Scanning important information
- Analyzing and understanding.

Received feedback/coaching from the instructors in coming up with meaningful solutions for the weak points.

Effective self-regulated learning occurs when learners actively interpret feedback from teachers and other peers, in terms of achieving their goals. Nicol and Macfarlane-Dick (2006) claim that external feedback plays a critical role in students' self-regulated learning. Teacher's feedbacks support the students to overcome their weakness, monitor and evaluate themselves, and improve their progress toward achieving their goals (Wolters & Brady, 2020). In addition, Schunk and Zimmerman (2007) recommend the following four steps for modelling in SRL development: (1) observation: observe how a model learns or performs the skill and infer its major characteristics; (2) emulation: the learner imitates the performance of a model with guidance/assistance; (3) self-control: the learner uses model skills independently under controlled conditions; and (4) self-regulation: the learner shows the ability to use skills in different context. Feedback/coaching from instructors indicated by GS2 as following:

> "While I was setting those goals, I tried to be realistic, and I got help from my experienced instructors. As I said, I was aware of my weak points, so I was taking advice from my instructors to find out meaningful solutions for my problems. For instance, I was having difficulties at reading, analyzing and understanding the articles. To be honest, I was thinking that the articles aren't useful and enjoyable. Then, one of my instructors taught me some strategies that I can use while analyzing an article and I read many articles to improve my analyzing abilities. Now I'm very fast at reading and finding the necessary information on an article. I can easily eliminate the articles that I need. Thus, in my opinion, ELT MA program has contributed to my self-regulatory learning, most importantly with the help of the instructors".

4.2.2.4 Theme 4: Development of Metacognition Strategies

2 of the MA candidates reported development of metacognitive strategies like Planning, motivation, taking charge of one's own learning were developed after attending the MA program as exemplified in the quotes below:

- Planning, motivation, taking charge of one's own learning
- Metacognitive strategies.

Planning, motivation, taking charge of one's own learning.

It is worth noting that planning, motivation, and autonomy have positive effect on students' self-regulation learning. The results of the previous studies found that self-regulated learners tend to have a greater autonomy, planning over their schedule. Also, the findings of the earlier works found a positive connection of motivation, self-regulation, and academic performance (Won & Yu, 2018; Wolters & Brady, 2020) as stated by GS3:

> "Yes, doing MA studies helped me improve my self-regulation strategies because SRL is the strategy that is guided by metacognition strategies, strategic action for example planning, motivation, and process of taking control of one's own learning and behavior. By doing my MA, I learned from reading articles how to do analysis for other idea, thinking about one's thinking, how practice my learning and how deeply understand the material, I learned to manage my time as well as my environment".

Metacognitive strategies.

Metacognitive strategy is an essential component of enabling learners to think critically. It empowers them to be aware of their own learning process and also it helps learners plan, monitor, and reflect their learning processes which leads to SRL development. In other words, metacognitive strategies promote learners' awareness of their learning and support SRL development. The results of the previous study reported the positive effect of metacognitive strategies in self-regulation development (Wolters

et al., 2017; Wolters & Brady, 2020) as stated by GS15: “Yes, I think I developed my self-regulatory by practicing different metacognitive strategies”.

4.2.2.5 Theme 5: Collaboration

3 of the ELT MA candidates claimed that their self-regulatory skills were developed only in terms of collaboration with peers after attending the MA program. They believed that doing group presentation, group discussion, thesis writing, conducting group research, presentation at international conferences, and dealing with specific detailed challenging tasks helped them to improve self-regulatory skills as exemplified in the quotes below:

- Doing group presentation and discussion
- Thesis writing
- Conducting group research
- Presenting at an international conference
- Dealing with specific detailed challenging tasks.

Doing group presentation and discussion.

Collaborating among students facilitates SRL development (Wigfield, Hoa, & Klauda, 2007). When students are assigned collaborative projects, they make an extra effort to contribute to the team. Students who are encouraged to consult each other as a source of knowledge can also benefit from sharing knowledge with their peers. Therefore, the learning process and the results of learning must be viewed as social phenomena (Bolhuis & Voeten, 2001). For engaging students and facilitating their reasoning, Norton and Hathaway (2010) suggest that students guide peer interaction by establishing positive interdependence in the group, giving clear instructions on how

to cooperate, and providing adequate feedback on the cooperative process (Bolhuis & Voeten, 2001) as explained below:

> GS8: "To promote SRL in classroom, teachers seem to have opportunity of the self-regulated process but in reality, many instructors haven't given any opportunities to us. In case, we just doing presentations have an opportunity for us".

> GS10: "MA studies has really help me to improve on my self-regulatory strategies, for instance, doing my presentation among my colleagues, I do know how well and how far I have gone in the knowledge of the subject matter".

Thesis writing, conducting group research, presenting at an international conference, and dealing with specific detailed challenging tasks.

Wagener (2017) highlighted that MA thesis writing and conducting research helped the students to develop their SRL skills and also the study identified that supervisor support in cognitive, affective, and social level is important in SRD as stated by GS9:

> " I believe because the entire course that I took at MA program provided me various opportunities to foster my SR strategies that I developed in the BA program. Apart from thesis writing, conducting a research in the field and being able to present in an international conference, dealing with more specific and detailed challenging tasks and the structure of course helped me a lot to foster my strategies as a professional rather than a student.

4.2.2.6 Theme 6: Course Evaluation Methods and Teaching Methods

As part of a systematic review of SRL, Vrieling, Bastiaens, and Stijnen (2010) argue that it is crucial to establish a knowledge base for ELT students in the domain (subject area) while expanding opportunities for SRL development in ELT higher educational programs. Since learning is self-regulated knowledge construction, ELT instructors are influenced to support and guide MA students in their SRL development (Vermunt & Verloop, 1999). ELT instructors should integrate teaching domain-specific content knowledge with metacognitive learning strategies in ELT learning environments

(Vermunt & Vermetten, 2004; Vermunt & Verschaffel, 2000). ELT instructors should therefore provide students with opportunities to practice/develop acquiring metacognitive skills. To do that, ELT instructors must explicitly link their teaching methods to the development of those skills. By incorporating the necessary metacognitive skills and content knowledge during instruction, this knowledge development can be facilitated. The results of the study showed that teaching method, course requirements, and course outline provided opportunity for ELT MA students to develop their SRL as indicated by the participants. One of the ELT MA candidates focused on the importance course evaluation methods and teaching methods in developing their self-regulatory skills an exemplified in the quotes below:

> GS12: "Course content and structure had to do with informing me about the existence of this concept in ELT, although they did not help me with the strategies as much. I think it was through course evaluation and teaching method techniques, that my teachers pressured me in doing my tasks by myself without much help. So, I used the concept to form some strategies for learning, because studying at the exam night did not seem to be enough anymore, if I wanted better grades. The pressure and responsibility that I felt, was in my belief, because of the way teachers were scoring and evaluating us. I think my transcript will testify to my argument. At the beginning my scores were very low not because I did not study, but because I did not have any strategy for studying during the semester. Also, course outline always draws me a very specific plan of what I needed to do, and when I had to do it. Before, learning using course outlines, given at the beginning of the semester, I did not know how to manage my time and resources".

4.2.2.7 Theme 7: Course outline

One of the ELT MA candidates focused on the importance course outline in developing their self-regulatory skills in terms of time management and reaching resources through assessment and projects an exemplified in the quotes below:

- Helped him/her in time management and reaching resources through assessments and projects.

Helped him/her in time management and reaching resources through assessments and projects.

> GS12: "Course content and structure had to do with informing me about the existence of this concept in ELT, although they did not help me with the strategies as much. I think it was through course evaluation and teaching method techniques, that my teachers pressured me in doing my tasks by myself without much help. So, I used the concept to form some strategies for learning, because studying at the exam night did not seem to be enough anymore, if I wanted better grades. The pressure and responsibility that I felt, was in my belief, because of the way teachers were scoring and evaluating us. I think my transcript will testify to my argument. At the beginning my scores were very low not because I did not study, but because I did not have any strategy for studying during the semester. Also, course outline always draws me a very specific plan of what I needed to do, and when I had to do it. Before, learning using course outlines, given at the beginning of the semester, I did not know how to manage my time and resources".

> GS14: "Yes, now I can make a specific time for each assignment or project. The next topic so I keep in touch with language all the time".

4.2.2.8 Theme 8: Course Requirement

One of the ELT MA candidates focused on the importance course evaluation methods and teaching methods in developing their self-regulatory skills an exemplified in the quotes below:

Course requirements.

> GS13: "Yes, at the university I had, and I will have some courses, which need to be autonomous, and I try to make my own strategies to be better and solve my problems easier".

4.2.2.9 Theme 9: Zone of Proximal Development

One of them is indicated the importance of prior knowledge activation in building up relationship among the ideas of the topic so as to deal with the challenging tasks. The following can be given as examples:

- Cooperation of instructors and peers
- Prior knowledge activation.

Cooperation of instructors and peers.

To build knowledge effectively, a gradual shift from teacher control over learning processes to student control is needed, also known as scaffolding. It is derived from Vygotsky's zone of proximal development, which states, "the process of learning is best achieved through collaborative activities, such as problem solving, in which learners have help from more knowledgeable peers or teacher" (Windschitl 2002, p.141). When a student is capable of performing more independently, teachers gradually decrease their assistance (Vrieling, Stijnen, & Bastiaens, 2018). In addition, they stress the importance of students having sufficient prior knowledge to be able to guide themselves internally. Once this occurs, the teacher can no longer provide guidance. Cooperation of instructors helped ELT MA students as indicated by GS11:

> "Before attending any educational course or program, it is necessary to develop some strategies to help students to achieve their goals. This is not a cumbersome task, and it is possible by co-operation of instructors and learners".

Prior knowledge activation.

Prior knowledge activation leads to understanding the learning task, goals, and identify the knowledge required to accomplish it and distinguish various characteristics and their performance abilities (Vrieling, Stijnen, & Bastiaens, 2018). In this sense, prior knowledge facilitates individuals' monitoring, coaching and judging results to their goals (Butler & Winne, 1995). Also, it helps ELT MA students to develop challenging goals, a necessary component of SRL development (Dembo & Eaton, 2000; Eccles & Wigfield 2002; Zimmerman, 2007) as explained by GS11:

> "During the MA program, we have been given opportunities to improve our self-regulatory strategies. Our MA courses deal with these strategies and their effects in learning process. I sincerely appreciate my instructors' methods of teaching and they were knowledgeable in their field of teaching, but they have to pay close attention to the students who are less motivated and students whose background knowledge is not sufficient about the course".

4.2.2.10 Theme 10: Reflection (Metacognitive Awareness and Monitoring of Cognition/ Monitoring of the Learning Process)

1 of the MA students (GS10) believed that they had some reflective strategies as part of their self-regulatory skills by developing different strategies for self-monitoring; and by being self-reflective about their learning processes.

The following quotations can be given as examples for the self-reflective strategies which MA candidates believed they had applied before attending the ELT MA program:

- Developing different strategies for self-monitoring
- Self-reflection.

Developing different strategies for self-monitoring.

According to Pintrich (2000), self-monitoring process considered to be a unique aspect of performance. Self-monitoring is an ongoing assessment/observation of how students are doing their tasks (Zimmerman, 2000). Results of the studies indicated that enhanced and effective self-monitoring is associated with better self-regulation learning and academic performance (Guzman et al., 2048) as indicated by GS10:

> "I believe that after attending the program I have developed more maximally different strategies in monitoring my own learning, for instance, before that I just go through what I have learnt and hope I have learnt but now, reflectively I can write down my stages of development in learning to justify my knowledge in different subject being taught".

Self-reflection.

According to Zimmerman (2000), self-reflection and self-assessment are two important process of performance phase in SRL. Self-reflection refers to the process which students reflect upon their experiences and outcomes they achieve from

fulfilling learning tasks. Studies showed that students' self-assessment, self-reflection, and attribution help to understand motivation and academic performance (Panadero et al., 2016) as explained by GS10:

> "I believe that after attending the program I have developed more maximally different strategies in monitoring my own learning, for instance, before that I just go through what I have learnt and hope I have learnt but now, reflectively I can write down my stages of development in learning to justify my knowledge in different subject being taught".

The following table summarizes the findings regarding ELT MA Graduate candidates' thoughts/beliefs about their self-regulatory skills development after attending the MA ELT program as below:

Table 4.3: Summery of findings regarding ELT MA graduate candidates' thoughts/beliefs about their self-regulatory skills development after attending the MA ELT program provided in category 2

Category 2: Views on Self-regulatory skills after attending MA program
Theme 1: Opportunities for Subject Matter **Subthemes:** • Understanding subject matter (GS1) (GS10) (GS4) • Dimension about subject matter (GS4) • Students' involvement in discussing subject matter
Theme 2: Goal setting **Subthemes:** • Improved learning abilities • Realistic goal setting • Guidance/support from instructors in goal setting (coaching, feedback)
Theme 3: Self-awareness of weak points **Subthemes:** • Received feedback/coaching from the instructors in coming up with meaningful solutions for the weak points.

