Metacognitive Awareness Inventory for Teachers (MAIT)

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Abstract

Introduction. In research literature there have been a great number of attempts to conceptualize the construct of metacognition over the last three decades. The concept itself has increased its popularity in almost all disciplines ranging from communication to nursing. This popularity has been materialized with a lot of metacognitive inventories developed in time. However, there is no inventory specifically designed solely for teachers, of which we know in the literature. At this point, this study aims at modifying Metacognitive Awareness Inventory for Teachers by making use of the inventory developed for metacognitive awareness of adults.

Method. Consisting of three phases carried out, this study was conducted so as to make the inventory reliable and valid to be used in educational research paradigm. Each phase consisted of steps, namely items construction, external feedback, SPSS analyses, and inventory piloting with a number of student teachers.

Results. The results of this three-phase study support the validity and reliability of scores on the inventory modified by the researcher who based it on the Metacognitive Awareness Inventory (MAI).

Discussion and Conclusion. The modified version of MAI, entitled MAIT, seemed to make a valid and reliable inventory to measure teachers' metacognitive awareness. Thus, this inventory would be utilized as a tool to measure teachers' metacognitive awareness in educational research area.

Keywords: Metacognition, Metacognitive Awareness, Teacher, Validity, Realibility.

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Inventario de Conciencia Metacognitiva para Docentes (MAIT)

Resumen

Introducción. En las publicaciones científicas se han producido un gran número de intentos de conceptualizar la construcción de la metacognición en los últimos tres decenios. El concepto en sí ha aumentado su popularidad en casi todas las disciplinas que van desde la comunicación a la enfermería. Esta populariadad se ha materializado con una gran cantidad de inventarios metacognitivo desarrollado. Sin embargo, no existe un inventario específicamente diseñado, exclusivamente para los profesores, que conozcamos por la literatura. En este punto, este estudio tiene por objeto elaborar un inventario de la conciencia metacognitiva para los profesores, a partir del inventario desarrollado para la conciencia metacognitiva de los adultos.

Método. El estudio consta de tres fases con el fin de hacer el inventario fiable y válido para ser utilizado en el contexto de la investigación educativa. Cada fase consistió en diferentes pasos, es decir, construcción de elementos, retroalimentación externa, análisis de SPSS, y pilotaje del inventariocon un número de estudiantes de pedagogía.

Resultados. Los resultados de este estudio, en tres fases, dan apoyo a la validez y fiabilidad de las puntuaciones en el inventario modificado por el investigador que se basa en el Inventarioa de conciencia metacognitiva (MAI).

Discusión y Conclusiones. La versión modificada del MAI, titulado MAIT, es un un inventario válido y fiable para medir la conciencia metacognitiva de los docentes. Por lo tanto, este i-ventario puede ser utilizado como una herramienta para medir la conciencia metacognitiva docente, en el área de la investigación educativa.

Palabras clave: Metacognición, conciencia metacognitiva, profesorado, validez, fiabilidad.

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Introduction

In research literature there have been a great number of attempts to conceptualize the construct of metacognition over the last three decades (Baker & Brown, 1984; Flavell, 1976, 1979; Garrison, 1997; Hacker, Dunlosky, & Graesser, 1998; Paris & Winograd, 1990; Schraw, 1998; Schraw & Dennison, 1994). The literature is replete with definitions of metacognition up to date (Brown, 1985; Flavell, 1976, 1979; Garrison, 1997; Hacker, Dunlosky, & Graesser, 1998; Paris & Winograd, 1990; Schraw & Dennison, 1994). However, there is no general consensus of the most agreed-upon definition of metacognition as yet (Hacker, 1998). It was Flavell (1970) who first coined the term and defined it as "our awareness of the learning process". Flavell, later, (1976, p. 232) described metacognition as "one's knowledge concerning one's own cognitive processes and products or anything related to them, e.g. the learning-relevant properties of information or data". Hacker's definition of metacogniton, though, has proved remarkably robust and remains the most widely cited definition in the field. Hacker (1998, p. 11) believed that "metacognition includes both knowledge of one's knowledge, processes, cognitive and affective states, and the ability to consciously and deliberately monitor and regulate one's knowledge, process, and cognitive and affective states". Since then, the relevant literature has tended to focus on two aspects of metacognition: a) metacognition knowledge b) metacognitive regulation. Indicating the assumption that metacognition plays a key role in different disciplines such as oral communication, reading comprehension, and writing comprehension, Flavell (1979) offered four classes of phenomena, which, he believes, that have very close ties with the monitoring of a wide variety of cognitive enterprises. Metacognitive knowledge, metacognitive experiences, goals (or tasks) and actions (or strategies). Metacognitive knowledge is "the stored world knowledge that has to do with people as cognitive creatures and with their diverse cognitive tasks, goals, actions and experiences" (Flavell, 1979, p. 906). That is to say, metacognitive knowledge consists of knowledge or beliefs that drive cognitive enterprises to emerge in the process of factors or variables (Flavell, 1979, 1987). Within this perspective, metacognitive knowledge includes three major categories: a) person b) task c) strategy. In Flavell's (1979, p. 907) remarks, "the person category encompasses everything that you could come to believe about the nature of yourself and other people as cognitive enterprises". In other words, a learner confronted with a particular learning situation needs to know his/her existing situation in terms of how much information s/he has related to that particular learning. Another category is task which "concerns the information available to you during a cognitive enterprise" (Flavell, 1979, p. 907). A learner needs to understand what variations enable what cognitive enterprises in achieving the task. The last category is “strategy”. There is a great deal of knowledge that could be acquired concerning “what strategies are likely to be effective in achieving subgoals and goals in what sorts of cognitive undertakings” (Flavell, 1979, p. 907). It basically refers to what kind strategies each learner needs to undertake when s/he is confronted with a particular learning situation/problem to deal with. Metacognitive experiences, on the other hand, are “any conscious cognitive or affective experiences that accompany and pertain to any intellectual enterprise” (Flavell, 1979, p. 906). In a broader context, they can be best described as “items of metacognitive knowledge that have entered consciousness” (Flavell, 1979, p. 908). Related to what metacognitive experiences propose with regard to cognitive goals or tasks, metacognitive knowledge, and cognitive actions or strategies, Flavell (1979) pinpointed three important implications for this. First, metacognitive experiences have the power of influencing metacognitive knowledge along with a variety of actions including adding, deleting or revising. Second, they can guide learners to recreate new goals and revise them on the basis of old ones. Third, metacognitive experiences can arouse strategies that may be employed in the face of cognitive or metacognitive goals.

