Self-regulated learning instruction and the relationships among self-regulation, reading comprehension and reading problem solving: PLS-SEM approach

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Abstract: Self-regulated learning (SRL) strategies have gained a great prominence in second language reading comprehension; however, to have a comprehensive picture of their efficacy, this study investigated the significant relationships among SRL components, reading comprehension and reading problem solving. Moreover, it examined the effects of SRL instruction on SRL strategies, reading comprehension, problem solving and the strength of the relationships among these variables. To this end, 183 Iranian English as a foreign language (EFL) learners participated in two phases of this study. In the first phase, the pretest PLS-SEM models were analyzed by evaluating the Motivated Strategies for Learning Questionnaire, Solving Problem Scale, and a test of reading comprehension. The results indicated that from among the components of SRL, cognitive and metacognitive strategies were the dominant predictors of reading comprehension and problem solving, respectively. In the second phase, the effects of SRL instruction and the traditional instruction of reading comprehension on the strength of the relationships were investigated by evaluating the Motivated Strategies for Learning Questionnaire, Solving Problem Scale, and a test of reading comprehension. The results indicated that from among the components of SRL, cognitive and metacognitive strategies were the dominant predictors of reading comprehension and problem solving, respectively. In the second phase, the effects of SRL instruction and the traditional instruction of reading comprehension on the strength of the relationships were investigated by evaluating the Motivated Strategies for Learning Questionnaire, Solving Problem Scale, and a test of reading comprehension.
performing multigroup analysis and comparing $f^2$ and $R^2$ values in the pretest-posttest models. The results indicated that SRL instruction was significantly efficient in improving EFL learners’ SRL strategies, reading comprehension, and reading problem solving.

**Subjects:** Communication Studies; Education; Language & Literature

**Keywords:** PLS-SEM; reading comprehension; reading problem solving; self-regulated learning

1. Introduction

The focus of education should be on creating self-regulated and life-long learners with the aim of developing higher-order thinking skills like problem solving, which requires a shift from the passive transmission of knowledge to the active construction of knowledge (DiFrancesco et al., 2015). Self-regulated learning (SRL) is important for reading comprehension (Cirino et al., 2017), because it is a goal-oriented behavior that requires students to develop a specific goal while dealing with the text, activate their background knowledge and make inferences within the text (Woolley, 2011). In order to increase English as a foreign language (EFL) learners’ strategy use and effective use of these strategies in reading comprehension, SRL strategies including cognitive, metacognitive and motivational aspects should be taught directly or indirectly in the classroom (Ping et al., 2015).

Reading comprehension is an important aspect of learning a foreign language, yet it is believed that the traditional teacher-centered approaches to learning cannot accomplish improving EFL learners’ reading ability (Atai & Nazari, 2011). According to Djudin (2017), such traditional approaches do not help students acquire higher order thinking skills in which problem solving abilities are emphasized. Accordingly, they are turned into knowledge recipients rather than knowledge creators. Thus, students need to develop a repertoire of self-regulation strategies that they can use more effectively (Cleary & Zimmerman, 2004). According to Finkbeiner et al. (2012), some EFL learners not only have an inadequate knowledge of effective reading strategies but also they do not know how to monitor and evaluate these strategies when they are not working properly. Reading comprehension is most in need of self-regulation because language learners often face difficulties in choosing and using different reading strategies. Therefore, these strategies need to be taught explicitly to these students (Chamot, 2018).

Similar to the first language reading in which SRL has a positive effect on improving students’ reading comprehension ability (Souvignier & Mokhlesgerami, 2006), it can lead to proficient EFL reading, as well (Morshedian et al., 2016). Studies on SRL show that good readers use cognitive strategies (i.e rehearsal and organization) to comprehend the text and metacognitive strategies (i.e. planning, monitoring, and evaluation) to plan, monitor and evaluate their reading task (Paris & Paris, 2001). In addition, reading is regarded as a problem solving activity and when readers encounter a comprehension failure, they often slow their reading rate down and try to use different strategies like rereading or self-questioning to fix the problem (Law et al., 2008).

A growing body of research is investigating how reading comprehension can be facilitated by improving SRL strategies through classroom-based intervention in an EFL context. In a study, Pratontep and Chinwonno (2008) found that the use of SRL strategies in an extensive reading program in Thailand improved Thai university students’ reading comprehension scores. The findings from the SRL interview showed that students frequently used metacognitive and performance strategies of self-regulation. In addition, the transcription of the data obtained from the verbal protocol of reading showed that students used SRL strategies in the performance stage more often than the forethought or self-reflection stages. In another descriptive study, Finkbeiner et al. (2012) implemented the empirical ADEQUA project in Germany to investigate how German EFL learners’ use of reading strategies could be facilitated during their engagement in self-regulated
cooperative reading tasks. The results indicated that students used different cognitive and socioaffective reading strategies without explicit instruction; however, only a few teacher support actions were identified that could promote students’ SRL strategies. Thus, teacher training programs were required to raise their awareness of how they could scaffold SRL strategies in their students.

In an attempt to examine the psychological and educational outcomes of strategies-based instruction, Ghahari and Basanjideh (2015) investigated the effects of reading strategies awareness on reading comprehension achievement (RCA) and problem-solving ability (PSA) of 145 Iranian undergraduate EFL students through using three instruments of problem solving inventory, survey of reading strategies and a reading comprehension test battery. The findings indicated that metacognitive and cognitive strategies positively correlated with PSA and RCA. However, metacognitive strategies were correlated more with problem solving, whereas cognitive strategies contributed more to reading comprehension scores. Last but not least, Morshedian et al. (2016) investigated whether training Iranian students in self-regulated reading could improve their reading comprehension ability and whether the proficiency level had an impact on the effectiveness of SRL instruction. They used think-aloud protocols and Motivated Strategies for Learning Questionnaire to collect SRL data. The findings revealed that SRL instruction improved students’ self-regulatory reading skills. However, the proficiency level did not have any moderating effect on self-regulated training.