Theme 4: Development of metacognition strategies **Subthemes:** • Planning, motivation, taking control of one's own learning
Theme 5: Collaboration **Subthemes:** • Group presentation, group discussion • Thesis writing • Conducting group research, • Presenting at an international conference • Dealing with specific detailed challenging tasks
Themes 6: Course evaluation methods + Teaching methods
Themes 7: Course outline **Subthemes:** • Helped him/her in time management and reaching resources through assessments and projects
Themes 8: Course Requirements
Theme 9: Zone of Proximal Development **Subthemes:** • Cooperation of instructors and peers • Prior knowledge activation
Theme 10: Reflection (Metacognitive awareness and monitoring of cognition/ Monitoring of the learning process) • Developing different strategies for self-monitoring • Self-reflection

4.2.3 Category 3: The Comparison of ELT MA Graduate Candidates' Beliefs on their Self-regulatory Skills before and after ELT MA Course

This part intends to compare ELT MA graduate candidates' beliefs on their self-regulation before and after attending ELT MA course. To do so, firstly we consider

ELT MA graduate candidates' beliefs before attending ELT MA courses. The findings of the study showed that they believed they had opportunity to develop their self-regulatory skills before attending ELT MA programs in the following themes:

1. Cognitive strategies
    a. Taking notes
    b. Asking questions
    c. Collecting information
    d. Thinking and analyzing critically
    e. Analyzing material
    f. Solving problems
    g. Finding ways / rules for problem solving
2. Affective strategies
    a. Keep motivated (motivation) to achieve goals
    b. Self-esteem, self-confidence, and Positive attitude
3. Reflection (Metacognitive strategies)
    a. Being aware of weaknesses and strengths
    b. Having metacognitive awareness
4. Planning
    a. Goal setting
    b. Time management
    c. Organization
5. ZPD
    a. lessons are challenging so that they should develop SRL to survive (Perception of task difficulty perception)

b. Dealing with various, challenging, and fruitful assignment, tasks, and projects (Perception of task difficulty perception).

Secondly, we consider ELT MA graduate candidates' beliefs after attending ELT MA courses. The findings of the study showed that they believed they had opportunity to develop their self-regulatory skills after attending ELT MA programs in the following themes:

1. Opportunity for subject matter
    a. Understanding subject matter
    b. Dimension about subject matter
    c. Students' involvement in discussing subject matter
    2. Goal setting
        a. Improved learning abilities
        b. Realistic goal setting
        c. Guidance/support from instructors in goal setting (coaching, feedback)
3. Self-awareness
    a. Received feedback/coaching from the instructors in coming up with meaningful solutions for the weak points.
4. Development of metacognitive strategies
    a. Planning, motivation, taking control of one's own learning
5. Collaboration
    a. For the improvement of self-regulatory skills
    b. Thesis writing
    c. Conducting research
    d. Presenting at an international conference

    e. Dealing with specific detailed challenging tasks
6. Course evaluation methods + teaching methods
7. Course outline
    a. Helped him/her in time management and reaching resources through assessments and projects
8. Course requirements
9. ZPD
    a. Prior knowledge activation
    b. Cooperation of instructors
10. Reflection (Metacognitive strategies)
    a. Self-monitoring
    b. Self-reflection.

Thirdly we compared the above-mentioned themes of ELT MA graduate candidates' beliefs regarding their self-regulatory skills development before and after attending ELT MA programs we come up with the common themes. The findings of the study showed that both parts believed that they had been given opportunities to develop their self-regulatory skills in the following common themes before and after ELT MA program:

1. Reflection
2. ZPD
3. Planning.

Although the findings showed that before and after ELT MA program, they share common themes, but they do not share the same common sub-themes as explained below:

1. **Reflection:** ELT MA graduate students' perception of reflection before attending ELT MA programs refers to:
    a. Being aware of weaknesses and strengths
    b. Self-reflection

But their perception about Reflection after ELT MA program changed to:

    a. Developing different strategies for self-monitoring
    b. Having metacognitive awareness
    c. Self-reflection and self-reaction.

Also, they have mentioned about metacognitive strategies like planning, motivation, and taking control of one's own learning that helped them to develop their self-regulatory skills.

2. **ZPD**: ELT MA graduate students' perception of ZPD before attending ELT MA programs goes back to task difficulty perception while their perception of ZPD after attending ELT MA program changed to cooperation of instructors, prior knowledge activation.
3. **Planning:** ELT MA graduate students' perception of planning before attending ELT MA programs refers to goal setting, time management, organization but their perception of planning after attending ELT MA program changed Improved learning abilities, realistic goal setting, Guidance/support from the instructors, and Coaching/feedback.

Then, we focused on the themes that ELT MA graduate candidates believed they had been developed their self-regulatory skills before ELT MA course. The result suggested that the ELT MA graduate students believed that they were able to develop

their self-regulatory skills in cognitive strategies and affective strategies (motivational factor).

Although ELT MA graduate candidates did not believe that they could be able to develop their self-regulatory skills in cognitive and affective strategies as before ELT MA program, but the result showed that ELT MA graduate students believed that after attending ELT MA program they had been given opportunity to develop their self-regulatory skills in the following themes:

1. Opportunity for subject matter
2. Self-awareness
    a. Feedback
    b. Coaching from the instructors
3. Development of metacognitive strategies
    a. Planning, motivation, taking control of one's own learning
4. Doing presentations for the improvement of self-regulatory skills
    a. Thesis writing
    b. Conducting research
    c. Presenting at an international conference
    d. Dealing with specific detailed challenging tasks
5. Course evaluation methods + teaching methods
6. Course outline
7. Course requirements
8. ZPD
    a. Cooperation of instructors and peers
    b. Prior knowledge activation.

In addition, in comparing the SRL shared theme, we found that although they share the common themes, but their perception moved from initial phase of SRL to developing phase and advanced phase of SRL development after attending MA ELT program.

4.3 Research Question 3

How do ELT graduate instructors believe/perceive of the effect of their courses on the promotion of MA graduate candidates' self-regulatory skills?

In order to provide data for research question 3, a semi-structured interview was conducted with ELT MA Graduate candidates' instructors and the following questions were asked:

1. Do you believe that your graduate course has an effect on the promotion of MA students' self-regulatory skills?
2. To what extent do you believe the following have promoted master students' self-regulatory learning:

   the graduate course contents

   course structure,

   course requirement,

   teaching methods and

   course assessment
3. Do you involve your students into the process of planning, goal setting (short-term & long-term), task value activation, and time management aspects of your graduate class? If yes, how?
4. Do you expect your students to describe you about their goal setting and the activities they attend to master/achieve their goals?

5. Do you use some strategies to help graduate students self-regulate their studies? If yes, which strategies (Internal / External/ Shared) do you use?
6. How do you consider prior knowledge activation? Or how the subject, assignment, and lesson connect well to the students' prior knowledge?
7. How and when (how often) do you provide coaching/judging/feedback to evaluate your graduate students' progress? Do you give them feedback based on previously formulated criteria? How are the students informed of the criteria they are to be evaluated?
8. How do you encourage students' collaboration with peers? (Give some examples from your course, if possible please)
9. In addition to the above questions, would you like to share any other points regarding MA graduate students' SRL in ELT department.

In relation to research question 3; ELT MA Graduate candidates' instructors reported their thoughts/beliefs of the effect of their course on the promotion of MA graduate candidates' self-regulatory skills. Therefore, the data collected for research question 3 consisted of the following three categories:

- Category 1: Planning
    a. Goal setting
    b. Time management
- Category 2: Monitoring, coaching, and feedback
- Category 3: collaboration with peers.

Each category will be dealt one by one in the order they have been listed above. Following is the presentation of each category and the themes under that category:

4.3.1 Category 1: Planning

3 of the ELT MA candidates' instructors focused on the importance planning on the promotion of MA graduate candidates' self-regulatory with 2 following themes:

1. Goal setting
2. Time management

4.3.1.1 Theme 1: Goal setting

Instructor 1.

- GS (graduate students) are involved in long-term and short-term aspects of planning

> **INS 1:** "Throughout the graduate course my students have been involved in such short-term and long-term aspect of planning".

Instructor 2.

- GS are not involved in planning
- Steps are arranged by the instructor.

> **INS 2:** "Regarding the time management, I should say my project are substantial at graduate level, and regarding the time management, I put the projects in 4-5 parts, and for example , I ask them to do the first part or second parts and each part has a deadline, and those parts are credited, for example coming up with the outlines, coming up with the references lists, first draft, second draft, and for example coming up with the research questions, these are all the tasks that I separated, I don't let them to come to the end of the semesters and if there is something wrong, you know paralyze for that, you know I partial credit for the steps that they take and those are directly related to the diff. processes that maybe for sometimes related to the tasks I give them like for different steps or I separate one task for different steps and parts, of course it's an extra burden on me, I have to read, evaluate, analyze and give feedback to students but at the end it's so fruitful to see that the product is really good or it's at the appropriate level".

Instructor 3.

- GS are not involved in the planning of course content

- They have freedom to bring different sources
- They are given an active role/freedom to choose their own topic for research.

> **INS 3:** "We have to involve our students in every stages of course planning and they have to be a decision maker … for example, in an assignment, I give them a list of topics and as a last option, I say ok, if you have a better idea, you can come and talk to me, you can choose your own topic, as far as it is related to the course content, it is ok. So, they have this flexibility and freedom to choose their own topic for research and work on them. Also, we don't give them all the materials, they have to go and search. Of course, we guide them to reach the sources, but it is their responsibility, rather than giving them five articles and asking ok to write a literature review paper by using these sources …

Instructor 4.

- Provided no data for planning/goal setting

4.3.1.2 Theme 2: Time management

Instructor 1.

- GS make their own decisions of deadlines for a range of submissions, and time management of their presentations.

> **INS 1:** "Throughout the graduate course my students have been involved in such short-term and long-term aspects of planning as the deadlines for a range of submissions, time management of their presentations… Graduate students enrolled in my course are required to select pertinent research articles, to present and critique these, as well as write portfolios to reflect on and manage their learning and progress, as well as write several reflections on the major issues in relation to their previous language learning and professional experiences, also their previous and current academic experiences/learning…"

Instructor 2.

- GS are not involved at all
- Time-management is predetermined by the instructor and presented to the students in the course description.

INS 2: "At the beginning of the semester we give policy sheet and we give them course outline, and also within that we share about goals and objectives and also the expected outcomes, it's not like we tell them the goals what we are planning to do, what we are going to deal with, we also give them information about expectation, goals and everything/ and plus we give them the expected outcome and they see the relation, what is goal, what are expected to achieve/to do at the end. They prepare themselves towards that.

Regarding the time management, I should say my project are substantial at graduate level, and regarding the time management, I put the projects in 4-5 parts, and for example , I ask them to do the first part or second parts and each part has a deadline, and those parts are credited, for example coming up with the outlines, coming up with the references lists, first draft, second draft, and for example coming up with the research questions, these are all the tasks that I separated, I don't let them to come to the end of the semesters and if there is sth wrong, you know paralyze for that, you know I partial credit for the steps that they take and those are directly related to the diff. processes that maybe for sometimes related to the tasks I give them like for different steps or I separate one task for different steps and parts, of course it's an extra burden on me, I have to read, evaluate, analyze and give feedback to students but at the end it's so fruitful to see that the product is really good or it's at the appropriate level".

Instructor 3.

- Course content to be covered and the deadlines for all of the duties are pre-

  determined and scheduled in the course outline at the beginning of the semester.

INS 3: "first of all, from the very beginning when I give them a course outline, we have a weekly schedule, so from the very beginning what we are going to do is written there for each week, which material we will discuss is there, so everyone can follow and organize him/herself … and another thing for example when they have assignment, I always put due date and I give them enough time and also as you know sometimes we give them free weeks and usually students leave everything to the last few days and I distribute the assignments, for example, I always advise them let's say to start from the beginning to come and see me, you know as early as possible, and time to time, so that you know I can guide them, so they can check if they are on the right track or not, so I always advise them not to wait till the last few days, because I try to guide them in time-management and it is very important especially in graduate level".

Instructor 4.

- Provided no data for planning/Time management

4.3.2 Category 2: Monitoring, Coaching, and Feedback

All the ELT MA candidates' instructors focused on the importance of monitoring, coaching, and feedback on the promotion of MA graduate candidates' self-regulatory skills as exemplified in the quotes below:

4.3.2.1 Instructor 1

- GS are required/encouraged to write portfolio to reflect on and manage their own learning
- They follow/monitor their own progress through reflections
- They monitor their own progress through previous language learning and experiences with the current academic experiences.
- Guidelines and criteria for various assignments are provided in advance and explained explicitly several times
- They know what is expected from them
- GS are provided feedback according to the previously given and explained criteria
- Criteria and guidelines are explained at the beginning
- Criteria and guidelines are explained clearly at the beginning.