Congruent with Flavell’s insights about metacognition (1979), Paris and Winograd (1990) proposed two aspects of metacognition, namely cognitive self-appraisal and self-management of cognition. While the former is described as “personal reflections about one’s own knowledge states and abilities” (Paris & Winograd, 1990, p. 17), the latter can be considered to be “metacognition in action, i.e. how metacognition helps to orchestrate cognitive aspects of problem solving” (Paris & Winograd, 1990, p. 18). As is easily recognized in these two aspects of metacognition, they both refer to thinking processes and the particular actions and insights when one is confronted with one’s cognitive enterprises. Corroborating with Flavell (1979)’s framework, Schraw and Moshman (1995) believed that metacognition can be broken into two parts. Drawing the studies conducted by Brown (1987), Baker (2001) and Paris and Winograd (1990) who distinguished knowledge of cognition from regulation of cognition, Schraw and Moshman (1995) proposed a distinction between metacognitive knowledge and metacognitive regulation. What Paris and Winograd (1990) call “self-appraisal” can be best associated with Schraw’s concept of “knowledge of cognition”, while self-management is very identical to Schraw’s concept of regulation (Schraw, 2001). Schraw and Moshman’s distinction between metacognitive knowledge and metacognitive regulation seems to have received a lot of approval from academicians and has been widely used in many research studies. Other than two key figures in the field of metacognition, there are, however, different levels of metacognitive processing. Kluwe (1982, cited in Hacker, Dunlosky, & Graesser, 1998), differentiated between executive monitoring processes, which are directed at the acquisition of information about the person's thinking processes, and executive regulation processes that are directed at the regulation of the course of one's own thinking. In this context, the first provides a ground for identifying the task, checking current progress of that task, evaluating that progress, and guessing what the result is likely to occur. The second, on the other hand, is concerned with certain decisions on employing his or her resources for the given task, determining the order of steps to be taken to complete the task, and pacing on the completion of task.

When it comes the question of how metacognition relates to learning, Flavell (1987, p. 27) emphasized that "metacognition is congruent with the learners' need and desire to communicate, explain and justify thinking to organisms as well as to himself". In a similar vein, a wide range of researchers agree to provide learners with the best environment to develop metacognitive knowledge and skills since learning is internalized through interaction and communities (Flavell, 1987; Paris & Winograd, 1990; Schraw, 2001; Schraw & Moshman, 1995). One of the studies that explore the relationship between metacognition and learning gains is that Jones et al. (1987, cited in Sinclair, 1999) who found that metacognitive awareness was related to success in language learning in the sense that successful learners were aware of the processes about their own learning processes and of the appropriate strategies to manage their own learning effectively. Young and Fry (2008), based on their research study where they investigated to reveal the relationship between metacognitive awareness and academic achievement in college students, found out that there are correlations between the MAI (Metacognitive Awareness Inventory) and cumulative GPA (Grade Point Average). These results provide support for the validity of the MAI as it relates to academic measures. On the other hand, Stevens (2009) investigated availability of a method for the development of metacognitive self-knowledge and also a means for discovering what academic experiences students perceive as influential in their development as learners. In a qualitative research design, the researcher concluded that metacognitive self-knowledge can be developed through the use of a guided reflection activity and that the guided reflection activity used in the study identified and illuminated academic experiences that students perceive as salient for their learning. There is little evidence that metacognition is related to academic success despite the fact that there are popular ideas in the literature. Coffey (2009), for example, examined whether writing instruction in a mathematics classroom increased metacognition. Students who are supported in using metacognition can increase their understanding in the classroom. Utilizing a pre-test-post-test control group, the researcher asked the participants to complete a mathematics problem solving assessment, which was analyzed with a rubric for accuracy and a survey concerning how they used metacognitive skills for the problem solving activity. She concluded that there was a relationship between metacognition and writing. Lee (2009) examined the relationships between metacognition, self-regulation and students' critical thinking skills and disposition in online Socratic Seminars for ninth grade World Geography and Culture students. Based on the findings of the study, she argued that self-regulation had significant relationships with students' critical thinking disposition, but not with students' critical thinking skills for both the experimental and the control group. Using semi-structured interviews with four students from a community college to investigate the use of e-portfolios as a tool for reflection/metacognition, Zellers and Mudrey (2007) put forward that there are two broader dimensions of the use of e-portfolios. The benefits are as follows. 1) Potential for raising student metacognition. 2) Potential for raising student achievement. Another benefit, instructor implementation, also consists of five important components. The components are clarity of purpose, coaching students in the reflective process, providing feedback throughout the process, addressing technological issues, and evaluating whether a course is well suited for a portfolio. The researchers concluded that electronic portfolios can be an effective tool for increasing student metacognition on condition that the way instructors implement it is very meaningful to the effectiveness itself. In a similar research study, Meyer, Abrami, Wade, Aslan and Deault (2010) conducted a research study in three Canadian provinces with 32 teachers and 388 students to answer the research question "Can an electronic portfolio have a positive impact on the literacy practices and self-regulated learning skills of students?". Using a non-equivalent pretest/ post-test design, the researchers found out that grade 4–6 students in the experimental group compared to the students in the control group showed significant improvements in their writing skills on a standardized literacy measure.