All of these studies show the effectiveness of SRL instruction in improving students’ reading comprehension ability. Most of the studies on the process of SRL have focused on the study of motivation, cognitive and metacognitive strategies taken separately, and there is no study showing the interactions and the interrelationships among these components and their relationships with reading comprehension and reading problem solving before and after SRL instruction. Therefore, there is a need to develop an integrated model that incorporates all of these variables together. Hence, in order to fill this gap in the research literature, the purpose of the present study was, first, to investigate the relationships among SRL or its three components, reading comprehension, and reading problem solving simultaneously through partial least squares structural equation modeling (PLS-SEM) and to compare the strength of these relationships before and after SRL instruction. Second, this study aimed to investigate the effects of SRL instruction of reading comprehension on improving EFL learners’ SRL strategies, reading comprehension and reading problem solving. The SRL components involved in this study were motivational self-regulation, cognitive strategies, and metacognitive strategies. Generally, for meaningful learning to occur, students should be motivated and possess the necessary cognitive and metacognitive strategies. Thus, having a deep understanding of the motivational, cognitive and metacognitive aspects of SRL promotes educational achievement (Paris & Winograd, 2003).

1.1. Self-regulated learning (SRL)
Self-regulated learning became popular in the 1980s from an interest in answering the question of how students direct their own learning processes (Zimmerman, 1989). It emphasized the autonomy and the students’ personal responsibility to take control of their own learning. Generally, it subsumed research on metacognition, cognitive strategies, motivation and emotion in one coherent construct with an emphasis on the interplay among all of these forces (Paris & Winograd, 2003). According to Zimmerman (2000), “self-regulation refers to self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals” (p. 14). Zimmerman (1989) also describes SRL as “the degree to which students are metacognitively, motivationally, and behaviorally active participants in their own learning process” (p. 329). Metacognitively, self-regulated learners have the ability to plan, self-monitor and self-evaluate their learning process. Motivationally, they have self-efficacy, competence, and autonomy to learn. Behaviorally, self-regulated learners have the ability to create an ideal learning environment that enhances learning. According to Zimmerman (2000), SRL is comprised of three main components: cognition, metacognition and motivation. Cognition includes the skills necessary for encoding,
memorizing and recalling information. Metacognition includes the skills that cause the learners to monitor and understand their cognitive processes. Motivation includes the attitudes and the beliefs that influence the development and the use of cognitive and metacognitive skills.

There are different models of SRL (e.g. Boekaerts & Corno, 2005; Zimmerman, 2000). Among these models, Zimmerman (2000) proposed the cyclic model of SRL based on the social cognitive theory developed by Bandura (1986). According to this model, self-regulated learners go through three stages of self-regulation: forethought, performance, and self-reflection. Forethought refers to the reflective processes that precede the learning act and are intended to enhance learning. The two distinct categories of forethought are task analysis and self-motivational beliefs. The performance involves those processes that are employed during efforts to learn and are intended to facilitate attention and self-monitoring. The two categories of performance are self-control and self-observation. Self-reflection refers to those processes that occur after the performance and are intended to optimize one’s reflection and evaluation of the learning outcomes. The two categories of the self-reflection stage are self-judgment and self-reaction (Zimmerman, 2000). Because of the cyclic and dynamic nature of SRL processes, the three stages of SRL are interrelated and merged (Seufert, 2018).

1.2. Problem Solving Ability
Self-regulated learning enables students to acquire good problem solving skills and behave like strategic learners (Cleary & Zimmerman, 2004). Problem solving refers to the affective, cognitive and behavioral processes and to the particular set of skills people use in order to find solutions for the problems of their everyday life (Heppner et al., 2004).

Models of self-regulation have integrated motivational, motoric, and metacognitive processes of problem solving skills within a cyclic framework (B.J. Zimmerman & Campillo, 2003). The models of self-regulation and problem solving are closely interrelated because they focus on similar activities like determining a problem area, developing appropriate strategies, and evaluating strategy effectiveness (Reschly & Ysseldyke, 1995). The main difference, however, is that the self-regulation models enable students to be actively involved in the process of problem solving; hence, increasing their autonomy over their learning tasks (Zimmerman, 2000). From a social cognitive perspective, problem-solving processes fall into three cyclical self-regulatory stages: forethought, performance, and self-reflection. Forethought processes precede the problem solving efforts and set the stage for the solution; performance processes occur during the solution efforts and influence action and attention, and self-reflection processes occur after the solution efforts and influence a person’s reaction to them. These self-reflections, in turn, influence forethought processes concerning the following solution efforts, thereby completing the self-regulation cycle. Because of its cyclic nature, this model can explain problem solving ability in both formal and informal contexts (B.J. Zimmerman & Campillo, 2003).

1.3. Theoretical framework
This study proposed two hypothetical models based on the theories and the previous empirical results of self-regulation (Figures 1 and 2). First, SRL is considered as a complex process involving motivational, cognitive and metacognitive aspects of learning (Zimmerman, 2000). Thus, motivation, cognitive strategies and metacognitive strategies were examined as the three main components of SRL (Pintrich & De Groot, 1990), affecting reading comprehension and reading problem solving. Second, in order to have meaningful learning, students should be motivated and should be able to use the necessary learning strategies. Therefore, the level of motivation significantly affects the use of appropriate cognitive and metacognitive strategies needed for the task (Li, 2017). Hence, motivation was tested as affecting cognitive and metacognitive strategies. Third, students’ capability to regulate their own learning considerably improves their learning performance (Li, 2017). According to Rycik and Irwin (2005), reading is most in need of self-regulation because reading comprehension is a complex cognitive process of making meaning from the text and it challenges the learners to coordinate different types of information (information about a topic, the
use of multiple strategies and making inferences). In addition, metacognition is a strong predictor of foreign language achievement (Pishghadam & Khajavy, 2013) and cognitive and metacognitive strategies positively affect the improvement of reading comprehension ability (Ghahari & Basanjideh, 2015). Therefore, the components of self-regulation were examined as related to reading comprehension. Fourth, according to Cleary and Zimmerman (2004), SRL enables students to think and behave like good problem solvers and strategic learners. Successful problem solving is dependent on the three components of skill, metaskill, and will. These three components refer to the cognitive, metacognitive and the motivational aspects of problem solving (Mayer, 1998). On the basis of the study conducted by Ghahari and Basanjideh (2015), cognitive and metacognitive strategies directly influence the enhancement of problem solving. Thus, the components of self-regulation were examined as related to problem solving. Consequently, the effects of SRL components (motivation, cognitive strategies and metacognitive strategies) on problem solving and reading comprehension were investigated in model A in order to see which components of SRL significantly predicted reading comprehension and problem solving (Figure 1).

In addition, the direct effect of SRL (without considering its components) on reading comprehension and reading problem solving was investigated in Model B in order to see whether improvements in SRL through instruction mediated improvements in reading comprehension and problem solving (Figure 2).