> **INS1:** "the course discussion agendas, the portfolio and the reflections in my graduate course aim at encouraging them to continuously relate a range of theoretical and practical issues to their previous language learning and professional experiences, also their previous and current academic experiences/learning… The course requirements, the guidelines for various assignments, for example a Written Critique have been provided well in advance, and since then the guidelines have explicitly been explained several times in class. Also, the graduate students, at their request, have been provided feedback in relation to their performance".

4.3.2.2 Instructor 2

- GS are required to conduct their own research
- They monitor their own progress through dealing with every stage of research (do the literature review, synthesize resources, and come up with the product)
- Instructor monitor/reads and provides feedback at every stage of the research
- GS are given the criteria and guidelines for their project's assignments
- They are made clear about what is expected from them
- Instructors provide feedback according to the criteria and guidelines she provided at the beginning of the semester.

> **INS 2**: "Well, you know they just conduct their own research, they write their own papers, finalizing their thesis and everything. So, they just conduct their own research and related stuffs about their research, dealing with literature review, pilot locating the source synthesizing their sources, putting them together, and then you know coming up with the product. I think they do it on their own.
>
> And my strategies are like separating big tasks into smaller pieces and helping them to focus on the smaller parts and combine all those parts related to each other and come up with the big project. This is one of the strategies that I usually use instead of just look at the process, I analyze the process, I give my feedback during the process instead of giving just one feedback at the end. It's not a requirement or must for a teacher maybe at this level to check the process but I believe in after analyzing the task into smaller pieces, I help them to manage their time better and bring quality at higher level regarding their project, because they will be able to manage, they are able to manage their time, if you divide the project of the task into smaller pieces and I can support their self-study, autonomous learning, better view and I can contribute more.
>
> My criteria are already known and given to the students, it's given at the beginning of the semester, I gave them all the guidelines, I gave them criteria and everything, all necessary information. They know the time, what is important and what they are supposed to do, how they need to do it".

4.3.2.3 Instructor 3

- GS visit instructor in the office hours more frequently to ask for guidance and feedback and their request decrease towards the end
- Instructor provides GS with detailed feedback both on their written and oral performances
- Instructors provide feedback according to the criteria and guidelines she provided at the beginning of the semester.

> **INS 3**: "in the very first lesson, I give the course policy sheet, and in the course policy sheet from the very first day, they know how they are going to be evaluated and if something unexpected or very serious problem doesn't happen, I don't change the evaluation criteria. And for each task for example if I give them reflection paper to write while I give them a task, all the criteria are given in the guidelines, and I tell them what I have expected them to do plus how the papers are going to be evaluated. Also, I always advise them let's start from the beginning to come and see me frequently, you know as early as possible, and time to time, so that you know I can guide them, they can check if they are on the right track or not
>
> Of course after their presentations, usually students come and ask how was it and I take down very detailed notes while they are doing presentation, so I want to see them individually to give them feedback about their assignment, for example if student take 20 out of 25, I can explain very clearly and let's say openly why it is 20 but it is not 19 or 21. So the criteria is there and full notes".

4.3.2.4 Instructor 4

- GS are provided the criteria which is to be used to assess/evaluate their knowledge, skills, and performances.
- These criteria are clearly explained (GS know the content, date, the points they need to focus to)
- When they are given a project; aim, format, content, benchmarks are all clearly stated and explained.
- They feel confident in what is expected from them.

- They do not care for feedback for development but for feedback when they score lower.

> **INS 4:** "I try when I set task, first of all when I go into a classroom, I try that my students see the whole picture not the elements. In other words, as a whole, I've got seen aim to reach, you have to do all these things, I will use these criteria to assess your knowledge, what we have, and what is usually outwardly stated, for example you are going to take what, for example if they are going to take mid-term exam, the date is specific, the content is specific, and what I am going to focus or what they should know, what I am looking for, they should have, otherwise they will never be confident in what they are doing, or if it is a project, for example when we first speak about a project, we speak about the aim, format, content, and everything we are looking for, and I tell them about the benchmark and what I am looking for in this project.
>
> Regarding the feedback, unfortunately, many students do not come for the feedback, why? Because they take 3 courses, maybe some of them take two courses or four courses, they are very busy and many of them just thinking about to pass the course and to finish with these things because the time is very pressing, and what they are interested in, most of them is grade that they get, if they are unhappy with their grade, they usually come and ask why they have got it. In other words, they ask why question, they are not very much interested in why they got this grade, they are interested in whether there is any way to improve their grade or not, so that's why speak about construction feedback is impossible".

4.3.3 Category 3: Collaboration with Peers

All the ELT MA candidates' instructors focused on the importance of collaboration with peers on the promotion of MA graduate candidates' self-regulatory skills as exemplified in the quotes below:

4.3.3.1 Instructor 1

Collaboration is encouraged through:

- Joint presentations
- Joint preparation of discussion agenda
- Monitoring of final round-table discussion.

INS 1: “I strongly encourage their contribution to class discussion, some examples for peer collaboration are joint presentations, or joint preparation of discussion agendas and monitoring of final round-table discussions.

4.3.3.2 Instructor 2

- There is a resistance for collaboration with peers due to cultural reasons
- They are more likely to compete rather than to cooperate
- They are more likely to copy each other in topic choice …
- Instructors spends effort to create means for collaborations.

INS 2: “ We have students from many different cultures, some of the students are really willing to collaborate with each other and considering some cultures, they holding themselves and they don’t want to collaborate, they feel like if they do, the other students are going to learn from them and this is a kind of interesting to see, but after a while explaining cooperative nature of talk, explaining the importance cooperating and collaborating together, and you as a teacher when help that, you may see that they start to cooperate with peers not compete, because some cultural they come here and they just start to compete with each other and when they see someone like you do something with one and they want to do the same, when I say this an interesting topic, all others try to start to do the same thing or couple of them insist to do the same, you go back and try to work with them and go back and see this is cultural, I don’t know but it’s teacher job to show that this is cooperation and not competition. Some people maybe not at graduate level but at high school level, promoting competition and believe that it works for them but me I do not like it. Cooperation not competition is what I am dealing with it every day.

4.3.3.3 Instructor 3

Instructor encourages collaboration through:

- Group presentations
- Group assignments
- Time to time contributes to group presentations and group assignments may not be sufficient
- Students complains about each other …
- Through a closed group on Facebook, they share interesting references

- She mostly achieves collaboration through presentations because the presenter is more likely the organizer/conductor of the discussion --- The presenter is in the role of a teacher
- S/he involves everyone into the discussion rather than presenting the knowledge, so it enables GS to collaborate.

> **INS 3**: "we have group presentations and group assignments to encourage the students to collaborate with each other. I used to give them group assignments but time to time we may have some problems, some people in the group may not contribute enough so they come and complain about each other, so if it is an assignment, I prefer to ask them to do individually but for presentation, we have group presentation. Also we have a closed group on Facebook, so they share material with each other, and if they find something interesting, they can also bring it to class, another thing is presentation but the format of presentations is not the one we are used to, the presenter rather than presenting the information, is more like conductor and organizer of the discussion, so present something but he/she try to involve everyone in the classroom with some questions, so there is someone presenting there but we all have to participate in the discussion, and I think I have achieved this, so I am happy with this.

4.3.3.4 Instructor 4

Instructor achieves collaboration through:

- Group work projects
    - During these group work projects, they are expected to question each other, to ask why questions, so they have an opportunity to raise different voices and ideas and reach to better conclusions.
- Presentations
    - During the presentations, they asses each other based on the given benchmarks such as aim (teaching, methodologies, validity, and reliability)
    - After presentations, they share their criticism and evaluation based on the benchmark and ask for more explanations for parts which are not clear

- Both the listeners and presenter are in the role of a teacher (Assessing, evaluation, involving and asking for explanation
- They contribute to each other's knowledge and understanding (through collaboration during presentations).

> **INS 4:** "Most of the projects are group work in my group, because I believe that if someone questions me, I can be better, if someone ask me why I can be better. In other words, so that's why when students create something, there must be different voices, only in these voices, one can see the reality first. On the second, collaboration is very important in my seminar classes, because each students presents the field that he or she is interested in, in that one, we are always open to criticism, for example. So, before we start doing that, I give them the most important benchmark that we have to do, in other words, when you present a topic, first of all you have to present in a way that I could understand what your aim is. In other words, aim must be very very clear… I want to reach this … and other people ask question about that, if they find that, for example the aim is not clearly stated, they openly say that, I do not understand what is thriving out … can we reformulate, we starting with the aim and then speak about the techniques for example, the methodologies, and they openly say why they do want to use this methodology, about the validity and reliability of the result for example participants. They contribute with their knowledge and with all these things. That is important thing that we want to reach, because when you learn read a chapter, you will forget it but when you see it, it is cooperation, and you won't forget it".

The findings of the study revealed that the ELT MA instructors had provided opportunities for MA candidates through goal setting and planning, monitoring, coaching, feedback, and collaboration with peers to develop their SRL skills and that there was a constructive interaction between ELT MA candidates' SRD and their instructors via the courses of their graduate studies. The results of the previous studies showed that planning, monitoring, coaching, feedback, and collaboration positively impact on students' SRL development and autonomy.

4.4 Research Question 4

How blockchain-based LMS with adaptive SRL intervention system can develop ELT MA students' self-regulation learning in online higher education?

4.4.1 Proposed Framework of Blockchain-based Adaptive SRL Intervention in Metacognitive Learning Management System

The following section explain the design and implementation of blockchain-based learning management system with SRL adaptive intervention in ELT online higher education:

To identify essential applications of blockchain-based LMS in ELT online higher education that would meet the educational needs for SRL development, this study conducted a requirement analysis of ELT MA students' SRL development over the course of their graduate studies. Requirement analysis is used in software engineering to determine the needs or conditions required for a new or modified product or project, taking into consideration the conflicting concerns of users and stakeholders, the process of gathering data, analyzing, and documenting requirements concerning system development, validating and management requirement, functional requirements, performance specifications, design specifications, and so on (Cheng et al., 2018). In light of a literature review, by identifying and analyzing the ELT MA students' SRL development over the courses of their graduate studies, learning process issues, and ELT MA instructors' idea, this study developed a benchmark data that would enable blockchain-based LMS framework design to provide adaptive SRL interventions and also will predict and overcome specific barriers in ELT online learning process. Therefore, the results of the first part of the study used as a benchmark data that plays an essential role in development of the blockchain-based LMS with SRL adaptive intervention in ELT online higher education. For online

higher education providers, benchmark data is important for stakeholder consultation, smart learning management system design, prototype testing, analyzing system operations, improving efficiency, and distributing public funding that suits their needs (Williamson, 2018; Pang et al., 2014; Spivey et al., 2021).

As shown in Figure 4.1, the framework constitutes four main entities including students, teachers, courses, and accreditors. Each of the entities is embedded with a node of the Blockchain Network (BCN). BCN is the core component of this framework that contains smart contracts for reading and writing the data of the ledgers, consensus protocol for data validation, and cryptography tools for data security. The entities of the framework are constructed according to the CoI framework and designed to use SRL for improving the quality of the online higher education.

Each of the entities represents a group of members with the same roles and responsibilities. For instance, the teacher denotes all the individuals with different expertise who presents the course syllabus, delivers instruction through the internet, and provides support, guidance, feedback to the students throughout the course. Accreditors are in charge of evaluating SRL pre and post-tests questionnaire, in-progress SRL evaluation, final assessment, and keep all ELT MA student records, certificates, and credentials securely and verifiably. The course entity performs its role using five modules and as like the others is embedded with a peer of BCN that holds ledgers for reading/writing the SRL scores. Each of the modules has some units for completion of their role. The modules of the course entity are named as application, preparation, action, reflection, and course completion. This entity has an internet connection with potential applicants. Through this link, the courses and entire system can recruit new students to the system.

The accreditor entity holds pre-SRL evaluation, in- progress SRL evaluation, post-SRL evaluation, final assessment, certificate, and students' records units for testing, validating, and accreditation activities of the students and course providers. The teacher entity holds support, and peer feedback units, and the student's entities holds group working, knowledge building, and assignment units. Two private ledgers are considered in the system and the entities have access to these ledgers using two channels. While all the entities have connected to the ledger1 through the channel1, only course provider and accreditor entities have access to the information of the ledger2 through the channel2 in the BCN. The ledger1 is designed to store all the SRL scores of the students of a particular course that will be used by the applicants and enrolled students for course selection, receiving appropriate SRL intervention, and improving the collaboration level. The ledger2 is for storing the SRL correlation scores data of the previous students for all the provided courses. The ledger2 information can be used by course providers for improving the quality of their services.

