The Differential Impact of Focused and Unfocused Oral Scaffolds on EFL Learners' Cognitive Knowledge and Cognitive Regulation

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Abstract

This study investigated the impact of orally presented scaffolds on cognitive knowledge and cognitive regulation among a cohort of female Iranian learners of English.Six intact groups of learners were assigned to five experimental conditions and a control group. All groups were tested on their cognitive knowledge and cognitive regulation through a pretest and two posttests. The results of the statistical analyses (one-way and repeated measures ANOVAs) showed that the participants who had received scaffolds significantly outperformed the control group on the posttests. The results also revealed that unfocused scaffolds functioned more efficiently in promoting the learners' metacognition, particularly regulation of cognition. The study also found that focused metacognitive scaffolds, when compared to other types of focused scaffolds, were more effective in improving the learners' metacognition.

Keywords: Cognitive Knowledge, Cognitive Regulation, Scaffolding.

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Originally defined as the "cognition about cognitive phenomena," or more simply "thinking about thinking" and introduced to educational psychology by developmental psychologist Flavell in the 1970s, metacognition has been known to be a higher-order thinking process, enabling individuals to exert active control over their own cognitive processes (Flavell, 1979, p. 906). An increasing number of studies have indicated that metacognitive awareness can contribute to individuals' educational success (Schraw & Dennison, 1994). In fact, those who were adequately motivated, but lacked the required metacognitive skills, were reported to fail to achieve high levels of self-regulation (Schraw, Crippen, & Hartley, 2006).

Given the mentioned effects of metacognition, designing interventions to develop and augment learners' metacognitive skills should be among the priorities of educators and program planners. Hence, empirical studies aiming at shedding lights on the ways in which educators can assist their learners to improve their metacognitive skills seem to be warranted. With the intention of providing empirical evidence on how educators can increase the learners' metacognitive skills by offering certain types of scaffolds, the present study aims to examine the impact of different types of orally offered scaffolds on cognitive knowledge and cognitive regulation as two components of metacognition among a cohort of Iranian learners of English in speaking tasks.

A Historical Overview

Metacognition

Since Flavell (1979) initially wrote his seminal work on metacognition, research on the concept of metacognition has enjoyed increasing popularity among many researches who have investigated different methods and techniques of developing and enhancing individuals' metacognition. In the educational literature, this type of research has been mainly motivated by the claims introducing metacognition as a predictor of the learners' regulatory skills (Schraw et al., 2006; Veenman, Van Hout-Wolters, & Afflerbach, 2006), and learning performance (Wang, Haertel, & Walberg, 1990).

Metacognition has been known to have two components or constituent parts, namely knowledge of cognition and evaluation of cognition or, as it is called, regulation of cognition (Brown, 1987; Cross & Paris, 1988; Flavell, 1979; Schraw et al., 2006). This dichotomy within metacognition stems from the distinction made between knowledge and skills (Veenman et al., 2006). Lai (2011) conducted a comprehensive literature review on metacognition, which led her to identify the components of the learner's metacognitive ability: three types of cognitive knowledge, namely knowledge of self, task, and strategy, as well as three types of cognitive regulation, namely regulating the planning process, being aware of comprehension and task performance, and evaluating the processes and products of one's learning. In other words, the knowledge which is separated from the skill in the dichotomy includes knowledge about one's own weaknesses and strengths (Flavell, 1979), the characteristics of certain tasks (Cross & Paris, 1988; Schraw et al., 2006; Schraw & Moshman, 1995), various learning and problem solving strategies (Flavell, 1979), and the most appropriate strategy for a particular context (Schraw et al., 2006). Identifying three knowledge sub-components, Schraw et al. (2006) used the term declarative knowledge to refer to knowledge about one's own characteristics as well as the knowledge about what factors influence one's performance and the term procedural knowledge to denote knowledge about various strategies. They also used the term 'conditional knowledge' to refer to knowledge of which strategy to apply in a certain task, as well as the knowledge about when and why to apply various cognitive actions. Veenman (2011) describes conditional knowledge as "the declarative knowledge about when a certain metacognitive strategy should be applied and to what purpose" (p.199).

The skill, however, takes account of the individuals' ability to plan learning activities – set goals, activate relevant background knowledge, and budgeting time –, monitor their learning process, and evaluate both the efficacy of their monitoring process and the outcome of their own learning activities (Schraw et al., 2006; Schraw & Moshman, 1995; Veenman, 2005). Schraw and Moshman (1995) identified planning, monitoring and evaluation as three main sub-components of regulation of cognition as a component of metacognition, arguing that while monitoring involves one's on-line awareness of comprehension and task performance, planning entails the selection of appropriate strategies as well as the allocation of resources that can impact performance. They also viewed evaluation as referring to assessment of the products as well as the processes of one's learning.