Metacognitive Awareness: Definitions and Trends

If it is the aim of education to let learners take charge of their own learning, then they need to be able to plan, monitor and evaluate their learning. In order to do so, they need to be metacognitively aware. Q'Malley, Chamot, Stewner-Marizanares, Kupper, and Russo (1985,

p. 24) summarized it: "Students without metacognitive approaches are essentially learners without direction and ability to review their progress, accomplishments and future learning directions". Oxford (1990) also pointed out that metacognitive strategies are essential for successful language learning. Strategies like organizing, setting goals and objectives, considering the purpose, and planning for a language task help learners arrange and plan for their language learning in an efficient way. The students without metacognitive strategies will never become autonomous learners because they don't know how to arrange, regulate, and evaluate their learning activities.

However, there is no explored relationship between metacognitive awareness and learning gains in the relevant literature. Only a few studies simply indicate that metacognitive awareness is an important element in learning and crucial to the development of effective learning (Wenden, 1991, 1999; Wilkins, 1997). Even though there are popular ideas available everywhere without specific research studies which support this view, metacognitive awareness plays a pivotal role in the effectiveness of learning process, which, however, needs to be researched. Simply described as being aware of one's own knowledge, processes, cognitive and affective states as well as of regulation of those states (Flavell, 1976, 1979) metacognitive awareness consists of three parts: thinking of what one knows (metacognitive knowledge), thinking of what one is currently doing (metacognitive skill) and thinking of what one's current cognitive or affective state is (metacognitive experience) (Hacker, Dunlosky, & Graesser, 1998). What is important is that all this knowledge, the beliefs and perceptions are much related to development of autonomy in that they are required to make informed decisions about one's own learning/teaching. Researchers (Brown, 1987; Schraw, 2001; Schraw & Moshman, 1995) elaborated on the distinction between metacognitive knowledge and metacognitive regulation. Efklides (2001, p. 299) described metacognitive knowledge as "knowledge we retrieve from memory and regards what the person knows or believes about him/herself and the tasks, goals, actions or strategies as well as the experiences s/he has had in relation to them". Flavell's overall definition of metacognition seems to be very close to this one as there are overlapping features that view metacognition in relation to tasks, goals, actions, or strategies. However, the role of memory is missing in the former one.

Metacognitive knowledge (or knowledge of cognition) contains three kinds of knowledge: declarative knowledge, procedural knowledge, and conditional knowledge (Brown, 1987; Jacobs & Paris, 1987, Schraw, 2001; Schraw & Moshman, 1995). In brief, declarative knowledge refers to “knowing about things”, procedural knowledge refers to “knowing how to do things”, and finally conditional knowledge is “knowing the why and when aspects of cognition" (Schraw & Moshman, 1995, p. 352). More specifically, declarative knowledge includes individuals’ conceptions, and also their beliefs of task structures, their cognitive goals, and their own personal abilities (Schraw, 1998; Schraw & Moshman, 1995; Schraw, Crippen, & Hartley, 2006). Presley, Borkowski, & Schneider (1987) recognized the importance of declarative knowledge in learning, particularly in relation to metamory in light of the results of their research study. Procedural knowledge, on the other hand, refers to “knowledge about the execution of procedural skills” (Schraw & Moshman, 1995, p. 353). In a broader sense, much of this knowledge is reflected through strategies that lead individuals to resolve the problems if there is any. Presley, Borkowski, and Schneider (1987) affirmed that individuals with a higher degree of procedural knowledge tend to possess a larger repertoire of strategies, and to sequence strategies effectively. Procedural knowledge basically includes information about how individuals perform cognitive tasks (Jacobs & Paris, 1987; Paris & Paris, 2001; Pintrich, 2002; Schraw, 1998; Schraw, Crippen, & Hartley, 2006). Conditional knowledge refers to “knowing when and why to apply various cognitive actions (Schraw & Moshman, 1995, p. 353). Young and Fry (2008) particularly refer to the knowledge we have about the conditions under which we can implement various cognitive strategies. This statement is very similar to Schraw and Moshman’s in that conditional knowledge ultimately concerns selected various strategies depending upon the condition in which learning is internalized. On the other hand, Reynolds (1992), based on his research study, claimed that conditional knowledge is important because it helps students selectively allocate their resources and use strategies more effectively. To put it more clearly, conditional knowledge includes the understanding of both the value and the limitations of the procedural knowledge and knowing when, how, and why procedures should be used (Jacobs & Paris, 1987; Pintrich, 2002; Schraw, 1998; Schraw, Crippen, & Hartley, 2006). As for metacognitive regulation (or regulation of cognition), it refers to “metacognitive activities that help control one’s thinking or learning” (Schraw & Moshman, 1995, p. 354). In contrast to metacognitive knowledge, metacognitive regulation is more related to a set of actions and events so as to facilitate learning than a set of knowledge that shapes how those actions emerge. Schraw (2001) accentuated that metacognitive regulation involves performance in a number of ways, including better use of intentional resources, better use of existing strategies, and a greater awareness of comprehension breakdowns.