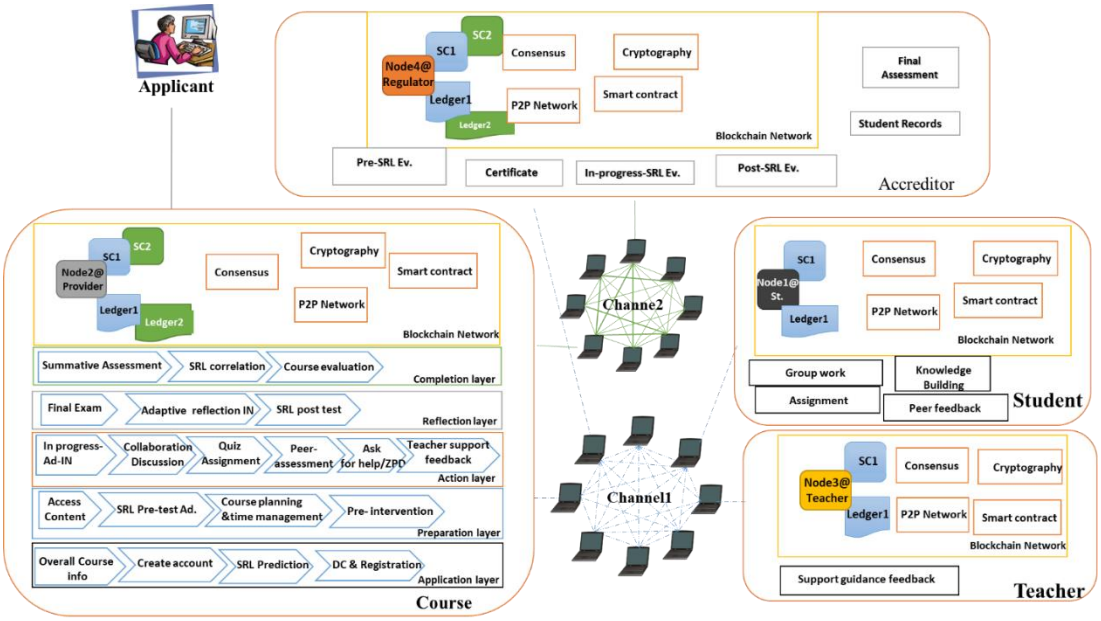

Figure 4.1: The proposed metacognitive learning management system enabled by blockchain technology

4.4.2 Course Entity

4.4.2.1 SRL Prediction and Digital Certificate Issue for Applicants

Figure 4.2 represents a sequence diagram for applicants' interactions with Blockchain-based SRL adaptive LMS. As shown in the figure, application layer provides overall course information and the applicant may demand two types of services from the LMS including SRL prediction, and Digital certificate and registration. Indeed, before course enrolment, an applicant wants to make sure about the SRL appropriateness. Since in the BCN ledger2 SRL scores of students with different demographic backgrounds are available for a particular course, the LMS can provide predicted SRL scores for an applicant based on the correlation scores data. As shown in the figure, an applicant as an actor selects a course from the course actor by logging in to the system. The applicant should provide demographic information to the system. As soon as the request is received the course provider actor invokes smart contract (i.e., chaincode) in channel 2 and reads related SRL correlation scores form ledger2. This information will be forwarded to the course provider where the actor provides a predicted SRL score to the applicant. The precision of the predicted SRL score is directly related to the knowledge available in the ledger2, and in case the ledger hosts more scores data, it can come up with well results. The predicted SRL score can be considered by the applicant to take or discard a course.

If an applicant decides to select a course from the course unit, he/she should first join to the BCN and have access to the ledger1 information by receiving a Digital Certificate (DC). The DC of a course is different from the others since the enrolled student can use DC to read the information available on the course ledger. For holding a DC, the applicant should provide demographic information to the DC actor in the

course provider. This unit will invoke the chaincode to write a transaction that contains the applicant's information. As soon as the transaction is written in the ledger, the DC unit will issue a certificate to the applicant. By using this DC, the applicant can enroll in the course and will be a registered student. The prediction and DC issue services can be iterated by the system for many applicants.

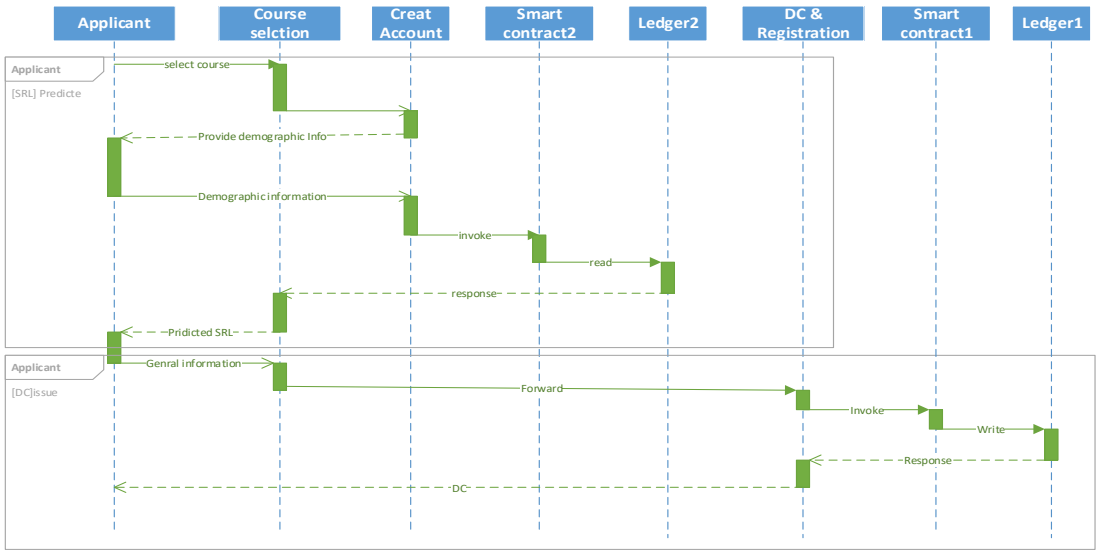

Figure 4.2: Application layer: SRL prediction and digital certificate issue diagram

4.4.2.2 Three Phases of SRL Adaptive Intervention

SRL is a cyclical process, wherein the students set goals and planning/time management for a task, monitor, and control their performance, and reflects on their outcome and strategy regulation as the student prepare what to do for the next tasks. Blockchain-based SRL adaptive LMS attempts to improve SRL competency on preparation, action, and reflection phases by creating SRL adaptive interventions in three interrelated phases and providing opportunities for communication, collaboration, ZPD and scaffolding among students and teachers.

Figure 4.3 represent the sequence diagram of the preparation layer, as shown below, the student should provide DC to the DC login actor in course provider. This unit forwards the course student to the selected course. Before any action, the initial SRL score of the student should be recorded. This information will be used by the LMS to provide individualized adaptive intervention to the student. The evaluation unit provides SRL pre-test to the student. As soon as the pre-test is answered by the student, the evaluation process will commence in the evaluation unit, and the results will be written in the course ledger by invoking the chain code. Thereafter, the score is also announced to the student. When the results are written in the course ledger, the course provider prepares an overview of course planning and time-management and personalized adaptive preparation intervention for the student.

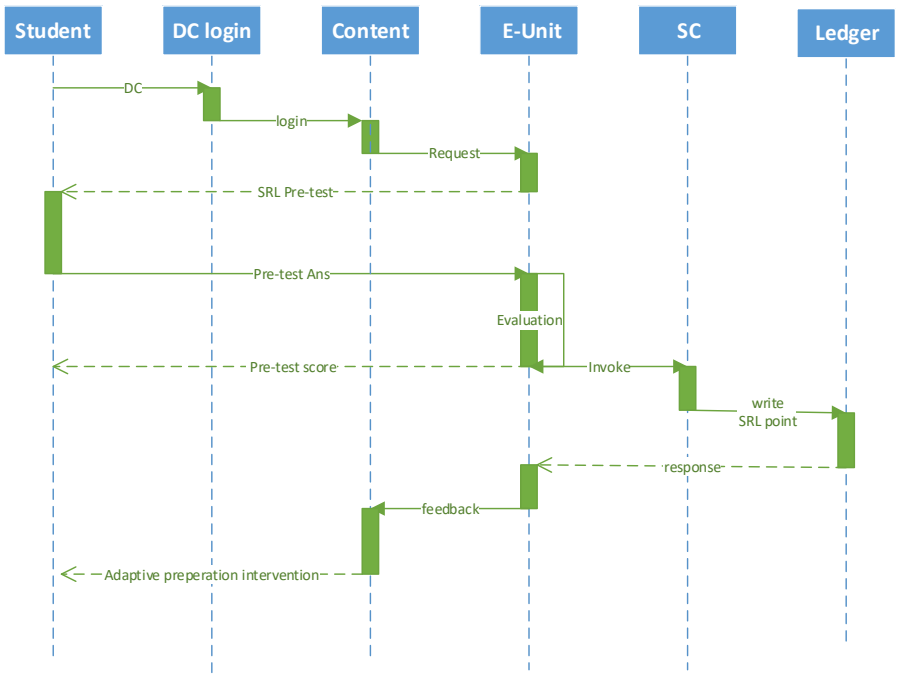

Figure 4.3: Preparation phase of SRL adaptive intervention

Figure 4.4 represents the action phase of the SRL improvement by blockchain-based SRL adaptive LMS. As shown in the figure many actors including student, and teacher

play role in this phase. In action phase, students have access to all the course content and materials. As a fact, the content of the course is fixed and not changing from one student to the other. However, the applied interventions are adaptive and may change from one student to the other based on the initial SRL score of the student. During the course study, the student's trace data activity for monitoring, control, ZPD and scaffolding (ask for help), and persistence will be recorded on the system and periodically these data are forwarded to the SRL evaluation unit for in-progress SRL evaluation. The in-progress SRL scores will be forwarded to the course ledger for the writing process by invoking the ledger chain code. The SRL evaluation unit also forward the scores to the content actor, and this actor based on students' trace data activity decide to provide adaptive intervention to the student. If they fail to comply intervention, the system asks the teacher to give feedback and support the student. After ending the videos in each module, the content encourages all of students to be involved for collaboration and group discussion. The content will have the moderator role in the discussion and will provide different topics and questions for group discussion. The scores of the collaboration activity will be forwarded to the SRL evaluation unit for scoring and the extracted scores will be written to the course ledger by invoking the chain code. The SRL adaptive intervention in the action phase repeat several times and it is the responsibility of the course provider to decide the iteration numbers and start points. As soon as the collaboration cycle is completed, the content will provide practice quizzes and assignments to the students and information about the time to be completed. It is peer's responsibility to evaluate the student practice quizzes and assignments and give them feedback and they have to manage their time to be on time, after that the results will be recorded in the ledger through the course content. At the end, the content will provide graded quiz to the student and the teacher

evaluates the student performance and forwards the marks to the content for a further record on the course ledger and results will be announced to the students. Then students can monitor their performance and if they have problem in understanding the material and quiz answers, they can ask for help from peers/teachers.

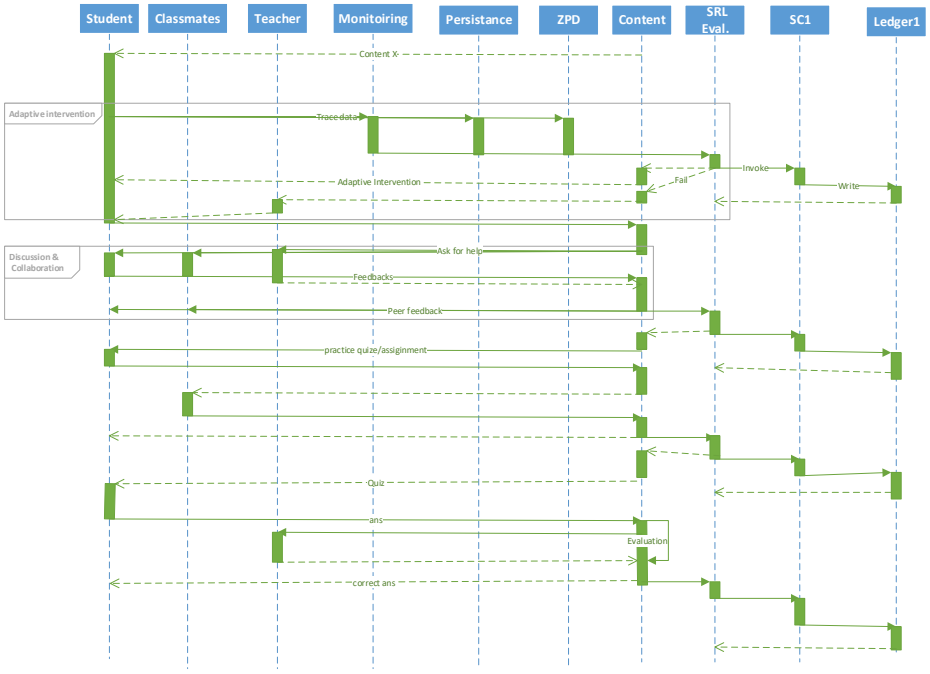

Figure 4.4: Action phase of the SRL adaptive intervention

In reflection layer, as shown in figure 4.5, after final exam is completed, an adaptive reflection intervention is provided to the students. In reflection intervention, student will be asked to think about what they have done so far and in strategy regulation intervention students think about what to do in next time learning tasks, and at the end SRL post-test is provided to the students. The obtained score should be recorded on the course ledger by invoking the chaincode. In case the score of the final SRL test is announced to the content, the actor will read all the student related SRL scores from the course ledger and propose to write an SRL correlation score transaction to the provider ledger by invoking the chain code of the ledger.