Scaffolding

The concept of scaffolding originated from the ideas put forward by Wood, Bruner, and Ross (1976) who viewed learning as requiring one-on-one interactions in which a more knowledgeable person provides the less knowledgeable one with assistance when needed. Scaffolding was also inspired by the socio-constructivist model of learning proposed by Vygotsky (1978) according to whom the scaffold should provide adequate assistance for the learners to be able to progress on their own. The assistance, Vygotsky stated, should be gradually withdrawn when the learners' competence increases (Hmelo-Silver & Azevedo, 2006; Hogan & Pressley, 1997; Sharma & Hannafin, 2007).

Four main features of scaffolds identified by Puntambekar and Hubscher (2005) are inter-subjectivity, which concerns collaboration and shared responsibility, the learner's engagement in an ongoing diagnosis of his/her current level of understanding, interactivity which necessitates active participation of both learners and the scaffold provider, and fading which indicates that the learner is finally able to carry out the task without the instructor's assistance.

Puntambekar and Hubscher (2005) identified a shared understanding of the goal of the activity, or as they call it intersubjectivity, which is obtained through collaborative redefinition of the task by the adult/ instructor and the learner/child as one of the indispensible features of scaffolds. Puntambekar and Hubscher (2005) also maintained that presenting the proper amount of assistance based on an ongoing diagnosis of current level of understanding of the learner/child was crucial for effective scaffolding. The provision of such assistance requires "a thorough knowledge of the task and its components, as well as the subgoals that need to be accomplished" as well as the knowledge about the learners' skills (p. 3). Interactivity, is the third key feature identified by Puntambekar and Hubscher (2005). Interactivity, to them, refers to the dialogic nature of scaffolds and active participation of both sides throughout the task. Finally fading or gradually dismantling the assistance when the learner/child signals ability to carry out the task without the instructor/adult's assistance is the last key feature identified by Puntambekar and Hubscher (2005).

Various dichotomies and taxonomies on scaffolds can be found in the literature. Molenaar, Roda, van Boxtel, and Sleegers (2012), for instance, distinguished static and dynamic scaffolding. They regarded static scaffolding as invariable over time and unchanged for all students, and dynamic scaffolds as the ones attuned to individuals. Similar accounts have been given by Saye and Brush (2002) who used the terms 'soft' and 'hard' to refer to dynamic and static scaffolds respectively. According to Saye and Brush (2002), to be able to provide the learners with soft scaffolds, the instructor is required to constantly monitor the learners' uptake and adjust her scaffolds to the responses given by learners.

Hannafin, Land, and Oliver (1999), also, distinguished among four types of scaffolding: conceptual, metacognitive, procedural, and strategic, arguing that while conceptual scaffolds guide the learners about what content to consider, procedural scaffolds provide them with directions and offer them guidance on how to think during the learning process and how to make use of the available resources and tools. They also regarded metacognitive scaffolds as prompting students to monitor and evaluate their own learning process and to set goals, while viewing the strategic scaffolds as providers of guidance about proper and alternative problem solving approaches in particular learning situations.

Another type of scaffolds identifiable in the literature is the motivational type that involves techniques designed to maintain or improve the learner's motivational state, such as attribution or encouragement (Alias, 2012; Chen, 2014). To Alias (2012), three categories of scaffolds can be found in the literature: (1) cognitive, (2) metacognitive, and (3) affective or motivational scaffolds. Alias stated that while "cognitive and metacognitive scaffolds provide assistance, support, hints, prompts, and suggestions regarding the content, resources, and strategies relevant to problem solving and learning management, motivational scaffolds involve techniques designed to maintain or improve the learner's motivational state, such as attribution or encouragement" (p. 138).

Drawing on Brophy's (1999) zone of motivational proximal development theory, Chen (2014, P. 342), similarly, maintained that adaptive scaffolds can be designed to "facilitate students' progressions on motivation", and suggested providing personalized scaffolds to promote motivation when learners are engaged in concept acquisition. However, as Belland, Chan Min, and Hannafin (2013) stated, research on motivational scaffolds is still scarce, and this type of scaffolds has not received sufficient attention.