As Schraw and Moshman (1995) pointed out, there are several regulatory skills that have been mostly referred in research literature. Pertaining to metacognitive regulation, three regulatory skills namely planning, monitoring, and evaluating (Kluwe, 1987; Jacobs & Paris, 1987) occupy an important role in regulating students' skills concerning their own learning processes. Planning involves "the selection of appropriate strategies and the allocation of resources that affect one's learning performance" (Schraw & Moshman, 1995, p. 354). The skills that might be attributable to planning are setting goals, selecting appropriate strategies, and scheduling time and strategies. Miller (1985) suggested, based on the findings of his research, that individuals' planning skills contain making prediction before reading, strategy sequencing, and allocating time or attention selective before beginning a task. Monitoring, on the other hand, involves "one's on-line awareness of comprehension and task performance" (Schraw & Moshman, 1995, p. 355). This skill can be best conceptualized through the process of performing a specific task and how well it is controlled at regular intervals to check if the learning happens or not. The statement "I ask myself if I am sure or not to be sure if I have really learned" can be a specific example of monitoring skills. Delclos and Harrington (1991) maintained that monitoring skills can be developed through practice and training. Finally, evaluating refers to "appraising the products and regulatory processes of one's learning" (Schraw & Moshman, 1995, p. 355). That is to say, evaluating involves taking a deep look at the outcome and determining if the learning matches our learning goals and if the regulation processes utilized were effective (Schraw & Moshman, 1995). Evaluating skills may also include re-evaluating one's goals and conclusion upon the completion of a task. Schraw and Dennison (1994) reported that these components are highly correlated with each other and they serve the same purpose. In other words, they complement one and other. Along similar lines, metacognition fosters students' awareness of their own learning and thinking processes and helps them regulate their cognition with the processes of planning, monitoring and evaluating. More specifically, metacognition has an essential role in problem solving, reading, writing, and memory (Flavell, 1987). Jimenez, Puente, Alvarado and Arrebillaga (2009) investigated how 684 students from 8 to 13 (Argentina and Spain) perceived themselves as readers. Using ESCOLA Reading Awareness Inventory, the study concluded that younger students seemed to have a lower level of reading awareness than the older ones.

As certain studies indicate (Hacker, Dunlosky, & Graesser, 1998; Wenden, 1999; Wilkins, 1997), metacognition is a crucial skill to have since it makes students independent thinkers who control their thinking processes. Using metacognition, learners can have the control over what and how they learn, which can trigger the development of independent learning. What is important is that learners who display more metacognitive skills tend to set clear objectives in the learning process, to define the content, to make a schedule in line with this content, and to select the cognitive and metacognitive strategies. The bottom line is that metacognitive awareness is an important element in learning and crucial to the development of (learner) autonomy (Wenden, 1991, 1999; Wilkins, 1997). Metacognitive awareness, in this regard, seems to be some of the key elements needed in developing autonomy. Cao and Nietfeld (2007) examined college students' awareness of difficulties in learning class content and selection of study strategies to address the perceived challenges. Employing both qualitative and quantitative procedures to analyse the data, the researchers concluded that students' awareness of different kinds of difficulties in learning the class content did not lead to adjustment of study strategies. This is not actualized in an autonomous learning process, though.

Metacognition Inventories

Since it was first utilized in the 1970s, the concept of metacognition has become quite fashionable in cognitive psychology. There have been several attempts to develop metacognitive inventories worldwide thus far. It was Myers and Paris (1978), who first created a metacognitive inventory. Corroborating with the categories, namely person, task, and strategy developed by Flavell and Welman (1977), Myers and Paris produced a structured interview format by allowing older readers to respond freely to the open-ended questions. Later, Paris and Jacobs (1984) modified the instrument of Myers and Paris (1978). Employing 15 open-ended questions containing three categories, namely planning, evaluating and regulating, they developed an inventory for any reading situation. Miholic (1994) used the Paris and Jacobs (1984) questionnaire as a starting point to develop an inventory to measure metacognitive activities of young students. This inventory included 10 questions concerning the difficulties learners might face while reading. As opposed to the two previous ones, this instrument focused more on difficulties encountered in terms of whether readers show metacognition in the process of reading. A frequently employed in the research literature, Metacognitive Awareness Inventory was developed to measure adults' metacognitive awareness. This 52-item inventory is a long, comprehensive scale assessing various facets of metacognition, including metacognitive knowledge and regulation (Schraw & Dennison, 1994). Items are classified into eight subcomponents under two broader categories, knowledge of cognition and regulation of cognition. Each component has different subcomponents. To clarify, knowledge of cognition includes at least three different kinds of knowledge: declarative, procedural, and conditional knowledge (Brown, 1987; Jacobs & Paris, 1987; Schraw & Moshman, 1995). Regulation of cognition, on the other hand, refers to a set of activities that help students control their learning. This component has also subcomponents: planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation. Although a number of regulatory skills have been described in the literature, three skills stand out in all accounts: planning, monitoring, and evaluation (Jacobs & Paris, 1987). The State Metacognition Inventory was developed by Q'Neil and Abedi (1996). With the four subscales of metacognition, namely planning, self-checking, cognitive strategy, and awareness, the entire inventory was validated with a group of 219 community college students along with a 20-item math test. Yıldız, Akpınar, Tatar and Ergin (2009) developed a new instrument entitled "Metacognition Scale (MS)" by reviewing previous studies (O'Neil & Abedi, 1996; Schraw & Dennison, 1994; Sperling, Howard, Miller, & Murphy, 2002). The scale includes eight scales, namely declarative knowledge, procedural knowledge and conditional knowledge, planning, self-control, cognitive strategies, self-assessment and self-monitoring. The results indicate that the MS is appropriate for researchers or teachers whose aim is to measure his/her students' metacognitive awareness and metacognitive abilities. Chen, Gualberto, and Tameta (2009) developed a new self-report instrument, called the Metacognitive Reading Awareness Inventory, to assess college students' reading awareness in reading academic or school-related materials. Consisting of five components, namely Phonemic Awareness, Phonics, Reading Fluency, Vocabulary Development, and Reading Comprehension, the inventory produced satisfactory results. The researchers believed that this instrument could be employed to measure metacognitive awareness and skills of elementary level students. Above the inventories were mostly based on reading skills. As easily seen thus far, the concept of metacognition has gained its popularity in educational psychology since it was first coined by Flavell in the 1970s. This popularity was recognized with a lot of metacognitive inventories developed in time. However, there is no inventory specifically designed solely for teachers, of which we know in the literature.