In the completion layer, as shown in figure 4.5 summative assessment provided to the students, and after that SRL correlation run for the student who completed all the steps of the course to find if there is any significant difference in students' SRL score before and after taking course. The SRL correlation is used by the LMS to provide adaptive interventions that will be constructive for further related course to the students. The SRL correlation scores can be used by the course providers for further content improvement and to find optimal adaptive interventions and collaborations, ZPD, and reflection approaches. The scores are also being used for predicting the SRL of the applicants to select the course.

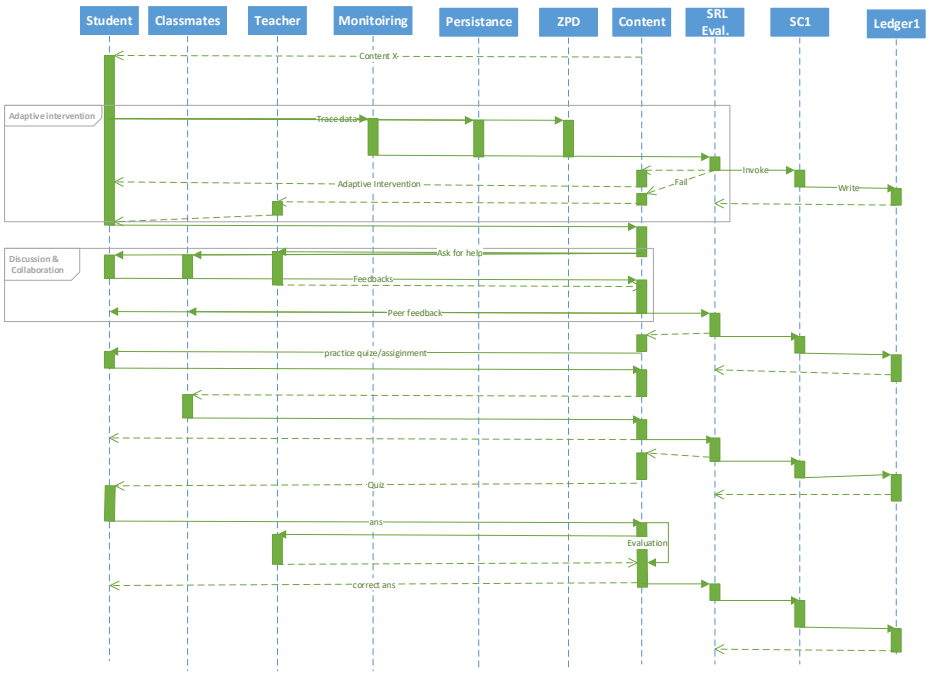

Figure 4.5: Reflection phase of SRL adaptive intervention and completion layer

4.4.3 Interrelation of the Units with BCN

Figure 4.6 represents the general schema of the interrelation among the units of the entities with BCN. As shown below, the units are represented by green and blue colors and interrelationship among the units is demonstrated by arcs. The green units are

used to perform a role in each entity of the LMS (i.e., LMS unit). For instance, the SRL prediction unit is a unit on course provider entities at the application module. The blue units are the units that are available in BCN peers of the entities and doing the same liability in distributed BCN. The start and endpoints are represented with circles and some decision points are symbolized with diamond.

To complete a task some of the units need SRL related information from a ledger. Likewise, some units in the framework may generate SRL related information that should be stored in the ledger. In the figure, these units have a connection with BCN that are represented with blue hatched arcs. For reading action the unit has an input for the request and output as the response (represented as A, and B arcs). For the writing action, the requester unit should first propose a transaction, collects the endorsed transaction, sends the endorsed responses, and received the completion message (represented as 1,2,3,4 arcs). In the framework “SRL prediction”, “SRL correlation” units demand read and “DC issue”, “pre-SRL evaluation”, “In progress, SRL Evaluation”, “In progress, adaptive Intervention”, “Post-SRL evaluation”, and “SRL correlation” units are writing action requesters.

Since, reading and writing actions should be realized in the BCN, the reading and writing actions are represented in the figure distinctly. Three units are considered for reading information from a ledger and six are considered for the writing process. For reading an SRL related information from a ledger, an inquiry request (i.e., A-read) should be provided by an LMS related unit. This inquiry will invoke a chaincode of a ledger, as soon as the reading action is completed, a response (i.e., B-response) is forwarded to the requester unit. Six units are contributed for the writing process after a write transaction proposal (i.e. 1write) is provided by an LMS related unit to the

BCN through a channel, the proposal will be forwarded to the endorsers, the endorsed proposal responses (i.e. 2Endorsed Tr) will be returned to the requester unit and this unit will prepare an endorsed transaction response (i.e. 3 Endorsed Re) to the orderer, the orderer will mine the transaction by finding a suitable hash value to the transaction and forward the mined transaction to the committer for the writing process. The committer will invoke the chain code and will write the transaction to the ledger as soon as the writing process is completed, a completion message (4write completed) will be forwarded to the requester unit.

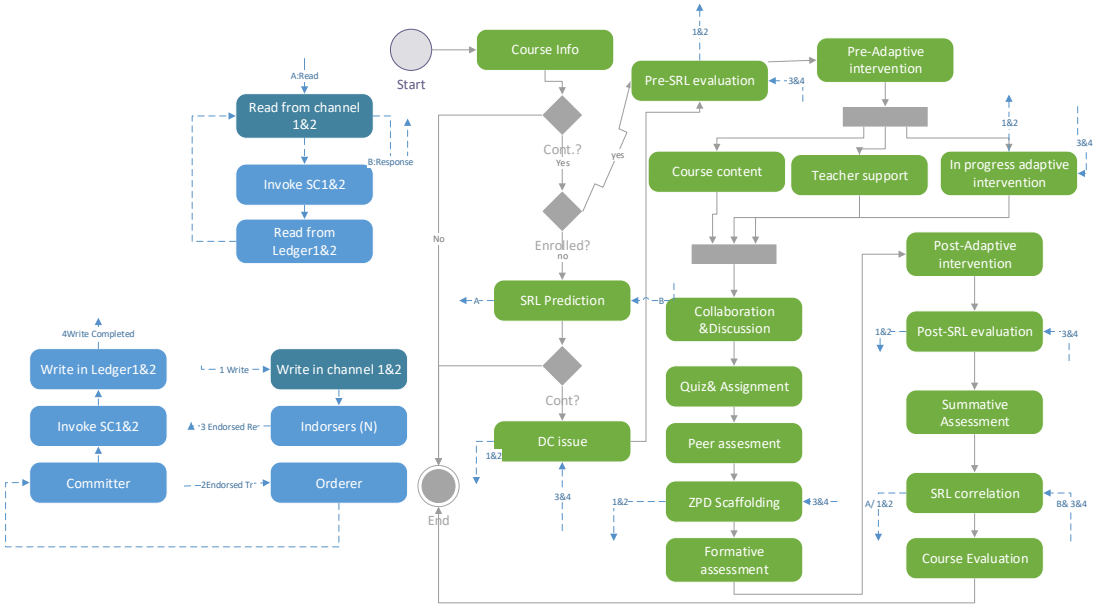

Figure 4. 6: Interactions among the units and BCN

4.4.4 Prototyping and Testing

BCN is built on the Hyperledger Fabric open BCT platform. Hyperledger Fabric is an open source, private blockchain framework, by The Linux Foundation. This modular, general-purpose framework offers unique identity management and access control features that are demanded in variety of track-and-trace applications (https://aws.amazon.com/blockchain/what-is-hyperledger-fabric/). An example of

Hyperledger Fabric application in education can be find in (Kosmarski, 2020).

The detailed fundamental implementation of BCT on a Hyperledger Fabric has been illustrated in (https://github.com/IBM/build-blockchain-insurance-app). To justify the applicability of the proposed blockchain-based SRL adaptive LMS, BCN is integrated with the department's module and course enrolment keys are used as DC for joining the network. To highlight the effect of using BCN- enabled module on SRL capability, a benchmark data studied is used. The benchmark data is generated based on approaches introduced by (Yang et al., 2021) using the 33 ELT MA participants both male and female, aged 23-28 in different semesters of their graduate studies.

Table 4.4: The benchmark data of the ELT MA participants

Student number	Pre-test	Post-Test	Course experience	SRL Correlation
1	3.9	6.2	8.3	6.1
2	9.6	9.8	9.7	9.7
3	4.0	8.2	7.6	6.6
4	1.5	7.4	6.9	5.3
5	9.9	10.0	10.0	9.9
6	1.0	7.9	6.1	5.0
7	3.5	5.4	5.3	4.7
8	7.3	9.2	8.4	8.3
9	7.3	9.0	9.4	8.6
10	0.5	8.4	0.5	3.1
11	7.6	9.1	8.3	8.3
12	3.6	8.3	9.3	7.1
13	8.5	9.3	9.6	9.1
14	2.0	8.9	2.6	4.5
15	9.7	9.9	9.8	9.8
16	8.2	9.2	9.0	8.8
17	7.6	8.3	8.5	8.1
18	8.4	9.3	9.9	9.2
19	9.3	9.7	9.6	9.5
20	3.7	9.3	6.5	6.5
21	0.5	7.1	8.5	5.4
22	5.7	7.9	9.6	7.7
23	2.9	5.9	6.0	5.0
24	6.6	9.9	8.8	8.4

25	9.5	9.8	9.9	9.8
26	5.3	8.2	6.7	6.7
27	3.3	7.1	8.2	6.2
28	3.5	7.0	6.1	5.5
29	6.5	7.5	7.9	7.3
30	5.2	7.6	8.5	7.1
31	6.8	8.5	9.0	8.1
32	2.2	9.0	7.2	6.1
33	8.7	9.0	9.1	8.9

The SRL adaptive interventions and collaboration procedures are developed according to the experience course teachers. 10 types of interventions and ten types of collaborations are designed to the students with different level of SRL capabilities during the online education by the system. For the students with the highest level of the SRL capability, highest grade of intervention and collaboration are considered (e.g., I10 and C10) and vice versa. Since the demographic information of the enrolled students in this example is similar to the benchmarked data, the SRL correlation average score is used to select the preparation intervention type for the next group of students. According to table 1, the average correlation score of the students is 7.28, so the preparation intervention of the next group of students is considered as I8. As a fact the SRL correlation scores are recorded on the ledger 2 and the collective knowledge might be used to improve the quality of the contents and it is used to select the most appropriate form of preparation interventions.

Table 4.5 delivers the SRL scores, three phases of SRL adaptive intervention and collaboration forms of the next group of the students. According to the pre-test results adaptive preparation, action, and reflection interventions were applied to each of the participants. Just as an example, for the student No.10 intervention I10 is applied since he/she holds a 9.4 score in the pre-test, and for the student No.28 since the pre-tests

core is 3.9 the intervention I4 is applied. The same approach is used for action intervention. Based on the pre-test and intermediate SRL score of a learner, the adaptive collaboration intervention is provided. After course completion, the SRL post-test is conducted, and the correlation between the pre and post-tests recorded as a transaction on the provider ledger. The SRL correlations knowledge will be used as an index for the next applicant choosing this course.