Empirical Studies on the Impact of Dynamic Scaffolds on Metacognition

The study of the related literature revealed two major lines of studies pertaining to the investigation of the impact of scaffolding on metacognition. In one line of research, researchers have restricted their investigation to the effects of scaffolds offered by meta - tutors in computer assisted learning environments (e.g. Molenaar, Chiu, Sleegers, & van Boxtel, 2011; Molenaar et al., 2012).

Molenaar et al. (2011) carried out a study to investigate whether structuring and problematizing metacognitive scaffolds in a computer - supported learning environment affect metacognitive activities, metacognitive knowledge, and learning. Arguing that different forms of metacognitive scaffolds foster metacognitive activities differentially, they expected structuring and problematizing scaffolds to have differential effects on student learning, i.e., students' metacognitive knowledge and domain knowledge. Using a coding scheme, the researchers analyzed 51, 339 conversation turns by 54 elementary school students working in triads to explore the metacognitive activity, which they viewed as reflected in the turns that monitor or control cognitive activities. The metacognitive knowledge of the students was measured by asking them to imagine that they were going to do the same assignment again. They were asked to write down the steps that they would take to do this assignment. A full procedural overview consisting of 18 steps was made by the researchers to score the answers. The findings of their study revealed that students receiving structuring or problematizing metacognitive scaffolds displayed more metacognitive knowledge than students in the control group.

In the same study, Molenaar et al. (2012) investigated the effects of dynamic scaffolding of socially regulated learning on students' learning in a computer-based learning environment. One hundred and ten students divided over 5 classes in the Czech Republic were grouped in 55 dyads within their classes based on the principle of heterogeneity, balancing gender, school performance, and reading and computer abilities. The dyads in all classes were randomly assigned to one of two conditions: the control condition and the experimental condition. The dyads in the experimental group received scaffolds provided by a virtual agent, while the dyads in the control condition did not receive any metacognitive or cognitive scaffolds from the agent. The scaffolds were dynamically attuned to dyads' progress with an attention management system. The scaffolds were designed so as to support the metacognitive and cognitive activities as two aspects of socially regulated learning. The effects of dynamic scaffolding on dyads' perfor-performance, their perception of the learning environment, and students' knowledge acquisition were examined and it was found that scaffolding had a positive effect on the dyads' learning performance, but no significant effect on students' domain knowledge. The richness of the text was evaluated by counting the number of topics covered in at least a paragraph in the paper. Dyads in the experimental condition were found to have written better papers and to have asked more questions. They also showed to be more positive about their teachers and their collaborators than students in the control condition. Nevertheless, scaffolds did not affect the students' domain knowledge that was measured individually by a curriculum-based knowledge test with 15 true/false items related to New Zealand. The researchers explained this by referring to the fact that the focus of the assignment, in their study, "was not on acquiring new knowledge, but on writing the paper comparing the Czech Republic with New Zealand and acquiring new information by asking questions" (p. 521).

Azevedo, Moos, Greene, Winters, and Cromley (2008) carried out a study aimed at assessing the impact of dynamic scaffolds on students' learning in a hypermedia environment. The scaffolding was delivered by a human tutor. The researchers assessed learning outcomes by determining shifts in mental models and acquired domain knowledge. The results of their study revealed that the students receiving scaffolds developed better mental models and acquired significantly more domain knowledge on the labeling task and the flow diagram task.

In a study conducted by Moos and Azevedo (2008), self-report and think-aloud data were used to measure the effect of conceptual scaffolds on 37 undergraduates' monitoring, planning and self-efficacy during learning in a commercial hypermedia environment. Having been randomly assigned to either the No Scaffolding (NS) or Conceptual Scaffolding (CS) condition, participants used a hypermedia environment for 30 minutes to learn about the circulatory system. Self-report questionnaire of self-efficacy was administered at three points during the learning task (immediately prior to the 30-min hypermedia learning task, 10 min into the learning task, and 20 min into the learning task), while think aloud data were collected as the participants were involved in the learning task. According to the findings of Moos and Avezedo's (2008) study, in both conditions higher levels of self-efficacy were reported by the participants immediately before the hypermedia learning task and the monitoring decreased as the learners progressed through the hypermedia learning task. The analysis of the think aloud data also revealed that participants in the CS condition planned their learning more during the hypermedia learning task, when compared with participants in the NS condition.