Based on the theoretical framework presented above, this study attempted to answer the following research questions:

(1) Which components of SRL (motivation, cognitive and metacognitive strategies) significantly predict reading comprehension?
Which components of SRL (motivation, cognitive and metacognitive strategies) significantly predict reading problem solving?

Does SRL instruction significantly strengthen the relationships between SRL or SRL components and reading comprehension?

Does SRL instruction significantly strengthen the relationships between SRL or SRL components and reading problem solving?

Which method (SRL instruction and traditional instruction) is more effective in improving Iranian EFL learners' SRL strategies, reading comprehension and reading problem solving?

2. Method

2.1. Participants

The participants were 207 Iranian undergraduate junior students (125 males and 82 females) from six classes which were selected following a convenience sampling method. Their age range was between 18 and 30 years. They were engineering students taking a general English course at Islamic Azad University, Bonab Branch. The purpose of this course was to teach the basic reading skills which focused on academic reading for undergraduate students. The participants had six years of English learning experience at school; however, as English was a subject to be studied one hour and a half based on mostly grammar-translation method, they had poor English proficiency background, at the level of elementary. That is why the proficiency test of Key English Test (KET), which was suitable for elementary students, was administered at the beginning of the study to check the participants' homogeneity. From among 207 participants, 183 elementary EFL learners (109 males and 74 females) were chosen according to one standard deviation (SD = 11.03) above and below the mean (M = 31.02). They were randomly divided into one experimental group (n = 95) and one control group (n = 88). The experimental group received SRL instruction in reading comprehension, while the control group received a traditional reading instruction with a primary emphasis on vocabulary learning, comprehension check, and translation.

2.2. Instrumentation

The following instruments were used to obtain the research data.

(1) KET is a standardized Cambridge exam in which students are tested on the basic knowledge of reading, writing, speaking and listening. In the present study, however, the speaking and the listening sections of this test were removed because of the practicality problems. This test was used for homogenizing students in terms of their language proficiency.

(2) Motivated Strategies for Learning Questionnaire (MSLQ). MSLQ (Pintrich & De Groot, 1990) measures students' motivational and SRL components. MSLQ is a self-report questionnaire consisting of two sections: a motivation section, and learning strategies section. The motivation section includes 22 items in three subscales assessing students' self-efficacy (nine items), intrinsic value (nine items), and test anxiety (four items). As Pintrich and De Groot (1990) reported, the alpha coefficients for self-efficacy, intrinsic value, and test anxiety were 0.89, 0.87, and 0.75, respectively. The test anxiety section was omitted in this study because we had tests at the beginning and at the end of the course. The learning strategies section (22 items) consists of cognitive strategy use ($\alpha = 0.83$) and metacognitive strategy use ($\alpha = 0.74$). The cognitive strategy use scale (13 items) is related to the subscales of elaboration strategies, rehearsal strategies, and organizational strategies. Metacognitive strategy use (nine items) is related to metacognitive self-regulation and effort management. In this study, reliability was calculated through Cronbach’s alpha for the scales of motivation, cognitive strategy use and metacognitive strategy use; alpha coefficients of which stood at 0.602, 0.707 and 0.780, respectively. In general, the reliability of MSLQ turned out to be 0.828 which is in an acceptable level.

Since we dealt with self-regulated reading in this study, we changed the wording slightly so that each statement was related to reading in EFL. Scholars like Morshedian et al. (2016) have also adapted this questionnaire to reading and have administered it to students as a measure of EFL.
reading self-regulation. In this study, the translated version of this questionnaire which has been translated and validated in the Iranian context by Hosseini Nasab and Ramshak (2000) was used to measure students' SRL strategies. They determined the validity of this questionnaire using content validity and factor analysis method. Meanwhile, a five-point Likert scale (1 = agree to 5 = disagree) was used for quantifying students’ responses to MSLQ. In addition, the subscales of motivation (two subscales), cognitive strategies (three subscales) and metacognitive strategies (two subscales) were used as indicators for measuring these latent variables. Moreover, the sum of all subscales of motivation, cognitive strategies, and metacognitive strategies was used as indicators for measuring SRL. Table 1 provides a sample item for each MSLQ subscale.

(3) Solving Problem Scale (SPS): This questionnaire is a subscale of the Inventory of Learner Resources (ILR) developed by Carr (1999). The ILR is a theoretically-based instrument having 80 five-point Likert-scale items of which 31 pertain to problem solving ability. Problem solving, in this questionnaire, is defined in terms of the parameters of planning, evaluating alternatives, and anticipating consequences for a given learning activity. In a quantitative study, Savenko (2011) validated the subscale of problem solving from ILR as a standalone instrument and renamed it as Solving Problem Scale (SPS). The results of the confirmatory factor analysis of this instrument by Savenko (2011) added another parameter of seeking assistance from other resources to this questionnaire. In addition, four items were identified as suspect items and needed to be reworded yielding 27 items. Therefore, this questionnaire has the parameters of planning (eight items), evaluating alternatives (10 items), anticipating consequences (six items) and seeking assistance (three items).

Since we dealt with problem solving in EFL reading in this study, 20 related items were chosen from SPS (Savenko, 2011). In addition, we changed the wording slightly so that each statement was related to reading problem solving in EFL. In order to fully understand EFL learners’ strategies toward reading problem solving and to evaluate these strategies more appropriately, we added eight problem solving reading strategies from the Survey of Reading Strategies by Mokhtari and Sheorey (2002) to SPS. Thus, the questionnaire had 28 items (planning, seven items; evaluating alternatives, seven items; anticipating consequences, four items; seeking assistance, two items and problem solving reading strategies, eight items) measuring elementary learners problem solving ability in EFL reading. This questionnaire was translated and back translated into Persian in order to prevent any language problems in measuring students’ problem solving ability in EFL reading. The reliability of this questionnaire measured through Cronbach’s alpha equaled 0.763 and its content validity was approved by three EFL professors. In addition, the five parameters of SPS were used as indicators for measuring reading problem solving. Table 2 provides a sample item for each SPS parameter.