Objective

This study aimed at modifying Metacognitive Awareness Inventory for Teachers by making use of the inventory developed for metacognitive awareness of adults (Schraw and Dennison, 1994). It is highly believed that knowing what teachers know about their own teaching should be a starting point for a change in teacher development. This inventory is considered to help teachers realize their metacognitive levels of teaching.

Method

Participants

The sample was made up of three groups consisting of 323, 226 and 125 student teachers of ELT (English Language Teaching) Program. In the first group, 271 male and 52 male students were the subjects of the study, in the second group, 165 female and 61 male participants. In the last group, 82 female and 43 male student teachers constituted the subjects of the study. All of these participants were senior students of ELT Program, Gazi University (Turkey).

Instrument and procedure: Metacognitive Awareness Inventory for Teachers (MAIT)

By taking the various dimensions of metacognition into account, the researcher made small changes on the inventory to make it more appropriate for teaching situations. While modifying Metacognitive Awareness Inventory for Teachers (MAIT), the researcher based it on the Metacognitive Awareness Inventory developed by Schraw and Dennison (1994). More specifically, there were three main phases conducted during the development of the MAIT in 2009-2010.

Phase 1

This section is concerned with three phases to conduct the validity analysis of the MAIT. Subsequent to a wide range of literature review and expert opinions, it was decided that 42 items would be employed to modify the inventory. Out of 52 items, only 42 items were taken from the inventory. Teaching aspects were added to the items. To illustrate, the item “I ask myself periodically if I am meeting my goals” was changed into “I ask myself periodically if I meet my teaching goals while I am teaching”. Similar changes were made in the items to make them more suitable for teaching contexts. A rigorous study was conducted to compose the 42 items that represent the components. Dörnyei (2003, p. 52) believed that in the questionnaire construction process “some external feedback is indispensable when we have prepared an initial item pool”. At this point, the 42 items were sent to five experts (3 Turkish, 2 British) of metacognition to get external feedback for the content of the inventory as well as the wording issues. Dörnyei (2003, p. 52) alleged that “questions that have been used frequently before must have been through extensive piloting”. As an integral part of the questionnaire construction, field-testing is used to "pilot the questionnaire at various stages of its development on a sample of people who are similar to the target sample for which the instrument has been designed" (Dörnyei, 2007, p. 112). Metacognitive Awareness Inventory for Teachers was piloted with 323 ELT student teachers in the first place. The data gathered through the inventory were processed through a statistical software program, SPSS 15, for the factor analysis. Factor analysis is "designed to see whether each item measured the subscale it was supposed to measure to look at construct validity" (Muijs, 2004, p. 70) and is particularly suited to reduce the number of variables to a few values that still contain most of the information found in the original variables (Hatch & Lazaraton, 1991). There are several ways to conduct factor analysis and the choice of method depends on many things (Field, 2005). The most important of this is the factor extraction on SPSS. Kaiser (1974, cited in Field, 2005) recommends accepting values greater than 0.5 as acceptable (values below this should lead you to either collect more data or rethink which variables to include). SPSS lists "eigenvalues associated with each linear component before extraction, after extraction and after rotation" (Field, 2005, p.7).

Phase 2

As a result of the first factor analysis, 6 items were removed from the inventory because their factor levels were not as high as required as Kasier (1974, cited in Field, 2005) mentioned. Later, the five experts were asked to get their further suggestions on the 36 items. On the basis of the suggestions made, the 36 items were administered to 226 student teachers. However, 12 items that did not work as a result of the second factor analysis were removed.

Phase 3

As a consequence of a meticulous study, those items were removed from the inventory. As a final step, the remaining 24 items were modified and administered to 125 student teachers. The inventory produced the expected results.

Table 1. ***The Ultimate Factor Analysis of the Metacognitive Awareness Inventory for Teachers***

Statements	Common Factor Variance	Factor I	Factor II	Factor III	Factor IV	Factor V	Factor VI
Factor I- Declarative Knowledge							
1- I am aware of the strengths and weaknesses in my teaching.	.573	.741					
7- I know what skills are most important in order to be a good teacher.	.662	.699					
13- I have control over how well I teach.	.501	.651					
19- I know what I am expected to teach.	.577	.582					
Factor II- Procedural Knowledge							
2- I try to use teaching techniques that worked in the past.	.701		.781				
8- I have a specific reason for choosing each teaching technique I use in class.	.570		.751				
14. I am aware of what teaching techniques I use while I am teaching.	.578		.683				
20. I use helpful teaching techniques automatically.	.541		.591				
Factor III- Conditional Knowledge							
3- I use my strengths to compensate for my weaknesses in my teaching.	.722			.802			
9- I can motivate myself to teach when I really need to teach.	.667			.741			
15- I use different teaching techniques depending on the situation.	.679			.662			
21- I know when each teaching technique I use will be most effective.	.540			.581			
Factor IV- Planning							
4- I pace myself while I am teaching in order to have enough time.	.644				.752		
10- I set my specific teaching goals before I start teaching.	.548				.682		
16- I ask myself questions about the teaching materials I am going to use.	.522				.631		
22- I organize my time to best accomplish my teaching goals.	.568				.601		
Factor V- Monitoring							
5- I ask myself periodically if I meet my teaching goals while I am teaching.	.711					.821	
11- I find myself assessing how useful my teaching techniques are while I am teaching.	.758					.732	
17- I check regularly to what extent my students comprehend the topic while I am teaching.	.754					.741	
23- I ask myself questions about how well I am doing while I am teaching.	.670					.681	
Factor VI- Evaluating							
6- I ask myself how well I have accomplished my teaching goals once I am finished.	.570						.581
12- I ask myself if I could have used different techniques after each teaching experience.	.508						.561
18- After teaching a point. I ask myself if I'd teach it more effectively next time.	.491						.521
24- I ask myself if I have considered all possible techniques after teaching a point.	.502						. 509