A number of researchers have investigated the impact of scaffolding on learning outcome and the participants' learning outcome. These researchers either have shown no interest in exploring the effects of scaffolds on the learners' metacognition (e.g. Azevedo et al., 2008) or have concluded a positive effect on the metacognition based on the observed change in the performance of the participants in their studies. Thiede, Anderson, and Therriault (2003), for instance, asked the participants in their study to read text passages, to rate their comprehension of each passage, and to answer questions about each. Participants received overall feedback regarding test performance. The results of their study showed that feedback positively influenced subsequent test performance, which the researchers used to infer that feedback promoted their metacognitive skills.

The Present Study

Given the significance of metacognition and its components in supporting learning (Kuhn & Dean, 2004; Lai, 2011; Zimmerman, 2000; Schraw et al., 2006), studies conducted to look for interventions that can improve learners' metacognitive skills are plausible. Besides, to date studies on metacognition have mostly focused on its potential impacts on the learning out-outcome, or the concepts it can be linked to, such as meta-memory, self-efficacy, motivation, and critical thinking (Boekaerts, 1997; Pintrich & De Groot, 1990; Pintrich & Schunk, 2002; Schneider and Lockl, 2002; Schraw et al., 2006). Moreover, previous scaffolding studies mostly examined the effects of scaffolding on students' learning (Molenaar et al., 2011; Veenman, 2011) and focused on the effects of metacognitive scaffolds (Molenaar et al., 2011) and failed to investigate the possible differential effect of different types of scaffolds. To date, to the best of our knowledge, no studies have been carried out to investigate whether non-metacognitive scaffolds function as well as metacognitive scaffolds in promoting metacognition, and what aspect of metacognition is mostly affected by various types of scaffolds particularly in non-computer supported learning environment.

Additionally, little is known about the role of various types of focused oral scaffolds in the two components of metacognition. Moreover, “research on motivational or affective scaffolding is relatively scarce” (Alias, 2012, p. 138). Thus, to fill the gap in the literature and to provide empirically backed evidence for the efficacy of scaffolding in promoting metacognitive skills, this study attempted to investigate the effects of different types of oral scaffolds, namely motivational, conceptual, procedural, strategic and metacognitive scaffolds, on the cognitive knowledge and cognitive regulation among a cohort of Iranian female English learners

Metacognitive scaffolds are expected to increase metacognition. Yet whether cognitive (e.g. procedural, conceptual, and strategic) and motivational scaffolds can also promote metacognition is still a question that needs to be addressed. The present study, thus, was designed to answer the following questions: 1- Do different types of oral scaffolds significantly increase the participants' cognitive knowledge? 2- Do any of the scaffold types function more efficiently in increasing the participants' cognitive knowledge? 3- Do different types of oral scaffolds significantly increase the participants' cognitive regulation? 4- Do any of the scaffold types function more efficiently in increasing the participants' cognitive regulation?

Method

Participating learners

Six groups of female Iranian learners of English each consisting of 28 learners studying in 12 classes in a language school participated in this study. In the first session of a twenty-one session term, the pretest was administered to 209 intermediate learners who had all successfully passed Cambridge Preliminary English Test. The results of the pretest were analyzed and 168 learners whose scores were one standard deviation from the mean were chosen for the study. Each of the six conditions was organized in a way as to include the learners of no more than two classes. Thus, six conditions each consisting of 28 learners comprised the participants of the present study. The same teacher taught the learners in each condition. Although all the learners in those classes received the treatment and took the pretest and the posttests, only the scores of the selected participants were taken into account for data analysis.

Oral procedural scaffold condition. The participants in oral procedural scaffolds (OPS) condition were offered scaffolds focusing on how to utilize resources and tools such as the formulaic expressions they had been taught, the internet, and their dictionaries. They were given scaffolding on how to use different kinds of learning tools including books and on-line resources to increase the accuracy and complexity of their speech during the speaking task designed for the study. Procedural scaffolds offered to the participants in this condition introduced the means and resources available in the environment and were expected to assist the learners to find the proper directions. An instance of such scaffolds in the present study was prompting the participants to use their notes or certain formulaic expressions to increase the complexity of their utterances in an oral picture description task. Besides, the participants in this condition were taught how to use advance organizers to assist them in remaining on the right track throughout the talk.

Oral conceptual scaffold condition. The participants in the oral conceptual scaffolds (OCS) condition, on the other hand, were provided with scaffolds focusing on what to consider mostly with regard to the content of their utterances and the adequacy of their reasoning and description. The participants in this condition were guided to reconsider the content and to make sure that they had expressed themselves clearly and supported their ideas with convincing arguments in oral reasoning tasks.