| Table 1. Sample items for each MSLQ subscale |
|---------------------------------------------|
| **Scale** | **Subscale** | **Sample item** |
| Motivation | Self-efficacy | Compared with other students in this class I expect to do well in reading. |
| Motivation | Intrinsic value | I prefer reading the texts that are challenging so I can learn new things. |
| Cognitive strategy use | Elaboration strategies | When reading, I try to connect the things I am reading about with what I already know. |
| Cognitive strategy use | Rehearsal strategies | When I study for a test I practice saying the important facts over and over to myself. |
| Cognitive strategy use | Organizational strategies | I outline the chapters in my book to help me study. |
| Metacognitive strategy use | Metacognitive self-regulation | Before I begin reading I think about the strategies I will need to do to read better. |
| Metacognitive strategy use | Effort management. | Even when reading materials are dull and uninteresting, I keep working until I finish. |
Reading comprehension test: this test, the scores of which showed reading comprehension achievement, was adapted from Day and Yamanaka (2007) course book called cover to cover 1. The test started with a passage (373 words) followed by 30-item closed-ended and multiple choice questions on some specific reading comprehension skills including identifying the main idea, finding the topic, distinguishing between fact and opinion, comparing and contrasting, making predictions, scanning and making inferences. This test was administered to the experimental and control groups as pretest in order to measure the participants’ pre-existing knowledge on reading comprehension and as posttest to investigate the effect of SRL instruction on the variables of the model and on the strength of the relationships among these variables. Its content validity was approved by three EFL professors and its reliability as measured through KR-20 was 0.701.

### 2.3. Procedure

In the current study, firstly, KET was administered to select 183 homogeneous participants from among 207 students. Then, the quasi-experimental study was conducted in two phases: The first phase was an investigation of the relationships among SRL components, reading comprehension and reading problem solving in PLS-SEM model using the data from the pretest. For the first week, the participants in the experimental and control groups took the pretests of reading comprehension, adapted MSLQ (Pintrich & De Groot, 1990), and adapted SPS (Savenko, 2011). In the second phase, the effects of SRL instruction on improving students’ use of SRL strategies, reading comprehension, reading problem solving and also on the strength of the relationships among these variables in PLS-SEM models were investigated. In this phase, the posttests of reading comprehension, adapted MSLQ (Pintrich & De Groot, 1990), and adapted SPS (Savenko, 2011) were administered and the pretest and posttest models were compared. It should be mentioned that because this course was part of the university’s curriculum, the regular attendance of all of the participants in the class and in the pretests and the posttests was ensured.

SRL instruction for the experimental group was implemented in three stages according to the latest version of Zimmerman’s (2000) social-cognitive model of SRL: forethought, performance, and self-reflection. Meanwhile, because many scholars believe that using cooperative learning strategies enhance students’ SRL (King, 2007; Nilson, 2013), a think-pair-share strategy was applied in order to promote SRL. Think-pair-share enables students to reflect on questions, discuss it with a partner, and share their thoughts with the whole class (Felder & Brent, 2009; Nilson, 2013; Randi & Corno, 2000). Throughout all of these activities, the teacher tried to speak English in the class and to encourage students to speak English too. However, because students were at an elementary level of language proficiency, sometimes using L1 (Persian) was inevitable. Each cycle of SRL intervention for reading comprehension took two sessions. The course lasted for 16 weeks with one hour and a half weekly. The book of Select Reading by Lee and Gundersen (2011) was taught to all of the classes. Before the intervention, the participants in the experimental group were given some information on SRL such as setting goals before reading, using appropriate strategies while reading and the ways of self-monitoring their reading task.
Within each cycle, the experimental group was first in the forethought stage. First, the participants took part in a think-pair-share-write activity about the goals of reading in a foreign language (Nilson, 2013). The teacher asked this question: what are your reading goals? Then, they were asked to set plans for the upcoming reading text (how they can achieve their goals) and the teacher helped them by providing an action plan of TWA (think before reading, think while reading and think after reading) checklist (Mason et al., 2006) showing what they were expected to do while reading. Self-regulated strategy development was implemented during all the stages of TWA.

The teacher also provided the participants with a purpose for reading (e.g. by saying that the purpose of this reading is to help you increase your knowledge of vocabulary, make inferences and use a good reading strategy). Then, they were engaged in the think-pair-share activity of filling the first part of the TWA checklist (identifying the author’s purpose, what you know and what you want to learn). In addition, one reading strategy was taught explicitly for each lesson and the teacher modeled the correct use of that strategy. These strategies included previewing and prediction, scanning, skimming, identifying main ideas, understanding details and making inferences.

Before the actual reading of the lesson, the teacher asked the participants to speak about their feeling and emotions in the reading class by using some positive sentences. Therefore, their motivation and self-efficacy were increased through the three modes of instruction: modeling, think-pair-share strategy and encouraging statements. According to Schunk and Zimmerman (2007), modeling strengthens students’ self-efficacy which maintains motivation for learning. In addition, cooperative learning situations (think-pair-share strategy in this study) in which students work together promotes students’ motivation more than do individualistic or competitive ones (Roseth et al., 2008).

The class then entered the performance stage. The emphasis in this stage was on self-monitoring and self-recording activities. First, the teacher modeled the reading process by engaging in think-aloud reading and verbalizing her thought processes (observation level). She did this by applying the four reading strategies of reciprocal teaching (predicting, questioning, clarifying and summarizing) developed by Palinscar and Brown (1984) and by engaging in reciprocal dialogues with the students. By modeling the reading activity through thinking aloud, the teacher helped students to self-talk and self-instruct themselves using appropriate reading strategies such as questioning, clarifying, predicting and imagery. Then, the participants were asked to reread the text independently (emulation level), time themselves as they were reading, write comments on the margins of the page, indicate their current status (need help, reread …), and highlight the most important vocabulary that they did not understand. This independent reading allowed them to focus their attention on what they were reading.

In order to promote sustained monitoring and reflection on reading, the teacher encouraged the participants to keep a record of their work in class and at home through studying the reading selections that were interesting to them by filling the self-monitoring forms (adapted from Andrzejewski et al., 2016) designed on the basis of Zimmerman’s (2000) model of SRL. Each form required the participants to monitor the amount of time engaged in class/homework, their environmental structuring, the strategies used, the content of the reading and their perceived self-confidence on the taught material.

The participants then entered the ‘self-reflection stage’. In this stage, they reviewed their own learning status, filled the self-assessment log and the third part of the TWA checklist (finding the main ideas and summarizing). At the end of each reading task, the participants did the comprehension exercises through the think-pair-share strategy.