Variance **Total:** % 60,411
Factor-1: % 7,946 **Factor-2:** % 13,911 **Factor-3:** % 27,439
Factor-4: % 6,499 **Factor-5:** % 4,616 **Factor-6:** % 5, 456

Data analysis

SPSS 15 statistical software program was used to process the data gathered from the participants during the study. For validity consideration, KMO (Kaiser-Meyer-Olkin Measure of Sampling Adequacy) was employed so as to identify the validity of the inventory (0,794) and the value for Barlett TKest was identified as significant (2513,474). As for the realibility issue of the inventory, Cronbach's Alpha was utilized to find out whether the inventory in the context of research was reliable or not.

Results

Validity

KMO (Kaiser-Meyer-Olkin Measure of Sampling Adequacy) was employed so as to identify the validity of the inventory (0,794) and the value for Barlett TKest was identified as significant (2513,474). This calculation proved to be appropriate for the factor analysis. The number of the factors was identified as 6, as indicated above. Factor I includes items 1, 7, 13, 19, Factor II 2, 8, 14, 20, Factor III 3, 9, 15, 21, Factor IV 4, 10, 16, 22, Factor V 5, 11, 17, 23, and Factor VI includes items 6, 12,18, 24. The ultimate factor analysis result is given in Table 1 (See the appendix for the inventory).

Reliability

After an inventory is constructed, it is mandatory that a reliability analysis be carried out. Reliability is the fact that a scale should consistently reflect the construct it is measuring (Field, 2005). In SPSS, Cronbach's Alpha was utilized to find out whether the inventory in the context of research was reliable or not. The detailed analysis for reliability issue is given in Table 2. When we examine the reliability data for the inventory, the values vary from 0, 79 to 0, 85, which indicates that the inventory was observed to display high alpha scores. The inventory modified in this doctoral dissertation was 5-point Likert-type response format, and the degree of agreement was from ‘strongly disagree’ (1) to ‘strongly agree’ (5). Scoring is provided as follows. “Strongly Disagree” (1) refers to 1, “Disagree” (2), “Neutral” (3), Agree (4), Strongly Agree (5).

Table 2. ***The Reliability Analysis of the MAIT***

Factors	Cronbach Alpha
Factor I- Declarative Knowledge	0, 85
Factor II- Procedural Knowledge	0, 82
Factor III- Conditional Knowledge	0, 84
Factor IV- Planning	0, 81
Factor V- Monitoring	0, 80
Factor VI- Evaluating	0, 79

Discussion and Conclusion

The motivation of this study came from a need to measure language teachers' meta-cognitive awareness. In the relevant literature, it is possible to encounter several inventories associated with metacognitive awareness. Not a single one designed for teachers' metacognitive awareness, however, is available that we are aware of. Since the construct of metacognition was first coined by Flavell (1970), the inventories have mostly focused on learning aspects rather than teaching ones. The inventories, though, took metacognitive knowledge and regulation as the starting point because metacognitive awareness consists of these two aspects in the literature. In a similar fashion, this study set out to develop an instrument to measure teachers' metacognitive awareness of teaching by taking metacognitive knowledge and regulation into account. More specifically, subdimensions of both metacognitive knowledge and regulation were used in the development of the inventory namely conditional, procedural and declarative knowledge for metacognitive knowledge, planning, monitoring and evaluating for metacognitive regulation.

The results of this three-phase study support the validity and reliability of scores on the inventory modified by the researcher who based it on the Metacognitive Awareness Inventory (MAI) developed by Schraw and Dennison (1994). While modifying the MAIT (Metacognitive Awareness Inventory for Teachers), the researcher focused on the two components that constitute metacognitive awareness in the literature. The widespread focus on the presence of two components served as a starting point in the process of the modification of the MAIT. As mentioned above, there were three phases carried out during the study. In the first phase, identification of 42 items that represent the very essence of two components of metacognitive awareness was done. Following this, teaching aspects to the inventory were added with a rigorous examination of each item added. Next step was to receive external feedback about the inventory in progress. To do so, five experts (3 Turkish and 2 British) on metacognition were advised to make comments on the items composed. As a final step of the first phase, these 42 items were administered to 323 pre-service English teachers in the Gazi University, Turkey. As a result of the explanatory factor analysis, it was revealed that 6 items did not work as anticipated. As Kaiser (1974, cited in Field, 2005) mentioned, to accept values, their values should be at least 0.5 or above. In the second phase, 6 items which did not work in the first factor analysis in SPSS 15 were removed from the inventory. After this process, 36 items were modified again and sent to the experts to get some further suggestions from them. In light of the feedback provided, 36 items were given to 226 student teachers to validate the inventory. There were still some items that did not produce satisfactory results for the second factor analysis in SPSS. The 12 items whose factor levels were considered to be lower than anticipated were removed from the inventory. In the third phase, the remaining 24 items were sent to five experts to make sure if content validity was covered. Subsequent to experts' opinions, 24 items that represent 6 dimensions, consisting of 4 items each, were validated with 125 student teachers. The data collected this way were processed through SPSS statistical programme. The results from empirical research combined with the student teachers' teaching metacognitive awareness revealed that the inventory modified was validated at the end of the statistical process. After the inventory was validated, the 24 items were processed through SPSS once again for reliability issue this time. As expected, Cronbach's Alpha results indicated that the inventory was found to have a high reliability to be used in educational sciences.