Oral metacognitive scaffolds condition. The participants in the oral metacognitive scaffolds (OMS) condition received hints and prompts assisting them to control and monitor their learning. Such scaffolds were intended to support students' metacognitive activities. Examples of such scaffolds are as follows: "How do you evaluate your performance?", and "What do you plan to start your next argument/ How do you plan to answer this counterargument?"

Oral strategic scaffolds condition. In the oral strategic scaffolds (OMoS) condition, the participants were provided with hints regarding the existence of alternatives even if the performance of the participants were acceptable. Strategic scaffolds also prompted the participants to investigate and consider all possible options when deciding to opt for a particular form to convey meanings and ideas.

Oral motivational scaffolds condition. In the oral motivational scaffolds (OMoS) condition, the participants' confidence was built and developed through the provision of opportunities for success. The participants' achievement and improvement were made explicit to them. The strengths of their oral performances were magnified, while the weak points were discussed quite briefly with them.

Oral unfocused scaffolds condition. In the oral unfocused scaffolds (OUS) condition, the participants received a combination of different types of oral scaffolds.

Control group. The participants in the control group (CG) were asked to do the routine classroom activities and to take part in oral picture description and reasoning tasks. Nevertheless, they were not given any written or oral scaffolds throughout the term.

Participating teachers

Five teachers teaching the intermediate levels volunteered to participate in the study. Four of them were selected to teach the experimental condition classes, namely OPS, OMS, OCS, OMoS, while the fifth one taught the control group. The teachers selected to instruct the experimental conditions, all of whom held a maters' degree in either teaching English as a foreign language or linguistics, were briefed on the aim of the study. They were also trained on the use and types of scaffolds for two hours and were required to study Hannafin, et al.'s (1999) paper. Further, they were asked not to hesitate to refer to the researchers in case of any confusion. In order to make sure the scaffolds offered to the participants in the experimental were dynamic, the teachers were asked to attune the scaffolds to the participants in their condition and not to adopt a pre - determined set of stages for all. They were also required to offer the assistance and prompt the participants, in the ways mentioned above, as long as needed. The four features of scaffolds as identified by Puntambekar and Hubscher (2005) were discussed with the participating teachers and they were asked to adjust their oral feedback in such a way as to meet the four conditions.

Finally, the last experimental condition (OUS) was taught by one of the researchers. Attempts were made to include all four types of scaffolds mentioned above, while offering the participants feedback on their performance in the speaking tasks. An attempt was also made to adapt the scaffolds to each individual in this condition.

Instruments

The Metacognitive Awareness Inventory (MAI), a 52-item self-report developed by Schraw and Dennison (1994), was deployed to measure the learners' cognitive regulation and cognitive knowledge. As this inventory was developed based on a two-component model of metacognition–knowledge of cognition and regulation of cognition–it was considered appropriate for the purpose of this study. The Knowledge of Cognition scale has been designed to mirror the learners' declarative knowledge, procedural knowledge, and the conditional knowledge, whereas, the Regulation of Cognition scale is aimed at reflecting learners' ability in planning, information management, debugging, monitoring, and evaluation (Schraw & Dennison, 1994). The participating learners were required to indicate degrees of agreement with each statement on a Likert-type scale, ranging from a score of one (Never True) to a score of six (Always True).

Schraw and Dennison (1994) reported high internal consistency for the inventory which was confirmed by the estimates of internal consistency gained in the present study (α=0.89 for the Knowledge of Cognition scale, and α=0.92 for the Regulation of Cognition scale).

Instructional Materials

The course consisted of 42 hours of general English instruction. All the four skills – speaking, writing, reading, and listening–were worked on during the course. Most of the class activities, however, were designed to help the learners improve their speaking skill. The intermediate book of the Total English series was taught as the main course book.

Design and Procedure

This study followed the quasi-experimental design using a pretest, a posttest, and a delayed posttest for each group, requiring the participants in all conditions to answer the self-report prior to, immediately after, as well as two weeks after the intervention. The instructor was available to answer the participants' questions and elaborate on the items during questionnaire administration.

The intervention included the provision of various types of focused scaffolds during oral picture description and reasoning tasks. During the 42 hours of treatment, six picture description and seven oral reasoning tasks were incorporated into the class activities. The picture description activities required the participants to describe a photo (time limit=5 minutes), while, in the reasoning oral tasks, the participants were required to justify a choice and/or express agreement or disagreement with a statement and to provide reasons and supporting arguments (time limit=5 minutes). The posttest was administered immediately after the intervention in the final session of the class, and the delayed posttest using the same instrument was administered two weeks after the posttest.