Unlike the experimental group, the control group was taught through the traditional method of reading instruction, focusing on teaching grammatical rules and new vocabulary while the students were reading the text and translating it. At the end of the semester, all classes were administered a posttest of reading comprehension, adapted MSLQ (Pintrich & De Groot, 1990) and adapted SPS (Savenko, 2011).
2.4. Data Analysis
The analysis of the SEM models was conducted by PLS-SEM software. PLS-SEM is an alternative statistical technique and a complementary modeling approach to covariance-based SEM (CB-SEM) approaches like LISREL and AMOS (Hair et al., 2017). It has several advantages over CB-SEM, for example, it can be applied when the data do not have a normal distribution, when the sample size is small, or when there is a complex model with many model relationships (Hair et al., 2017).

3. Results
First, an overview was done from the proposed model in order to determine the significant relationships in the structural model. Second, the measurement models, the structural model and the model’s goodness of fit were evaluated. It should be mentioned that the missing values (although there were few missing values) were treated using mean replacement before the final analysis. This option replaces missing values with the sample mean of all data points of the same indicator (Hair et al., 2017). Finally, an independent sample t-test was used to test the significant score differences between the experimental group (SRL instruction) and the control group (traditional instruction).

3.1. An Overview of the Proposed Model
In this section, the aim was to eliminate the insignificant paths in the structural model and the indicators with low factor loadings (less than 0.40) after analyzing the pretest models by PLS-SEM. It should be mentioned that a PLS-SEM model consists of two elements: a measurement model, which represents the relationships between the latent variables and the observable variables and the structural model, which represents the relationships among the latent variables. The latent and the observable variables, in this study, were referred to as constructs (ovals) and indicators (rectangles), respectively (Hair et al., 2017). The results of the PLS-SEM analysis of the pretest for both the experimental and control groups showed that the loadings of all indicators were greater than 0.40 except the indicator of organizational strategies in SRL of the experimental group equaling 0.356. Considering the theoretical importance of this variable, we decided to keep it. Furthermore, all the relationships in both models (Model A & Model B) were significant at 95% confidence level except the relationship of MRC and MPS. In other words, the variable of motivation did not have any significant effects on reading comprehension and problem solving. Thus, the direct effect of motivation on these two variables was not investigated in the other stages of this study. It should be noted that the pretest model for the control group, the pretest model for the experimental group, the posttest model for the control group and the posttest model for the experimental group were referred to, in this study, as M:C, M:E, M:C and M:E, respectively.

3.2. Evaluation of PLS-SEM Models
In this section, the pretest and posttest PLS-SEM models for both the experimental and control groups were evaluated. This analytical procedure included examining the measurement models, the structural model, and the model’s goodness of fit.

3.3. Measurement Models
The measurement models were assessed through the three aspects of indicator reliability, convergent validity, and discriminant validity. Indicator reliability included the evaluation of the indicator loadings, Cronbach’s alpha, and composite reliability. Convergent validity was calculated by average variance extracted (AVE) and discriminant validity was assessed through Fornell-Larcker criterion (Hair et al., 2017). Before evaluating the parameters of the measurement models, the output of M:C, M:E, M:C and M:E including loadings and path coefficients in PLS-SEM software is shown in Figures 3–6. In these models, the numbers inside the ovals show the R² values and the bold numbers are related to the posttest PLS-SEM models.

3.3.1. Reliability
Indicator loadings, Cronbach’s alpha (α), and composite reliability (CR) are considered as the three criteria for evaluating the reliability of the measurement models. Considering the fact that the
Figure 3. The path coefficients of the structural model, the loadings of the measurement models, and $R^2$ values for M.C and $MC$ (bold numbers) in Model A.

Figure 4. The path coefficients of the structural model, the loadings of the measurement models, and $R^2$ values for M.E and $ME$ (bold numbers) in Model A.

Figure 5. The path coefficients of the structural model, the loadings of the measurement models, and $R^2$ values for M.C and $MC$ (bold numbers) in Model B.
acceptable value for the indicator loadings should be at least 0.4 (Hulland, 1999), the loadings were greater than 0.4 in all of the models (Figures 3–6) except the indicator of organizational strategies in SRL in the model of M.E that was kept because of its theoretical importance.

Cronbach’s alpha (α) is considered as a conservative measure of internal consistency reliability that assumes equal indicator loadings on the construct (Hair et al., 2017). The value of 0.6 is an acceptable value for α coefficient in exploratory research (Uysal & Sirakaya-Turk, 2017). Since α is regarded as a traditional criterion for internal consistency, a different measure of this reliability, known as composite reliability (CR) is used in PLS-SEM. Its acceptable values are between 0.60 and 0.70 in exploratory research and between 0.70 and 0.90 in more advanced stages of research (Hair et al., 2017). As shown in Table 3, the α coefficient is acceptable for the two groups in the posttest. However, because it is more appropriate to apply composite reliability in PLS-SEM analysis, its values are acceptable in all the models. Hence, they have an acceptable level of reliability.

3.3.2. Convergent Validity
Convergent validity is the second criterion for evaluating the measurement models in PLS-SEM. The convergent validity is assessed through the average variance extracted (AVE) between each construct and its indicators. The critical value of AVE for each construct should be greater than 0.5 (Fornell & Larcker, 1981). As shown in Table 3, the models’ convergent validity is at an acceptable level after the treatment for both groups.

3.3.3. Discriminant Validity
In discriminant validity, the goal is to ensure that a reflective construct has the strongest relationship with its own indicators (Hair et al., 2017). In this study, Fornell-Larcker criterion (Fornell & Larcker, 1981) was applied to test this kind of validity (Table 4). In this criterion, the square root of each construct’s AVE should be greater than the estimated correlation values with the other constructs (Hair et al., 2017). As shown in Table 4, the discriminant validity of all the models is satisfied.

3.4. Structural model
The structural model is assessed through an examination of t-values, $R^2$, and $f^2$ values (Hair et al., 2017). T-values are the most important criterion for examining the significance of the relationships among the constructs of a model. When the size of the resulting t-values is above 1.96, the path coefficient is significant at 95% confidence level. The presented t-values in Table 5 show the significant relationships among the constructs of the proposed model at 95% confidence level.