In conclusion, this study revealed that the modified version of MAI, entitled, MAIT possesses good reliability and validity estimates. It, thus, can be used as a diagnostic and research tool to measure metacognitive awareness of teachers. The instrument added to our knowledge of the nature of the metacognitive awareness in that two of the main components of the instrument reflected both developmental and psychosocial. The two components are attention deficit and hyperactivity. Thus, this inventory would be utilized as a tool to measure teachers' metacognitive awareness in educational research area. Further re-search is needed in the future to validate the structure of the instrument with larger and varied samples.

References

Baker, L., & Brown, A.L. (1984). Metacognitive skills and reading. In P. D. Pearson (Ed.), *Handbook of reading research* (pp. 353–394). New York: Longman.

Brown, A.L. (1985). Metacognition: The development of selective attention strategies for learning from texts. In H. Singer & R. B. Ruddell (Eds.), *Theoretical models and processes of reading* (pp. 501–526). Newark, DE: International Reading Association.

Cao, L., & Nietfeld, J.L. (2007). College students' metacognitive awareness of difficulties in learning the class content does not automatically lead to adjustment of study strategies. *Australian Journal of Educational and Developmental Psychology*, 7, 31-46.

Chen, M. H., Gualberto, P.J., & Tameta, C.L. (2009). The Development of Metacognitive Reading Awareness Inventory. *TESOL Journal*, 1, 43-57.

Coffey, H. (2009). *The relationship between metacognition and writing in sixth grade mathematics*. Unpublished Doctoral Dissertation, Walden University, Walden.

Delclos, V.R., & Harrington, C. (1991). Effects of strategy monitoring and proactive instruction on children's problem-solving performance. *Journal of Educational Psychology*, 83(1), 35–42.

Dörnyei, Z. (2003). *Questionnaires in second language research: Construction, administration, and processing*. New Jersey: Lawrence Erlbaum Associates, Publishers.

Efklides, A. (2001). Metacognitive experiences in problem solving: Metacognition, motivation, and self-regulation. In A. Efklides, J. Kuhl, & R. M. Sorrentino (Eds.), T*rends and prospects in motivation research* (pp. 297–323). Dordrecht, The Netherlands: Kluwer.

Field, A. P. (2005). *Discovering statistics using SPSS*. London: Sage

Flavell, J.H. (1970). Developmental studies of mediated memory. In H. W. Reese & L. Lipsitt (Eds.), *Advances in child development and behavior* New York: Academic Press.

Flavell, J.H. (1976). Metacognitive aspects of problem solving. In L. B. Resnick (Ed.), *The Nature of intelligence* (pp. 231–236). Hillsdale, NJ: Erlbaum.

Flavell, J.H. (1979). Metacognition and cognitive monitoring: a new area of cognitive-developmental inquiry. *American Psychologist*, 34(10), 906-917.

Flavell, J.H. (1987). Speculations about the nature and development of metacognition. In F. Weinert & R. Kluwe, (Eds.), *Metacognition, motivation, and understanding* (pp. 21–29). Hillsdale, NJ: Erlbaum.

Flavell, J.H. & Wellman, H.M. (1977). Metamemory. In R.V. Kail & J.W. Hagen (Eds.), *Perspectives on the development of memory and cognition*. Hillsdale, NJ: Erlbaum.

Jimenez, V., Puente, A., Alvarado, J. M., & Arrebillage, L. (2009). Measuring metacognitive strategies using reading awareness scale ESCOLA. *Electronic Journal of Research in Educational Psychology*, 7(2), 779-804.

Garrison, J. (1997). *Dewey and Eros: Wisdom and desire in the art of teaching.* New York: Teachers College Press.

Hacker, D.J., Dunlosky, J., & Graesser, A.C. (Eds.), (1998). *Metacognition in educational theory and practice* Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

Hatch, E., & Lazaraton, A. (1991). *The research manual: Design and statistics for applied linguistics.* Boston, MA: Newbury House.

Kluwe, R.H. (1987). Executing decisions and regulation of problem solving behavior. In F.E. Weinert & R.H. Kluwe (Eds.), *Metacognition, motivation and understanding* (pp. 31- 64). Hillsdale: Earlbaum Associates

Lee, S. (2009). *Examining the relationships between metacognition, self- regulation and critical thinking in online socratic seminars for high school social studies students*. Unpublished Master's Thesis, University of Texas, Texas

Meyer, E., Abrami, P.C., Wade, C.A., Aslan, O., & Deault, L. (2010). Improving literacy and metacognition with electronic portfolios: Teaching and Learning with Epearl. *Computers & Education*, 55(1), 84–91.

Miholic, V. (1994). An inventory to pique students' metacognitive awareness of reading strategies". *Journal of Reading*, 38 (1), 2 – 4.

Muijs, D. (2004). *Doing quantitative research in education with SPSS*. California: Sage Publications.

Myers, M. & Paris, S.G. (1978). Children's metacognitive knowledge about reading. *Journal of Educational Psychology*, 70, 680–690.

Oxford, R.L. (1990). Language learning strategies: What every teacher should know. Rowley, Mass: Newbury House.

Paris, S.G., & Winograd, P.N. (1990). How metacognition can promote academic learning and instruction. In B. Jones & L. Idol (Eds.*), Dimensions of thinking and cognitive instruction* (pp. 15–51). Hillsdale, NJ: Lawrence. Erlbaum Associates

Paris S.; & Jacobs, J. (1984*)* The benefits of informed instruction for children's reading awareness and comprehension skills. *Child Development,* 55,2083–2093.