Results

Firstly, for each scale, a one-way ANOVA was run so as to find out whether there were any statistically significant differences among the six groups' scores on the pretests. The results showed no statistically significant group differences among the six groups, both in the Knowledge of Cognition scale, $F(6, 189)=1.80$, $p>0.05$, $\mu 2=0.05$, and in the Regulation of Cognition scale, $F(6, 189)=1.35$, $p>0.05$, $\mu 2=0.04$. Thus, any improvement in the posttests could be considered attributable to the treatment.

To answer the first two questions of the study, the researchers ran an ANOVA with repeated measures to compare scores on the Knowledge of Cognition test at Time 1 (prior to the intervention), Time 2 (following the intervention), and Time 3 (two weeks follow-up). Table 1 shows the repeated measures ANOVA results of the Knowledge of Cognition scale scores across the experimental conditions and the control group.

As it is illustrated in table 1, repeated measures ANOVA for the Knowledge of

Table 1. Repeated measures ANOVA of the Knowledge of Cognition Scores

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Within-subjects time	2	4950.12	58.39	.00	.23
time * treatment	12	1241.19	14.64	.00	.31
Between-subjects treatment	6	5850.44	20.98	.00	.40

Cognition scale showed a significant main effect for time, F(2, 189)=58.392, p<0.05, partial eta squared=.236, a significant main effect for treatment, F(6, 189)=20.98, p<0.05, partial eta squared=0.400, and also a significant effect for treatment × time interaction, F(12, 189)=14.641, p<0.05, partial eta squared=0.31. A post hoc scheffe's test was run to further probe into the effect of treatment types on participants' knowledge of cognition component of metacognition. The results of the scheffe's test are demonstrated in Table 2.

Table 2. Multiple Comparisons (Scheffe's Test): Knowledge of Cognition

Group	Control (M=64.95)	OMS (M=80.79)	OCS (M=72.08)	OPS (M=73.71)	OMoS (M=65.28)	SS (M=75.73)	OUS (M=87.73)
CG		-17.20*	-7.13*	-8.76*	-.33	-10.78*	-22.78*
OMS			10.07*	8.44*	16.86*	6.41*	-5.58*
OCS				-1.63	6.79*	-3.65	-15.65*
OPS					8.42*	-2.02	-14.02*
OMoS						-10.45*	-22.45*
OSS							-12.00*

As table 2 shows, a significant difference was detected between OMS, OPS, OCS, OSS, and OUS and the control group. Nevertheless, no statistically significant difference was found between the mean scores of the OMoS and CG. Thus, all but one type of scaffolds were found to have increased participants' knowledge of cognition.

To answer the second question, the researchers further analyzed the results of the post hoc test. The results indicated that the OUS had performed significantly better than the other experimental conditions. Moreover, the OMS was found to have obtained a mean score significantly higher than those of the OCS, OPS, OSS, and OMoS. Besides, no significant difference was observed among the OPS, OCS, and OSS all of which performed significantly better than OMoS.

Pair-wise comparisons were run to compare the performance of the conditions across the three administrations of the test and to further probe the effect of time in the Knowledge of Cognition scale. The results of the pair-wise comparisons indicated that on the whole, participants' performance in the posttest (M=81.28, SD=73) was significantly better than their performances in both the pretest (M=67.59, SD=0.93) and the delayed posttest (M=74.69, SD=0.89). Besides, it was observed that the mean scores gained in the delayed posttest were significantly higher than those in the pretest. This indicated that the scaffolding techniques resulted in both immediate and long term growth in cognitive knowledge.

Next, another ANOVA with repeated measures was run to compare scores on the Regulation of Cognition test at three testing times and to find the answer the third question which concerned the effect of different types of oral scaffolds on cognitive regulation. Table 3 shows the repeated measures ANOVA of the Regulation of Cognition scale scores across the experimental conditions and the control group.

Table 3. Repeated measures ANOVA of the Regulation of Cognition Scores

Source	df	Mean Square	F	Sig.	Partial Eta Squared
Within-subjects Time	2	165257.21	408.51	.00	.68
time * treatment	12	25599.38	63.28	.00	.66
Between-subjects treatment	6	64471.56	87.132	.00	.73

As Table 3 depicts, repeated measures ANOVA for the Regulation of Cognition scale revealed a significant main effect for time, F(2, 189)=408.51, p<0.05, partial eta squared=.68, a significant main effect for treatment, F(6, 189)=87.13, p<0.05, partial eta squared=0.734, as well as a significant effect for treatment × time interaction, F(12, 189)=63.28, p<0.05, partial eta squared=0.66.