Effect size $f^2$ indicates the size of the effect of a construct on another construct. Cohen (1988) proposed the $f^2$ values of 0.02, 0.15, and 0.35 for a small, medium, and large effect size of the exogenous construct. It is clear that SRL instruction has improved the effect size of the constructs in the structural model.
Table 3. α Coefficient, CR and AVE values of the pretest and the posttest models

| Latent variables | M.C | M.E | M.C | M.E |
|------------------|-----|-----|-----|-----|
|                  | α   | CR  | AVE | α   | CR  | AVE | α   | CR  | AVE |
| CS               | 0.546 | 0.768 | 0.526 | 0.462 | 0.725 | 0.477 | 0.660 | 0.817 | 0.600 | 0.717 | 0.841 | 0.638 |
| M                | 0.469 | 0.789 | 0.652 | 0.331 | 0.749 | 0.599 | 0.488 | 0.790 | 0.656 | 0.603 | 0.832 | 0.713 |
| Model A          | MS  | 0.581 | 0.822 | 0.599 | 0.325 | 0.747 | 0.596 | 0.668 | 0.857 | 0.750 | 0.795 | 0.906 | 0.828 |
|                  | PS  | 0.768 | 0.845 | 0.525 | 0.819 | 0.874 | 0.587 | 0.835 | 0.883 | 0.603 | 0.946 | 0.959 | 0.822 |
|                  | RC  | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Model B          | PS  | 0.768 | 0.845 | 0.525 | 0.819 | 0.872 | 0.585 | 0.835 | 0.883 | 0.603 | 0.946 | 0.959 | 0.822 |
|                  | RC  | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
|                  | SRL | 0.718 | 0.804 | 0.374 | 0.596 | 0.738 | 0.295 | 0.798 | 0.851 | 0.452 | 0.839 | 0.879 | 0.511 |

Note: CS = cognitive strategies, M = motivation, MS = metacognitive strategies, PS = problem solving, RC = reading comprehension, SRL = self-regulated learning
### Table 4. Models’ discriminant validity by Fornell-Larcker criterion

| Latent variables | Model | M.C. | M.E. |
|------------------|-------|------|------|
|                  | CS    | M    | MS   | PS   | RC   | CS    | M    | MS   | PS   | RC   |
| CS               | 0.725 |       |      |      |      | 0.691 |       |      |      |      |
| M                | 0.531 | 0.807 |      |      |      | 0.405 | 0.774 |      |      |      |
| MS               | 0.263 | 0.487 | 0.836 |      |      | 0.203 | 0.340 | 0.772 |      |      |
| PS               | 0.416 | 0.445 | 0.484 | 0.724 |      | 0.339 | 0.289 | 0.382 | 0.766 |      |
| RC               | 0.434 | 0.469 | 0.416 | 0.486 | 1.000 | 0.397 | 0.269 | 0.368 | 0.391 | 1.000 |

**Model A**

| Latent variables | Model | M.C. | M.E. |
|------------------|-------|------|------|
|                  | CS    | M    | MS   | PS   | RC   | CS    | M    | MS   | PS   | RC   |
| CS               | 0.775 |       |      |      |      | 0.798 |       |      |      |      |
| M                | 0.575 | 0.810 |      |      |      | 0.689 | 0.844 |      |      |      |
| MS               | 0.513 | 0.509 | 0.866 |      |      | 0.476 | 0.572 | 0.910 |      |      |
| PS               | 0.663 | 0.420 | 0.701 | 0.777 |      | 0.748 | 0.672 | 0.759 | 0.907 |      |
| RC               | 0.694 | 0.452 | 0.687 | 0.686 | 1.000 | 0.798 | 0.683 | 0.745 | 0.810 | 1.000 |

**Model B**

| Latent variables | Model | M.C. | M.E. |
|------------------|-------|------|------|
|                  | PS    | RC   | SRL  | PS   | RC   | SRL  |
| PS               | 0.725 |       |      |      |      | 0.765 |
| RC               | 0.481 | 1.000 |      | 0.387 | 1.000 |
| SRL              | 0.581 | 0.568 | 0.611 | 0.471 | 0.485 | 0.544 |

**Model C**

| Latent variables | Model | M.C. | M.E. |
|------------------|-------|------|------|
|                  | PS    | RC   | SRL  | PS   | RC   | SRL  |
| PS               | 0.776 |       |      |      |      | 0.907 |
| RC               | 0.686 | 1.000 |      | 0.810 | 1.000 |
| SRL              | 0.753 | 0.770 | 0.672 | 0.866 | 0.886 | 0.715 |
| Construct relationships | M.C | M.E | M.C | M.E |
|-------------------------|-----|-----|-----|-----|
|                         | t-values | $\rho^2$ | t-values | $\rho^2$ | t-values | $\rho^2$ | t-values | $\rho^2$ |
| CS $\rightarrow$ PS    | 3.571 | 0.133 | 2.669 | 0.091 | 5.707 | 0.326 | 8.667 | 0.832 |
| CS $\rightarrow$ RC    | 4.345 | 0.159 | 3.481 | 0.143 | 5.564 | 0.428 | 12.18 | 1.324 |
| Model A                 |       |       |       |       |       |       |       |       |
| M $\rightarrow$ CS     | 7.120 | 0.393 | 4.717 | 0.197 | 7.871 | 0.493 | 13.36 | 0.905 |
| M $\rightarrow$ MS     | 5.680 | 0.311 | 3.724 | 0.131 | 5.900 | 0.350 | 8.690 | 0.487 |
| MS $\rightarrow$ PS    | 4.341 | 0.223 | 3.406 | 0.131 | 6.421 | 0.463 | 8.233 | 0.904 |
| MS $\rightarrow$ RC    | 3.692 | 0.138 | 3.630 | 0.114 | 6.416 | 0.402 | 9.157 | 0.896 |
| Model B                 |       |       |       |       |       |       |       |       |
| SRL $\rightarrow$ PS   | 10.12 | 0.509 | 6.959 | 0.285 | 17.27 | 1.310 | 36.32 | 2.990 |
| SRL $\rightarrow$ RC   | 7.965 | 0.477 | 6.753 | 0.307 | 15.37 | 1.458 | 40.63 | 3.662 |
$R^2$ is a measure of the variance of an endogenous construct that is explained by its predictor constructs. The higher the $R^2$ values, the better the prediction will be by PLS-SEM model (Hair et al., 2017). Chin (1998) recommended the values of 0.67 (substantial), 0.33 (moderate) and 0.19 (weak) for $R^2$. Considering the $R^2$ values in Figures 3–6, it is clear that the strength of the predictions (explained variance) among the constructs has significantly been improved in both the experimental and control groups.