Table 4.5: The SRL scores, adaptive intervention, and collaboration types of the first group of the students

Student	Pre-test	Preparation intervention	Action intervention	Trace data	Collaboration	Reflection intervention	Post- Test	SRL correlation
1	9.3	**I8**	I10	9.3	C10	I10	10.0	9.5
2	2.3	**I8**	I3	8.6	C6	I7	7.7	6.2
3	2.5	**I8**	I3	6.6	C5	I6	6.9	5.3
4	9.5	**I8**	I10	9.9	C10	I10	9.7	9.7
5	9.6	**I8**	I10	9.9	C10	I10	9.9	9.8
6	3.7	**I8**	I4	8.7	C7	I8	9.6	7.3
7	4.2	**I8**	I5	6.4	C6	I7	7.5	6.0
8	6.8	**I8**	I7	7.3	C8	I8	9.7	7.9
9	7.4	**I8**	I8	9.0	C9	I9	8.8	8.4
10	9.4	**I8**	I10	9.8	C10	I10	9.7	9.6
11	8.9	**I8**	I9	9.9	C10	I10	9.9	9.6
12	5.3	**I8**	I6	8.6	C7	I8	9.5	7.8
13	3.4	**I8**	I4	9.5	C7	I8	9.9	7.6
14	7.9	**I8**	I8	8.1	C8	I9	9.3	8.4
15	0.5	**I8**	I1	1.5	C1	I3	6.2	2.7
16	7.2	**I8**	I8	8.8	C9	I9	10.0	8.7
17	8.8	**I8**	I9	9.0	C9	I10	9.8	9.2
18	3.1	**I8**	I4	7.4	C6	I5	4.1	4.9
19	3.2	**I8**	I4	4.8	C4	I6	9.5	5.8
20	10.0	**I8**	I10	10.0	C10	I10	10.0	10.0
21	5.8	**I8**	I6	6.0	C6	I8	9.4	7.1
22	0.4	**I8**	I1	7.6	C4	I4	1.8	3.2
23	7.0	**I8**	I7	7.5	C8	I9	10.0	8.2
24	6.6	**I8**	I7	9.5	C9	I9	8.2	8.1
25	8.1	**I8**	I9	9.1	C9	I9	9.5	8.9
26	1.6	**I8**	I2	7.6	C5	I6	7.9	5.7
27	2.7	**I8**	I3	6.8	C5	I6	7.5	5.7
28	3.9	**I8**	I4	7.1	C6	I7	8.1	6.4
29	8.1	**I8**	I9	8.7	C9	I9	9.7	8.8

30	2.8	**I8**	I3	6.4	C5	I7	9.1	6.1
31	2.5	**I8**	I3	9.4	C6	I8	9.7	7.2
32	5.6	**I8**	I6	6.9	C7	I8	9.6	7.4
33	1.9	**I8**	I2	9.4	C6	I6	5.7	5.7
34	3.5	**I8**	I4	6.7	C6	I7	7.8	6.0
35	6.7	**I8**	I7	8.7	C8	I9	9.3	8.2
36	5.9	**I8**	I6	6.7	C7	I8	10.0	7.5
37	10.0	**I8**	I10	10.0	C10	I10	10.0	10.0
38	9.4	**I8**	I10	9.5	C10	I10	10.0	9.6

Table 4.6 represents the SRL scores, personal intervention, and collaboration types of the next groups of the students. Like the previous group of students' preparation intervention is selected according to the average SRL correlation scores of all the course graduates (76 graduates). While the average SRL correlation score of the first group of graduates was 7.3 and the next group was 7.5, the 7.4 is used to select the preparation intervention which was I8. Like the previous attempts the action, reflection, and collaboration adaptive intervention are considered. In fact, to test the applicability of the proposed approach, the content of the course is not changed during conduction, however all the generated and recorded knowledge can be used by the provider to improve the content of the course.

Table 4.6: The SRL scores, adaptive intervention, and collaboration types of the second groups of the students

Student	Pre-test	Preparation intervention	Action intervention	Reflection intervention	Trace data	Collaboration	Pos-Test	SRL correlation
1	7.3	**I8**	I8	I9	7.3	C8	9.5	8.0
2	5.5	**I8**	I6	I8	8.7	C8	9.6	8.0
3	3.9	**I8**	I4	I7	9.5	C7	7.4	6.9
4	6.7	**I8**	I7	I9	9.7	C9	9.0	8.5
5	2.5	**I8**	I3	I7	6.8	C5	9.5	6.3
6	10.0	**I8**	I10	I10	10.0	C10	8.6	9.5
7	9.1	**I8**	I10	I10	9.6	C10	9.3	9.3
8	7.9	**I8**	I8	I10	9.6	C9	9.9	9.1
9	5.4	**I8**	I6	I7	7.7	C7	6.2	6.5
10	7.4	**I8**	I8	I9	7.8	C8	9.8	8.3
11	9.7	**I8**	I10	I10	10.0	C10	9.1	9.6

12	6.8	**I8**	I7	I9	9.4	C9	9.5	8.5
13	5.3	**I8**	I6	I9	9.6	C8	9.7	8.2
14	6.2	**I8**	I7	I8	10.0	C9	7.5	7.9
15	1.7	**I8**	I2	I6	7.4	C5	8.2	5.8
16	6.7	**I8**	I7	I8	8.5	C8	7.2	7.5
17	2.3	**I8**	I3	I5	3.5	C3	7.1	4.3
18	3.7	**I8**	I4	I6	7.8	C6	3.5	5.0
19	9.9	**I8**	I10	I9	9.9	C10	6.4	8.7
20	9.9	**I8**	I10	I10	10.0	C10	7.9	9.3
21	0.5	**I8**	I1	I7	8.6	C5	10.0	6.4
22	9.5	**I8**	I10	I10	9.9	C10	8.7	9.3
23	8.4	**I8**	I9	I9	8.8	C9	6.8	8.0
24	1.1	**I8**	I2	I7	9.9	C6	9.1	6.7
25	0.6	**I8**	I1	I7	9.8	C6	9.9	6.8
26	6.6	**I8**	I7	I8	6.8	C7	8.8	7.4
27	9.0	**I8**	I9	I8	9.0	C9	3.5	7.2
28	6.4	**I8**	I7	I8	6.5	C7	8.1	7.0
29	7.7	**I8**	I8	I8	9.1	C9	5.6	7.5
30	8.7	**I8**	I9	I9	9.3	C9	8.9	9.0
31	5.7	**I8**	I6	I9	9.1	C8	9.3	8.0
32	2.6	**I8**	I3	I7	9.5	C7	8.5	6.9
33	1.5	**I8**	I2	I4	4.4	C3	6.0	4.0
34	3.5	**I8**	I4	I6	4.7	C5	8.2	5.5
35	9.0	**I8**	I9	I10	9.5	C10	9.2	9.2
36	4.1	**I8**	I5	I7	6.2	C6	9.3	6.5
37	5.8	**I8**	I6	I7	6.4	C7	8.7	7.0
38	3.9	**I8**	I4	I6	4.5	C5	7.9	5.4

4.5 Summary

The study examined how self-regulation develops within graduate students using both qualitative and quantitative methods through pre- and post-SRL questionnaire, reflective essay, and semi-structured interview. Based on the study results, students' SRL skills had significantly improved in terms of monitoring, coaching, collaboration, and ZPD after attending the MA program. ELT MA students have reported through their reflective essays that they were provided opportunities to develop their SRL skills through realistic goal setting, subject matter proficiency, self-awareness, metacognitive strategies development, group presentations, group discussion,

collaboration with peers, ZPD and scaffolding, course evaluation, course outline, course requirements, and teachers' feedback. Furthermore, ELT instructors' interviews revealed that they helped MA candidates develop their SRL skills by offering opportunities for goal setting and planning, evaluation, coaching, and feedback through the course discussion agenda, the portfolio, and conducting research, and collaboration with peers through Joint presentations, Joint preparation of discussion agenda, monitoring of final round-table discussion. These opportunities resulted in constructive interactions between ELT MA candidates' SRD and their instructors. In the second parts of the study, regarding to requirement analysis benchmark data, a blockchain-based learning management system with SRL adaptive interventions in three phases of SRL planning, action, and reflection was developed and implemented for 76 ELT MA students enrolled in ELT online higher education. This framework consisted of four main entities: students, teachers, courses, and accreditation. Each entity is embedded with a Blockchain Network (BCN). BCN is the core component of the framework, which contains smart contracts for reading and writing data, a consensus protocol for data validation, and cryptography tools for securing data. A system is considered to have two private ledgers which can be accessed by entities via two channels. The modules of the course entity are named as application, planning, action, reflection, and completion layers. BCN is built on the Hyperledger Fabric open BCT platform. A blockchain-based LMS based on the SRL has been developed, which integrates BCN with the department's module, using the course-enrollment keys as the control component for joining the network. A benchmark study of 33 ELT students was used to illustrate the effect of using BCN-enabled modules on SRL capability. According to the pre-test results adaptive preparation, action, collaboration, and reflection interventions were applied to each of the participants throughout the

course. After course completion, the SRL post-test is conducted, and the t-test run to consider the pre and post-tests SRL recorded as a transaction on the provider ledger. The results of the study indicated there was a significant difference in SRL development before and after attending ELT online education program in terms of realistic goal setting, self-monitoring, self-reflection, self-awareness through coaching/judging, ZPD, and collaboration.

Chapter 5

CONCLUSIONS

This chapter presents an overall summary of the study followed by discussion, major findings, subsequent to this are some of the limitations of the study and the implications for further research and conclusion.

5.1 Presentation

Over the past few years, student-centered learning has gained popularity by shifting the focus away from the teacher to the student. ELT online learners typically have more autonomy and freedom when it comes to choosing the pace, place, and time of their learning process. As part of the autonomy offered by online education, learners must engage in self-regulated learning, however many students have difficulty managing their learning processes; therefore, it is crucial to support students' SRL in online education.

Self-regulation is considered essential to improve lifelong learning skills for ELT students, learning motivation, and reflection practices. The main purpose of the study was to investigate ELT MA students' self-regulation development over the courses of their graduate studies and based on that design blockchain-based LMS with adaptive SRL intervention, teachers' support and feedback in ELT online higher education and ways in which they can develop more self-regulatory skills and strategies for their own use and to implement in future classroom. Few studies have examined the use of blockchain-based learning management systems (LMS) and adaptive SRL

interventions in online higher education. To promote meaningful engagement and successful learning for ELT MA students in ELT online higher education, this study designed a smart learning management system by using blockchain technology engaged in SRL adaptive intervention to improve planning, monitoring, collaboration, ZPD, scaffolding, and reflection. It was beneficial for ELT MA students to learn SRL strategies as self-regulated lifelong learners in the context of online higher education where SRL skills support autonomy, self-control, and self-reflection development.

The study aimed to address the following research questions listed below:

1. How do ELT MA graduate candidates perceive their self-regulatory learning strategies at the start and towards the completion of their graduate studies?
2. To what extent do ELT MA graduate candidates believe the course they are enrolled provide opportunities for self-regulated learning?
3. How do ELT graduate instructors believe/perceive of the effect of their courses on the development of MA graduate candidates' self-regulatory skills?
4. How blockchain-based LMS with adaptive SRL intervention system can develop ELT MA students' self-regulation learning in online higher education?

To this end, as shown in figure 5.1, this study conducted a mixed method using qualitative and quantitative methods with 33 ELT MA students at Eastern Mediterranean University to examine students' self-regulation development through their graduate studies, and to explore instructors' perceptions of how their courses affect students' self-regulation development. Data were collected quantitatively by utilizing SRL pre- and post-test questionnaire which were analyzed along the t-test and qualitatively by adopting reflective essays and semi-structured interview which were analyzed through the content analysis method.

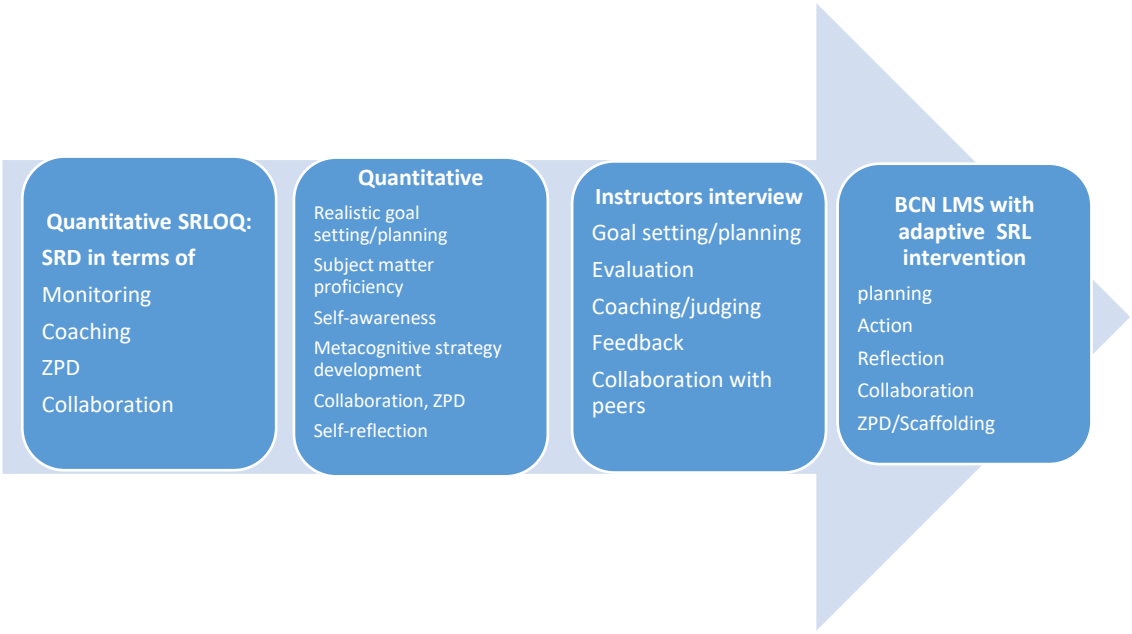

Figure 5. 1 Overall results of the study

The study results indicated that Students' SRL skills had improved significantly in terms of planning, monitoring, coaching, collaboration, and ZPD after attending the ELT MA program. Through reflective essays, ELT MA students reported that they had been given the opportunity to develop their SRL skills through realistic goal setting, opportunity for subject matter, self-awareness, developing metacognitive strategies, presentations, discussion, collaboration with peers, course evaluation, course outline, course requirements, ZPD, and teaching feedback. In addition, the results of ELT MA instructors' interviews revealed, they provided opportunities for MA candidates to develop their SRL skills through goal setting and planning, evaluation, coaching, and feedback, and collaboration with peers. These opportunities led to constructive interactions between ELT MA candidates' SRD and their instructors. As a result of benchmark data, this study developed and implemented blockchain-based LMS with SRL adaptive interventions through three phases: planning, action, and reflection with 76 MA student in ELT online higher education and the result of the study showed that

there was a significant different in SRL development before and after attending ELT online education program in terms of realistic goal setting, and self-monitoring, self-reflection, self-awareness through coaching/judging, ZPD, and collaboration.