To further delve into the effect of treatment types on participants' regulation of cognition component of metacognition, a post hoc scheffe's test was run the results of which are shown in Table 4.

The results of the pair-wise comparisons for the time effect in the regulation of cognition further demonstrated that, similar to the results obtained in the Knowledge of Cognition scale, participants' performance in the posttest (M=137.35, SD=1.83) was significantly better than their performances in both the pretest (M=86.72, SD=1.41) and the delayed posttest (M=116.46, SD=1.41). The delayed posttest mean scores were also significantly higher than those in the pretest. The result of the pair-wise analysis, thus, showed the scaffolding techniques resulted in both immediate and long term growth in cognitive regulation.

Table 4. Multiple Comparisons (Scheffe's Test): Regulation of Cognition

Group	Control (M=85.98)	OMS (M=152.46)	OCS (M=100.58)	OPS (M=101.46)	OMoS (M=100.70)	SS (M=99.29)	OUS (M=154.15)
CG		-66.47*	-14.59*	-15.47*	-14.71*	-13.31*	-68.16*
OMS			51.88*	51.00*	51.76*	53.16*	-2.167
OCS				-.881	-.119	1.28	-53.57*
OPS					.762	2.16	-52.69*
OMoS						1.405	-22.45*
OSS							-54.85*

As Table 4 demonstrates, all experimental conditions gained means significantly higher than the one obtained by the CG, which indicated that all scaffold types could increase the participants' regulation of knowledge.

The results of the Scheffe's test for the repeated measures of ANOVA were further analyzed to answer the fourth question and compare the effect of various scaffold types on cognitive regulation. The mean scores of both the OMS (M=152.46) and the OUS (M=154.15) conditions were significantly higher than those the OPS (M=101.46), the OCS (M=100.58), the OSS (M=99.29), and the OMoS (M=100.70) conditions. Nevertheless, no significant difference was detected between the OUS and OMS conditions, and also among the OSS, OCS, and OPS conditions.

The results of the post-hoc comparison tests were also used to answer the question concerning the differential impact of focused and unfocused scaffolds with regard to cognitive regulation. Post-hoc tests using Scheffe analysis revealed that the unfocused scaffolds condition had outperformed all the focused scaffolds conditions but one (metacognitive scaffolds) in the Regulation of Cognition scale. The unfocused scaffolds condition, however, did not get a significantly higher mean score than the one gained by the metacognitive scaffolds condition for the Regulation of Cognition scale.

Discussion

With regard to the first research question concerning the impact of scaffolds on participants' cognitive knowledge, the results of the repeated measures of ANOVA and post hoc tests revealed metacognitive, procedural, conceptual, strategic, and unfocused scaffolds could significantly improve the participants' ability to regulate their cognition and increase their knowledge of cognition. Nonetheless, motivational scaffolds failed to increase the participants' cognitive knowledge.

The results gained in the current study concerning the impact of metacognitive scaffolds, which were found to affect learners' knowledge of cognition positively, echo Veenman (2005, 2011) ideas regarding the effectiveness of meta-cognitive scaffolding in triggering metacognitive activities and increasing metacognitive knowledge.

Regarding the impact of procedural, conceptual, and motivational scaffolds, this study has made an important contribution in that not only was the impact of such scaffolds on metacognition not addressed in previous studies, but also the results revealed which component of metacognition was affected by various types of scaffold. In cognitive knowledge scale, the OMoS failed to gain a significantly higher mean score in the posttest, when compared to the control group. This can indicate that this type of scaffolds fail to promote the individuals' declarative, procedural, and/or conditional knowledge. The results also demonstrated that cognitive scaffolds, such as conceptual, procedural and strategic ones, were also effective in increasing learners' cognitive knowledge.

With regard to the second research question addressing the possible differential impacts among the scaffold types in terms of increasing learners' cognitive knowledge, offering a combination of scaffold types and not focusing on a certain kind was found to be the best scaffolding technique. This provides empirical backing for Belland, Gu, Armbrust, and Cook's (2013) suggestions regarding the provision of a diversity of scaffold types to cater for a range of learners' abilities. Moreover, among the focused scaffolds, metacognitive scaffolds were found to function more effectively in promoting the learners' knowledge of cognition. Hence, the results indicated that presenting merely metacognitive scaffolds and depriving learners of other scaffold types was not as fruitful as providing different kinds of scaffolds simultaneously in increasing metacognitive knowledge. According to the findings of this study, thus, to gain the best results when intending to increase learners' cognitive knowledge, instructors should not suffice to metacognitive scaffolds.