3.5. Goodness of Fit (GOF)

Although there is not any overall goodness of fit (GOF) indices in PLS-SEM for evaluating the overall model fit (Henseler et al., 2016), Tenenhaus et al. (2005) proposed a diagnostic tool of GOF index. Wetzels et al. (2009) reported the cut-off values of 0.01, 0.25, and 0.36 as a weak, medium, and large for GOF. As the GOF values of Table 6 show, the posttest models have a stronger model fit than the pretest models.

3.6. Multi-group analysis (MGA)

In this section, multi-group analyses (MGA) were performed to see whether there were any significant differences between the pretest and the posttest path coefficients in both the experimental and control groups and to explain the effects of SRL instruction of reading comprehension on the strength of the relationships in the structural model. First, it should be confirmed that the pretest path coefficients of the structural model in the control group were not significantly different from the corresponding path coefficients in the experimental group. In other words, the participants were approximately at the same level in terms of their SRL strategies, reading comprehension and problem solving abilities. Therefore, the parametric approach to PLS-MGA (Keil et al., 2000) was performed to compare the PLS-SEM models across two groups of different datasets (Hair et al., 2017). Considering the estimated t-values from MGA shown in Table 7 under the column of M.C- M.E, it is clear that the path coefficients in these two models are not significantly different at 95% confidence level.

Regarding the t-Values in Table 7 under the column of ME- ME, it is clear that the path coefficients of the five relationships have significantly increased at 95% confidence level. However, in the column of M.C—M.C, this increase is not significant for the most of the relationships. This shows the efficiency of SRL instruction in improving the participants’ use of SRL strategies and their relationships with reading comprehension and problem solving.

3.7. The Effect of SRL instruction on the model’s variables

To investigate the effects of SRL instruction of reading comprehension on the models’ constructs, the three variables of SRL, problem solving and reading comprehension were considered with their indicator means. The results of independent sample t-test showed that there were not any significant differences between the means of the two groups in SRL, reading comprehension and problem solving pretest scores (p-values for SRL, reading comprehension and problem solving were 0.626, 0.851 and 0.515, respectively). It should be mentioned that the equality of variance assumption was violated for both groups.

Assuming unequal variances, the results showed that the participants in the experimental group (SRL instruction) scored significantly higher than those in the control group (p-values for SRL, reading comprehension and problem solving equaled 0.000). Hence, SRL instruction was
more effective than the traditional instruction in improving the participants’ use of appropriate SRL strategies and enhancing their reading comprehension and reading problem solving abilities.

4. Discussion
This study examined the relationships among SRL, SRL components, reading comprehension (RC), and reading problem solving (PS) before and after SRL instruction. The pretest-posttest PLS-SEM models were compared to investigate the impact of SRL instruction on the strength of the relationships among the variables of the model. The results showed that in the experimental group, the model’s GOF was higher than the control group in the posttest (Table 6). Thus, the proposed model had a better predictive power in the experimental group by accounting the performance of both the measurement models and the structural model. Moreover, an independent sample t-test was used to investigate the effect of SRL instruction on EFL learners’ SRL strategies, reading comprehension and problem solving abilities.

Before discussing the research questions, it should be mentioned that when the size of the resulting t-values is above 1.96, the path coefficient is significant at 95% confidence level. As to the first and second research questions, the analysis of PLS-SEM models showed that from the three components of SRL, only cognitive strategies (CS) and metacognitive strategies (MS) significantly affected RC and PS at 95% confidence level because the t-values related to CS → RC, CS → PS, MS → RC and MS → PS relationships were greater than 1.96. These findings are partly in line with the findings of previous studies like those of Ghahari and Basanjideh (2015), Kung (2017). Ghahari and Basanjideh (2015) proposed the model of reading strategies awareness reporting that both cognitive and metacognitive strategies affected the development of reading comprehension and problem solving in an EFL context. The learning motivation (M) did not have any significant direct effects on RC and PS at 95% confidence level since the t-values related to M → RC and M → PS relationships were less than 1.96. However, motivation (M) had an indirect effect on RC and PS because the t-values related to M → CS, M → MS were greater than 1.96. These results fit well with the literature on SRL suggesting that the students’ motivation does not directly play a role in their academic achievement because any influence of motivation on achievement is mediated by such factors as metacognition, cognitive engagement and the students’ use of learning strategies (Li, 2017). In addition, motivation is the major predictor of foreign language learning strategies (Bonney et al., 2008); thus, the higher the motivation, the more likely the use of cognitive and metacognitive strategies will be for optimal learning (Li, 2017). Similarly, in the path analytic test of reading strategies mediation model, Völlinger et al. (2018) found out that reading strategies had a direct effect on reading comprehension while motivation had an indirect effect on it through mediating reading strategies. Moreover, in a modeling study to investigate the relationships among mathematical problem solving, motivation and metacognition, Özcan and Eren Gümüş (2019) found that motivation had an indirect effect on mathematical problem solving through metacognition. The positive correlation between motivation and other dimensions of SRL show that EFL learners who

| Construct relationships | M.C—M.E | M.E—M.C | M.C—M.E |
|-------------------------|---------|---------|---------|
| Model A                |         |         |         |
| CS → PS                | 0.890   | 1.936   | 0.285   |
| CS → RC                | 0.994   | 2.210   | 0.104   |
| M → CS                 | 0.422   | 2.840   | 1.110   |
| M → MS                 | 0.181   | 2.074   | 1.180   |
| MS → PS                | 0.745   | 1.698   | 0.564   |
| MS → RC                | 1.109   | 1.764   | 0.207   |
| Model B                |         |         |         |
| SRL → PS               | 2.402   | 5.481   | 1.246   |
| SRL → RC               | 2.324   | 5.333   | 0.825   |
are active in regulating their motivation can approach challenging problems in their reading comprehension by choosing from a repertoire of cognitive and metacognitive strategies (Teng & Zhang, 2016). These results indicate that designing an integrated reading instruction that covers all aspects of SRL including motivational aspects, cognitive self-regulation and strategy skills is considered to be more effective in improving students’ reading comprehension and reading problem solving (Souvignier & Mokhlesgerami, 2006).