5.2 Discussion

This research identified several implications of improving learners' SRL development in online higher education based on the previous studies. First, research on SRL adaptive interventions in ELT online higher education was sparse, so more research was needed to determine how to improve SRL in ELT online learning environments. Second, compliance with the SRL intervention research studies was challenging in the heterogenous context with different students need, goals, and background knowledge. So, it was imperative to provide smart LMS with adaptive SRL intervention in ELT online higher education in a secure decentralized platform. Thus, considering the scope and depth of SRL research intervention and ELT online higher education, we believe it is worthwhile to combine these research strands. To this end, we proposed a study in which explore ELT MA students SRL development over the courses of their graduate studies and based on that this study designed blockchain-based LMS with adaptive SRL intervention in ELT online higher education program.

Blockchain-based SRL adaptive LMS keeps a massive students' SRL score data and their achievement securely without any third-party intervention of these sensitive personal data. This learning data management system build a smart platform that meets personalized learners' needs, goal, and pace through adaptive intervention and collaboration aiming to improve SRL skills. Although previous studies have shown that SRL intervention has positive effects on SRL development and learning

achievement, the results of those studies are not organized. In this study, the positive effect of the SRL intervention led to the conclusion that the implementation of SRL adaptive intervention in ELT online education was beneficial for learners. The SRL intervention improved students' course completion, and it also facilitated the students' SRL development during ELT online Education. Blockchain-based LMS with adaptive SRL intervention allowed ELT MA students to optimize SRL as well as acquire knowledge more efficiently. The system provided SRL adaptive intervention in three phases of preparation, action, and reflection for the ELT MA students to support SRL in the learning process toward achievement and goal attainment. Adaptive SRL helped ELT MA students to set goals, self-monitor their performance, self-assess their progress, self-reflect, and regulate learning on their own pace. In fact, if students are provided with a SRL adaptive learning environment, they will be more successful in learning and manage to take responsibility of their own learning towards achievement. Besides, teachers tracked students' activity during the course, and in case, they failed to comply the SRL adaptive intervention, teacher could support the student by providing guidance and feedback. As long as this is consistently practiced, ELT MA students would be able to develop their self-regulation and learner-autonomy and to manage their learning towards professional development.

All the ELT MA students' SRL scores were recorded to the ledgers through the smart contracts. The knowledge of the ledgers could be very helpful for the course developer to improve the course contents. It also will be a starting point to build smart online platforms that meet users' personalized needs and provide smart content that allows the ELT learners to customize their learning needs, goals, and pace. The data can also be used as an index for the applicants on course selection based on their information,

skills, goal, and interests. Later, by adding more data, the system provides better adaptive intervention and better- personalized content for the students.

The blockchain-based LMS applied for SRL adaptive collaboration to encouraged all of the ELT students to involve in the classroom and encourage the student to read, discuss information, and share their opinion from different perspectives, and to elaborate and refine their understanding to re- and co- construct knowledge or solve problems. From Socio-cognitive point of view, collaborative learning plays a prominent role in SRL for many reasons. It develops the contribution of all members to participate in collaborative work without being limited to time and place. It also brings social equity to the classroom and cuts across gender, economic, and ethnic differences. It provides opportunity for discussion and reflection in the classroom in which it enables the students to assess and reflect both themselves and peers to fosters self-regulation learning strategies.

A growing body research showed that ZPD and scaffolding is very practical in higher performance and SRL development. Blockchain-based SRL adaptive LMS provides opportunities for adaptive scaffolding and ZPD to support the students in the online learning process. Adaptive scaffolding intervention allowed the students to ask for help from peers and teachers, get feedback from their peers, reflection, peer-assessment, and discussion at the beginning and throughout the course. Overall, the system can be used for formative assessment in the learning process, adaptive intervention, and final achievement evaluation. Besides, it brings challenges for researchers, course developers, and educators to consider Blockchain-based SRL adaptive LMS in online higher education.

5.4 Limitations of the Study

This study, like the majority of studies, suffers from certain shortcoming; thus, the following limitations must be considered:

1. Learning is a non-linear process, in a cyclical model of self-regulation, all behavioral, cognitive, and social aspects of learners need to be assessed, on the one hand, extensive data were used to provide SRL adaptive interventions and on the other hand, benchmark data were restricted to 33 MA students.
2. Technologically, the interaction and integration among the entities of the proposed framework verified and evaluated considering a course provider and an accreditor. Furthermore, the accomplishment of the entire system was limited to only SRL knowledge of students. In the BCN, we only consider one orderer, committer and two endorses. However, the more orderer committer and two endorses might be exist in real-life ecosystems that affect the internal and external actions performances of the BCN, including throughput and latency.

5.5 Further Research

Further research can employ blockchain technology for teachers' evaluation and teachers' professional development. Applying blockchain and smart contract record all teachers' activity and performance. The smart contract will verify the consistency of the teaching design and practice, which is going to be an important instruction evaluation indicator. It is a very good reference for teachers who have done a good job. It serves as both an appreciation and encouragement for teachers' teaching skills.

This study applied BCN SRL adaptive intervention in LMS, further study can be performed to develop a smart platform that meets users' personalized needs and develop a smart content with adaptive SRL intervention which allows the learners to

customize their learning needs, goals, and pace and SRL development towards learning achievement in online higher education learning.

In addition, formative assessment is very challenging in education system because it is so difficult to tracking all the students' activities during learning process. In further studies, it is possible to apply blockchain LMS and smart contract to ease formative assessment by keep tracking students' activities details into the ledger, staying informed about their progress, predicting their failure/weakness and consider the effect SRL intervention on SRL development as well as their course completion and also to consider the differences in course completion are caused by which SRL indicator.

5.5 Conclusion

This study proposed a novel blockchain-based metacognitive LMS in ELT online higher education to support students' SRL. It showed the properties of blockchain technology built up trust, security, and transparency in online learning platform and had potential for incorporating adaptive SRL development in ELT online higher education. To conclude, the implemented blockchain-based LMS with adaptive SRL intervention has been successful in improving ELT MA students SRL activity. The system had three main visions including (a) blockchain-based SRL score prediction of the applicants to choose the most appropriate courses, (b) blockchain-based SRL adaptive intervention based on three phases of Zimmerman's model (2002) in planning, action, and reflection throughout the course, and (c) blockchain-based system to boost collaboration, ZPD and scaffolding among the students and teachers. The findings of the prototyping study revealed that online ELT MA candidates believed that they had been given the opportunity to develop their SRL through goal setting, planning, monitoring, persistence, self-reflection, self-awareness through

coaching/judging, collaboration, and ZPD. They also believed that they were given opportunities to develop metacognitive strategies, understand subject matter through group discussion and collaboration, and foster time management and resource utilization through course outlines and course assessment. Thus, the results provide evidence of the benefits of blockchain-based technology LMS implementing adaptive SRL support in ELT online higher education. There needs to be more research conducted into how different adaptive SRL interventions affect SRL development and how to best maximize compliance with such interventions. This study provided a valuable foundation for future research.

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APPENDICES

Appendix A: Permission Letter

May 20, 2014

Dear Assoc. Prof. Dr. Gülşen Musayeva Vefalı,
Chair of the Foreign Language Eucation Department

As part of my PhD thesis study titled "MA Candidates' Self-regulation Development Over the Courses of Their Graduate Studies", I need to carry out research at Eastern Mediterranean University, Faculty of Education *English Language Teaching Department*. More specifically, I would like to administer a questionnaire to the MA graduate students, conduct interviews both with MA graduate candidates and the instructors teaching these courses. MA graduate students will also be assigned to write reflective essays. I may also need to carry out some observations in the MA graduate classes. Therefore, I would kindly like to ask for permission to conduct my research in the ELT Department.

Thank you for your consideration.

Sincerely yours,

Zohreh Saadati
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Attachments:
A sample questionnaire
Self-regulated learning opportunities questionnaire (SRLOQ)

Appendix B: Consent Form

Dear Students,

I am a Ph.D. candidate, and I am currently doing my thesis on self-regulation. This questionnaire aims to examine self-regulation strategies which you use most in your courses over the course of your MA graduate studies. It is very important that you express your opinion sincerely. Your identity and individual responses will be kept confidential and will be used only for research purposes.

Thank you for your cooperation.

Zohreh Saadati
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Department of Foreign Language Education
Faculty of Education
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CONSENT FORM

I have read and understood the purpose of this study and how my responses will be used. Therefore, I agree to participate in this study.

Name - Surname: _____
Signature: _____
Date: _____

Appendix C: SRL Questionnaire

No.	Items	1	2	3	4	5
1	My instructor expects me to describe personal learning goals for his/her course.					
2	My instructor expects me to describe SMART (specific, measurable, acceptable, realistic and time processing) learning goals for his/her course.					
3	My instructor expects me to describe short-term learning goals to master my long-term personal learning goals for his/her course.					
4	My instructor expects me to describe how my personal learning goals and the learning goals of his/her course are harmonized.					
5	My instructor expects me to determine which learning activities I attend to master the learning goals for his/her					
6	My instructor expects me to describe how my learning activities contribute to mastering the learning goals for his/her course.					
7	My instructor expects me to describe SMART (specific, measurable, acceptable, realistic and time processing) learning activities for his/her course.					
8	The electronic learning environment/manual describes how this course can support me in my development towards professionalism.					
9	The electronic learning environment/manual describes the learning goals of his/her course.					
10	Students divide big assignments into smaller parts for his/her course.					
11	The electronic learning environment/manual describes how students can divide big assignments into smaller parts for his/her course.					
12	Students describe the value of their learning goals for his/her course towards classroom practice.					
13	The electronic learning environment/manual describes the importance of the learning goals for his/her course towards classroom practice.					
14	My instructor makes a time plan to master the learning goals for his/her course.					
15	The electronic learning environment/manual describes when the assignments for his/her course have to be finished.					
16	The electronic learning environment/manual describes how much time I need in general to accomplish the assignments for his/her course.					
17	The electronic learning environment/manual describes the subject matter that has to be studied for his/her course.					

18	My instructor expects me to describe my progress for his/her course.					
19	My instructor expects me to describe my progress for his/her course based on obvious criteria.					
20	My instructor expects me to point out in which areas I need feedback for					
21	My instructor expects me to describe the adjustments of my work after getting feedback					
22	My instructor expects me to describe the adjustments of my working routine based on my success and failure experiences for his/her course.					
23	The electronic learning environment/manual describes how I can describe my progress for his/her course.					
24	My instructor expects me to describe my prior knowledge for his/her course.					
25	My instructor expects me to describe how my thinking and acting have changed due to the obtained new knowledge and skills for his/her course.					
26	I can point out which subjects should be part of the lessons for his/her course.					
27	My instructor's assignments connect well to my prior knowledge.					
28	My instructor's lessons appeal to my prior knowledge.					
29	The content of instructor's lessons connects well to my prior knowledge.					
30	A few days before the lessons start, I have access to relevant documents for his/her course (e.g., through the electronic learning environment).					
31	The program of instructor's course provides opportunities for making choices in the subject matter					
32	The electronic learning environment/manual describes students' opportunities for making choices in the subject matter of his/her course.					
33	The electronic learning environment/manual describes the way I can prepare myself for the lessons of his/her course.					
34	My instructor expects me to describe why my learning activities for his/her course are challenging.					
35	The assignments of his/her course challenge students.					
36	My instructor expects me to provide peer feedback to other students for his/her course.					
37	My instructor provides feedback to my learning progress for his/her course.					