Regarding the third research question, the results yielded support for the effectiveness of all scaffold types, focused and unfocused, in increasing the participants' regulation of cognition. The results demonstrated that not only metacognitive but also cognitive and motivational scaffolds could improve learners' ability to regulate their cognition and plan, monitor, and evaluate their learning. Metacognitive scaffolds in the OMS elicited explicit discussion of planning and assessment of whether the set goals were met, which according to Davis (2003) can promote planning and evaluation skills.

The findings of the present study are also in line with those of the studies suggesting that training and practice can promote monitoring ability (e.g. Delclos & Harrington, 1991), as the learners in the OMS condition who had received prompts to monitor their performance outscored the other conditions in the posttest. This also supports the findings of Molenaar et al.'s (2011) study in which the learners who received metacognitive scaffolding showed proportionately more metacognitive activities. The results of the present study concerning the impact of the metacognitive scaffolds on the metacognitive skills of the learners are also congruent with those by Azevedo et al. (2008) who reported that metacognitive scaffolding could improve learners' metacognitive activities. With regard to the impact of conceptual scaffolds, the results gained in the current study echo the findings of Moos and Azevedo (2008) who reported the learners who received conceptual scaffolds in a computer-mediated learning environment used more processes related to planning during the hypermedia learning task than participants who were not offered any conceptual scaffolds.

The results also indicated that motivational scaffolds could increase the learners' ability to regulation their cognition. Motivational scaffolds and verbal persuasion increases learners' self-efficacy (Bandura, 1997) which is a construct directly and positively related to the ability to monitor and control thoughts (Moores, Chang, & Smith, 2006; Rahimi & Abedi, 2014). The findings of this study, hence, echo recommendations by Boyer, Phillips, Wallis, Vouk, and Lester (2008) regarding the use of motivational scaffolds in classrooms and offering a balanced diet of motivational and other types of scaffolds.

Finally, concerning the last research question and the differential impact of various scaffold types on regulation of cognition, superiority was observed between the performance of metacognitive and unfocused scaffolds and the other conditions. However, no statistically significant difference was detected when OMS condition was compared to the OUS in the Regulation of Cognition scale. This marks prompts eliciting metacognitive moves as the pivotal factor in increasing learners' ability to plan, monitor and evaluate their learning and to regulate their cognition. Similarly, no significant difference was found when the performance of the learners in OPS, OMoS, and OCS conditions in the Regulation of Cognition scale were compared, indicating that cognitive and motivational scaffolds, although not as helpful as metacognitive ones, are equally effective in inducing metacognitive behaviors among learners.

Conclusion and Implication for Classrooms

The present study shed some lights on the efficacy of various types of focused and unfocused scaffolds on English as a foreign language learners' metacognition. The findings can provide an impetus for the encouragement of the incorporation of various types of dynamic scaffolds while responding to learners' performance in class activities. The results can also motivate English instructors to avoid sufficing to one type of scaffolds and instead to employ other types of scaffolds such as motivational and affective ones in their teaching practice, as the learners who received unfocused scaffolds outperformed the ones who had received focused scaffolds. It is likely that certain combination of scaffolds (e.g. metacognitive and motivational or metacognitive and procedural) has led to the superiority of the unfocused scaffolds over the focused ones. However, because in the present study the OUS condition learners received a combination of all other four types, it was not discovered which certain combination created the effect. Future research can investigate various possible combinations of scaffolds in different unfocused scaffold conditions as compared to focused ones. The results also stress the important role of metacognitive scaffolds and hint to the necessity of teacher training courses in which instructors are familiarized with this type of scaffolds as valuable teaching tools. The present study highlights the fact that language learners require assistance in the form of prompts and cues reminding them of the necessity of planning, monitoring, and reflecting resulting in evaluation to be able regulate the cognition and expand their knowledge of cognition.

Limitations and Recommendations

One of the limitations pertains to the fact that in the current study, the scores gained in the subscales of the two metacognition components were not separately analyzed; hence, claims cannot be made as to which of these types of knowledge, and/or skill were mostly affected by various kinds of scaffolds. Further research can broaden the scope of the analysis to each subcomponent to increase the accuracy of the interpretation, and to provide a more complete picture.

In addition, caution is required when interpreting the results of this study due to the relatively small number of learners in each condition, and any claims of extrapolating the effects to all language learning contexts depend upon further confirmation. The fact that all the learners in the study were female English learners also affects the generalizability of the findings to other EFL contexts.

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