In terms of research questions three and four, the $f^2$ values were increased after SRL instruction and the traditional instruction of reading comprehension. In other words, the effect of the constructs in the models of $M_C$ and $M_E$ were stronger than the models of $M_C$ and $M_E$. By comparing the corresponding $f^2$ values in Table 5, it was clear that the $f^2$ values of all the relationships in $M_E$ were stronger than those values in $M_C$. In other words, the effects of SRL and SRL components on RC and PS in SRL instruction were strengthened and this indicated that SRL instruction was more effective than the traditional instruction. Moreover, SRL instruction in the experimental group caused $M$ (motivation) to be a strong predictor of the variance in CS and MS. In addition, as shown in Figures 3 and 4 and Table 5, the path coefficients and the $f^2$ values related to CS→RC were greater than the path coefficients and the $f^2$ values of MS→RC relationship. This means that the variable of CS had a stronger effect on RC than the variable of MS. These results are in keeping with some studies showing the correlation between reading comprehension success and cognitive and metacognitive strategies in which cognitive strategies were found to have a more significant effect on reading comprehension than metacognitive strategies (e.g. Gahari & Basanjideh, 2015). However, the reverse was true for PS in which MS had a strong effect on it. These findings show that the awareness and the use of metacognitive strategies can help readers solve their reading problems and successfully understand the text (Djudin, 2017; Miller, 2017). Thus, the level of metacognitive engagement and SRL is considered as a key to successful problem solving ability and individuals with high metacognitive ability are more likely to use effective strategies for problem solving, to think about their own learning process and to monitor their own learning (Tzohar-Rozen & Kramarski, 2017). Thus, having a good knowledge of the metacognitive reading strategies leads to a problem solving success in the reading comprehension of the foreign language learners and it is in line with some studies showing a high correlation between metacognitive strategies and problem solving (e.g. Gahari & Basanjideh, 2015).

The $R^2$ values in Model A (Figures 3 and 4) indicated that in the experimental group, these values had considerably been increased. Therefore, in SRL instruction, the components of SRL constituted a dominating predictor of the participants’ RC and PS, explaining approximately 80.8% and 76.8% of the variance of RC and PS, respectively while 19.02% and 23.2% of the variance of these two variables were related to other factors (Figure 4). However, in the traditional instruction, the components of SRL constituted approximately 63% and 61.7% of the variance of the variables of RC and PS, respectively (Figure 3). In other words, SRL instruction was more effective than the traditional instruction in improving the participants’ use of SRL strategies, reading comprehension and problem solving. By Figures 3 and 4, $M$ predicted approximately 47% and 32.6% of the variance of CS and MS, respectively, in $M_E$, while these values were 32.8% and 25.9% in $M_C$. This shows the effectiveness of SRL instruction in improving the indirect effects of motivation on reading comprehension and problem solving.

By the similar analysis for the Model B (Figures 5 and 6), it can be said that SRL was the dominant predictor of RC and PS in SRL instruction. Therefore, instruction on SRL strategies and supporting students in using these strategies can improve academic achievement (Yildizli & Saban, 2016) and self-regulatory reading skills (Morshedian et al., 2016). Moreover, SRL increases the students’ autonomy and enables them to be actively involved in the process of problem solving (Ackerman & Thompson, 2015).

The results provided by MGA (Table 5) showed that in the experimental group ($M_E – M_T$), the path coefficients of the five relationships were significantly increased at 95% confidence level and the path
coefficients of the three relationships were significantly increased at 90% confidence level; while in the control group (M.C – M.C), this increase was not significant for the most of the relationships. In other words, SRL instruction created a significant increase in the relationship of SRL, CS and MS constructs with RC and PS constructs. This, along with the explanations given about $f^2$ and $R^2$ values show that the improvements in SRL through instruction mediate improvements in reading comprehension and problem solving. By this, the answers to the questions 3 and 4 get clear.

As to the research question five, the results of the independent sample t-test showed that after the treatment, the means of the variables of SRL, reading comprehension and problem solving in the experimental group (SRL instruction) were significantly greater than those in the control group (traditional instruction). This shows the efficiency of SRL instruction at improving EFL learners’ SRL strategies, reading comprehension and problem solving. These results are in keeping with some studies which show the positive effect of SRL instruction on the reading comprehension scores of students (e.g. Morshedian et al., 2016), SRL strategies (Pratontep & Chinwonno, 2008) and mathematical problem solving (Tzohar-Rozen & Kramarski, 2017).

5. Conclusion
The present study investigated the relationships of SRL and SRL components to reading comprehension and reading problem solving before and after SRL instruction of reading comprehension. It was found that from among SRL components, both cognitive and metacognitive strategies affected reading comprehension and reading problem solving significantly and directly. Moreover, motivation had an indirect effect on these outcome variables through mediating cognitive and metacognitive strategies. In addition, the strength of the relationships among SRL components, reading comprehension and problem solving was significantly increased after the treatment. By comparing the results of MGA, the measurement models, the structural model and the models’ goodness of fit, it became evident that SRL instruction was more efficient than the traditional instruction in improving the participants’ reading comprehension and reading problem solving. These results show the teachability of academic self-regulation and the necessity of teachers’ support in developing students’ strategic knowledge and self-regulation of reading in an EFL context (Morshedian et al., 2016). Therefore, by explicit training of SRL strategies which can be implemented successfully with reading materials in EFL classes, the students’ ability in reading comprehension and their ability in solving their reading problems improve to a higher extent.

SRL-based reading instruction might have significant implications for syllabus designers, teachers, and students. The syllabus designers might design a learner-centered curriculum in which they organize their syllabuses around self-regulated learning strategies and around tasks and learning activities which involve students in problem-solving situations. Moreover, the EFL books should help teachers to develop life-long learning conditions in the classroom and teach students to learn how to learn. Meanwhile, the teachers should create an ideal SRL environment in which students could generate the ideas, feeling and behaviors in order to reach their own goals and apply these strategies to other learning contexts too (Zimmerman & Schunk, 2001). When students gain knowledge of what they learn (cognitive strategies) and how they learn (metacognitive strategies), they will use these strategies to effectively acquire new information, and accordingly, they will become an independent thinker and an independent problem solver.

Finally, some limitations are imposed on this study. First, the kinds of surveys for SRL and problem solving used in this study were in the questionnaire form based on a Likert scale. Therefore, not being truthful about the answers may be an issue. Second, this study was conducted on a sample of Iranian elementary EFL learners. Therefore, the generalizability of the results to other EFL proficiency levels and other geographical contexts awaits further research. Third, PLS-SEM is mostly used for developing theories in exploratory studies (Hair et al., 2017). In order to have a strong theoretical support for the results of this study, covariance-based SEM softwares like Lisrel or Amos with large sample sizes can be applied for confirming these results.
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