38	My instructor provides feedback to my assignments and tests for my course.					
39	Instructor's feedback is based on previously formulated criteria.					
40	My instructor provides feedback to short-term products.					
41	My instructor provides opportunities for handing over the assignments after adjustments.					
42	My instructor provides feedback in the electronic learning environment.					
43	My instructor makes use of planned moments for me on which I can meet him/her to ask questions about my progress or I can always meet him/her when I have					
44	My instructor describes judging criteria to grade my progress for his/her course.					
45	My instructor describes judging criteria to grade my work for his/her course.					
46	My instructor describes strong and weak points in my work for his/her course based on judging criteria.					
47	My instructor grades the assignments based on previously formulated judging criteria.					
48	The electronic learning environment/manual describes how I can grade my progress for his/her course.					
49	The electronic learning environment/manual describes the judging criteria of the assignments for his/her					
50	My instructor stress students' strong qualities.					
51	My instructor demonstrates that making mistakes is part of the learning process.					
52	Students collaborate with peers for his/her course.					
53	Students describe the way they collaborate with peers for his/her course.					
54	Students describe the way they collaborate with peers in the electronic learning environment for					
55	During collaboration, the instructor pays attention to specific collaboration skills such as dividing tasks and reporting to each other.					
56	During collaboration, the instructor pays attention to general social and communicative skills such as good listening and respecting other opinions.					

Appendix D: Reflective Essay Questions

REFLECTIVE ESSAY QUESTIONS

You are kindly requested to reflect, in an essay, on your graduate course(s) experiences, specifically in terms of your self-regulation development towards the **end of the semester.** The questions below are intended to guide your reflective writing.

1. What does self-regulatory learning mean to you?
2. Do you believe that you have developed self-regulatory strategies before attending the MA ELT program? If yes, please elaborate on your answer and provide related examples.
3. To what extent do you believe the following have promoted your self-regulatory learning:

*the course content
* the course structure
*the course requirements
*teaching methods
*the course assessment?

4. Do you believe that you have been given opportunities during your MA studies so far to improve your self-regulatory strategies? If yes, please elaborate on your answer and provide related examples.
5. In addition to the above questions, would you like to share any other reflections?

Appendix E: Interview Form for the Instructors

INTERVIEW FORM FOR THE INSTRUCTORS

1. Do you believe that your graduate course has an effect on the promotion of MA students' self-regulatory skills?

2. To what extent do you believe the following have promoted master students' self-regulatory learning:
   the graduate course content
   course structure,
   course requirement,
   teaching methods and
   course assessment

3. Do you involve your students into the process of planning, goal setting (short-term & long-term), task value activation, and time management aspects of your graduate class? If yes, how?

4. Do you expect your students to describe you about their goal setting and the activities they attend to master/achieve their goals?

5. Do you use some strategies to help graduate students self-regulate their studies? If yes, which strategies (Internal / External/ Shared) do you use?

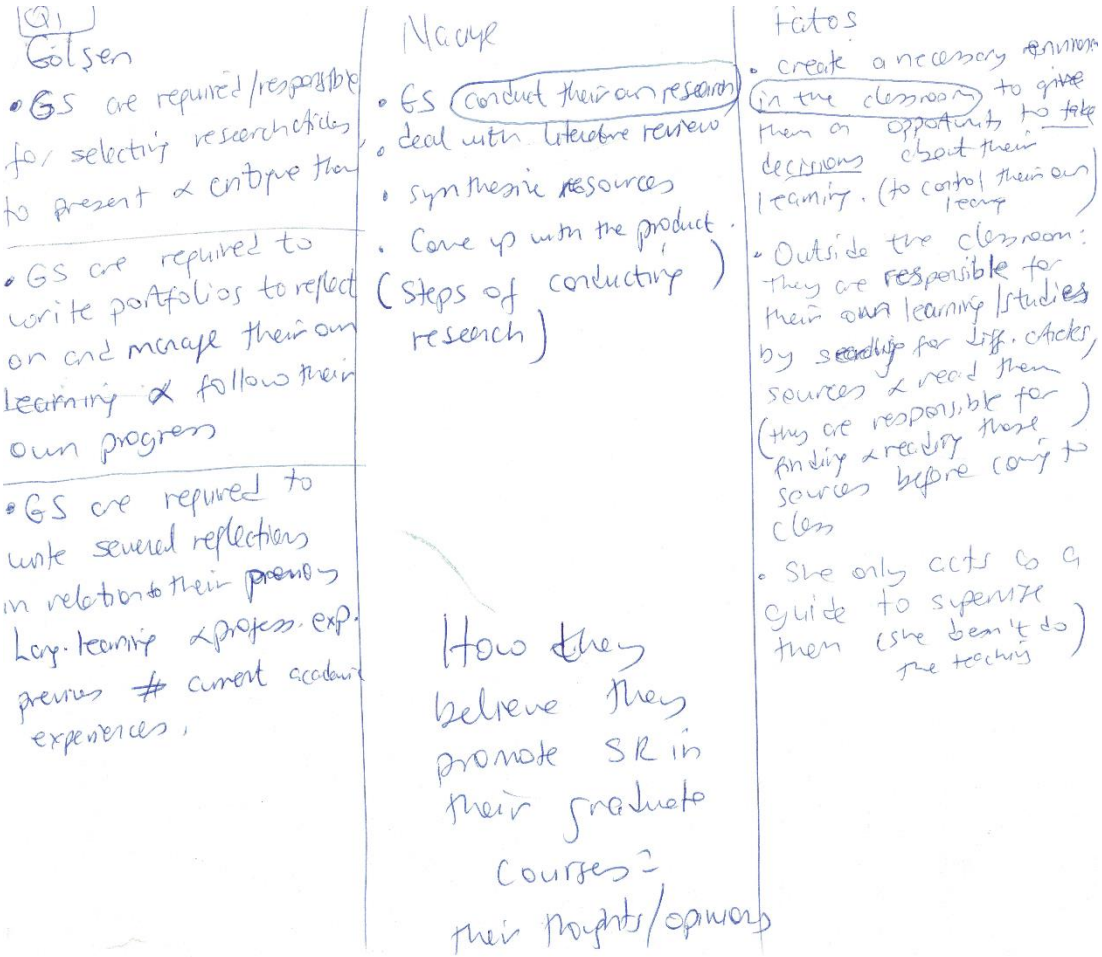
6. How do you consider prior knowledge activation? Or how the subject, assignment, and lesson connect well to the students' prior knowledge?

7. How and when (how often) do you provide coaching/judging/feedback to evaluate your graduate students' progress? Do you give them feedback based on previously formulated criteria? How are the students informed of the criteria they are to be evaluated?

8. How do you encourage students' collaboration with peers? (Give some examples from your course if possible, please)

9. In addition to the above questions, would you like to share any other points regarding MA graduate students' SRL in ELT department?

Appendix F: Content Analysis



19 Jaiveer Shirke

- He attempts to raise SS awareness on that there can be diff. approaches; diff. ways of seeing ~~things~~ ~~different approaches~~, diff. criteria's to analyze things & to reach to conclusions.. & even conclusions can be different — there is not one single correct answer - -

(Q2) Gölyen

- In terms of (indirect)
- self-study (direct)
- management of class discussion
- managing ss own learning (indirect)
- regulating class events (directly) (indirectly)
  & active participation

Nacuye

In terms of:

- communication, discussion & interactions
- helps her to create opportunities for ss to be on their own, to apply some study skills,
- to be autonomous
- to be self-sufficient

enables her to give an active role to ss

Fatos

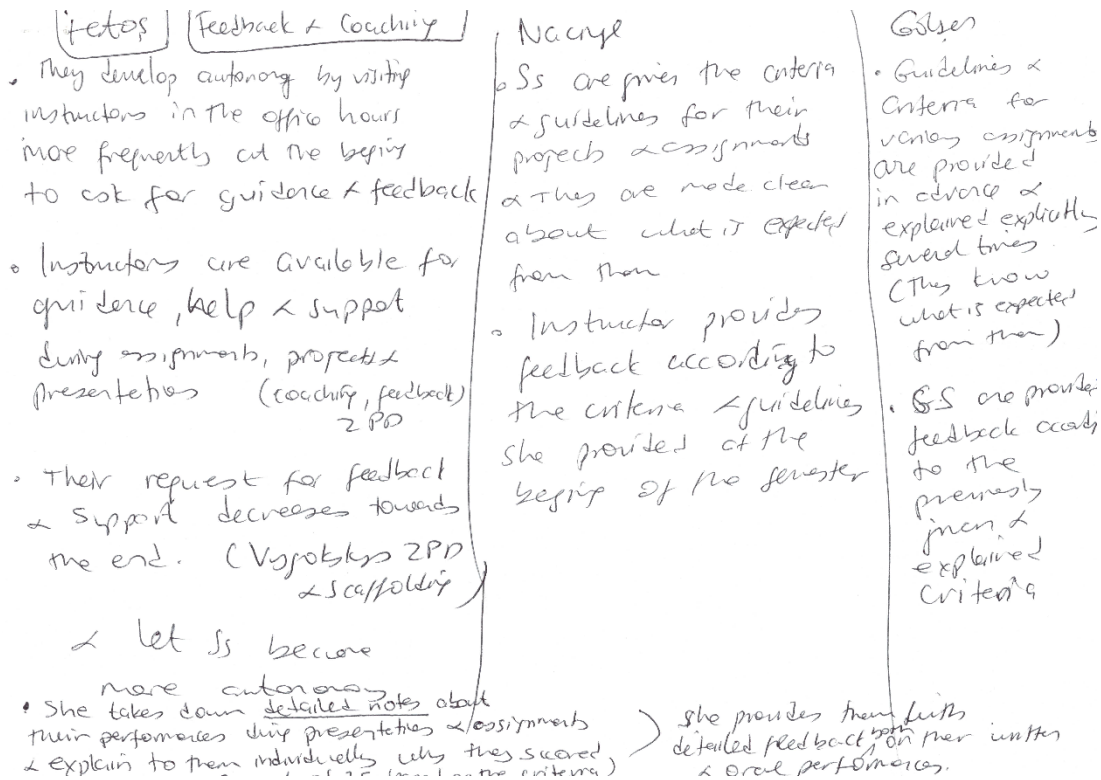
She just guides

- supervises
- attempts to involve her ss in every stage of the course planning
  (role of ss in active role to ss in planning)
- ss are the decision makers
- ss are free to choose their own topic for research – ss are not limited (ss are also given an active role in determining the course content to a degree)
- Teach. methods - individual group work
- ss both present & hold the discussion in class – (active role)

Q2) Jeevanshur

- His core content / structure / requirement, methods etc enable him
  - to teach Ss how to learn
  - to " " " be effective
  - to ~~make~~ Ss more independent (more autonomy)

Q3 Gölsen Goal-setting Ss are involved in • long-term & short-term aspects of planning • they make decisions of deadlines for a range of submissions, time management of their presentations	• She monitors • She reads • She provides feedback • Ss are not involved • Steps are created by the Instructor.	Ss are not involved in the planning of course content: but they are given freedom to bring in different sources • Course content is (scheduled) (predetermined) & in the course outline with the deadlines at the beginning of the semester
Jaworski		


Feedback & Coaching
They develop autonomy by visiting instructors in the office hours more frequently at the begin to ask for guidance & feedback
Instructors are available for guidence, help & support during assignments, projects & presentations (coaching, feedback) ZPD
Their request for feedback & support decreases towards the end. (Vygotsky ZPD & scaffolding)
& let Ss become more autonomous
Nacıye
Ss are given the criteria & guidelines for their projects & assignments & They are made clear about what is expected from them
Instructor provides feedback according to the criteria & guidelines she provided at the begin of the semester
Gülşen
Guidelines & criteria for various assignments are provided in advance & explained explicitly several times (They know what is expected from them)
Ss are provided feedback according to the previously given & explained criteria
She takes down detailed notes about their performances during presentations & assignments & explain to them individually why they scored
she provides them with detailed feedback both on their written & oral performances.

Ownership Feedback & Coaching

- They are provided the criteria which is to be used to assess/evaluate their knowledge, skills & performance.
- These criteria are clearly explained - GS know the content, date, the points that they need to focus on.
- when they are given a project
  - aim
  - format
  - content
  - benchmarks

  } are all clearly stated & explained

They feel confident in what is expected from her

- They do not care for feedback for development but ask for feedback reasons when they get a low score/mark.
They are more interested in the grades rather than their weaknesses & strengths
- No request for constructive feedback