Presley, M., Borkowski, J. G., & Schneider, W. (1987). Cognitive strategies: Good strategy users coordinate metacognition and knowledge. In R. Vasta, & G. Whilehurst (Eds.), *Annals of Child Development* (pp. 80-129). Greenwich, CT: JAI Press.

Pintrich, P.R. (2002). The role of metacognitive knowledge in learning, teaching & assessing. *Theory Into Practice*, 41(4), 220-227.

Q'Malley, J. M., Chamot, A.U., Stewner-Marizanares, G., Kupper, L., & Russo, R.P. (1985). Learning strategies used by beginning and intermediate ESL students. Language Learning, 35(1), 21-46.

O'Neil, H. F., & Abedi, J. (1996). Reliability and Validity of a State Metacognitive Inventory: Potential for Alternative Assessment. *Journal of Educational Research,* 89 (4), 234-245.

Reynolds, R.E. (1992). Selective attention and prose learning: Theoretical and empirical research. *Educational Psychology Review*, 4(4), 345–391.

Schraw, G. (1998). Promoting general metacognitive awareness. *Instructional Science*, 26(1 2), 113–125.

Schraw, G., & Moshman, D. (1995). Metacognitive theories. *Educational Psychology Review*, 7, 351-373.

Schraw, G. (2001). Promoting general metacognitive awareness, H.J. Hartman (Eds.), *Metacognition learning and ınstruction* (pp. 3-16). USA: Kluwer Academic Publisher.

Schraw, G., & Dennison, R.S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology*, 19(4), 460–475.

Schraw, G., Crippen, K.J., & Hartley, K. (2006). Promoting self-regulation in science education: Metacognition as part of a broader perspective on learning. *Research in Science Education*, 36(1-2), 111-139.

Sinclair, B. (1999). Wrestling with a jelly: The evaluation of learner autonomy. In B. Morrison (Ed.), *Experiments and evaluation in self-access language learning* (pp. 95-109). Hong Kong: Hasald.

Sperling, R. A., Howard, B. C., Miller, L. A., & Murphy, C. (2002). Measures of children's knowledge and regulation of cognition. *Contemporary Educationa Psychology*, 27, 51-79.

Stevens, K.W. (2009). *Metacognition: Developing self-knowledge through guided reflection.* Unpublished Doctoral Dissertation, University of Massachusetts, Massachusetts.

Yıldız, E., Akpınar, E., Tatar, N., & Ergin, Ö. (2009). Exploratory and Confirmatory Factor Analysis of the Metacognition Scale for Primary School Students. Kuram ve Uygulamada Eğitim Bilimleri, 9 (3), 1591-1604.

Young, A., & Fry, J.D. (2008). Metacognitive awareness and academic achievement in college students. *Journal of the Scholarship of Teaching and Learning*, 8(2), 1-10.

Wenden, A. (1991). Learner strategies for learner autonomy. London: Prentice Hall International.

Wenden, A. (1999). Special issue on metacognitive knowledge and beliefs in language learning. System, 27(4), 435-441.

Wilkins, L.S. (1997). Fostering independence with metacognition. In L. Dickinson (Ed), Autonomy 2000: The development of learning independence in language learning, Bangkok: King Mongkut's Institute of Technology Thonburi.

Zellers, M., & Mudrey, R.R. (2007). Electronic portfolios and metacognition: A phenomenological examination of the implementation of e-portfolios from the instructors' perspective. *International Journal of Instructional Media*, 34(4), 419–430.

APPENDIX

Metacognitive Awareness Inventory for Teachers (MAIT)

The MAIT is a list of 24 statements. There are no right or wrong answers in this list of statements. It is simply a matter of what is true for you. Read every statement carefully and choose the one that best describes you. Thank you very much for your participation.

1= Strongly Disagree 2= Disagree 3= Neutral 4= Agree 5= Strongly Agree

1. I am aware of the strengths and weaknesses in my teaching.	1 2 3 4 5
2. I try to use teaching techniques that worked in the past.	1 2 3 4 5
3. I use my strengths to compensate for my weaknesses in my teaching.	1 2 3 4 5
4. I pace myself while I am teaching in order to have enough time.	1 2 3 4 5
5. I ask myself periodically if I meet my teaching goals while I am teaching.	1 2 3 4 5
6. I ask myself how well I have accomplished my teaching goals once I am finished.	1 2 3 4 5
7. I know what skills are most important in order to be a good teacher.	1 2 3 4 5
8. I have a specific reason for choosing each teaching technique I use in class.	1 2 3 4 5
9. I can motivate myself to teach when I really need to teach.	1 2 3 4 5
10. I set my specific teaching goals before I start teaching.	1 2 3 4 5
11. I find myself assessing how useful my teaching techniques are while I am teaching.	1 2 3 4 5
12. I ask myself if I could have used different techniques after each teaching experience.	1 2 3 4 5
13. I have control over how well I teach.	1 2 3 4 5
14. I am aware of what teaching techniques I use while I am teaching.	1 2 3 4 5
15. I use different teaching techniques depending on the situation.	1 2 3 4 5
16. I ask myself questions about the teaching materials I am going to use.	1 2 3 4 5
17. I check regularly to what extent my students comprehend the topic while I am teaching.	1 2 3 4 5
18. After teaching a point, I ask myself if I'd teach it more effectively next time.	1 2 3 4 5
19. I know what I am expected to teach.	1 2 3 4 5
20. I use helpful teaching techniques automatically.	1 2 3 4 5
21. I know when each teaching technique I use will be most effective.	1 2 3 4 5
22. I organize my time to best accomplish my teaching goals.	1 2 3 4 5
23. I ask myself questions about how well I am doing while I am teaching.	1 2 3 4 5
24. I ask myself if I have considered all possible techniques after teaching a point.	1 2 3 4 5

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