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## The impact of tutors' metacognitive awareness on students' metacognitive awareness and academic performance

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The impact of tutors' metacognitive awareness on students' metacognitive awareness and  
academic performance

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Metacognitive awareness plays an important role in students' learning as well as in teaching and tutoring. The goal of this thesis research is to investigate the relationship between academic tutors' metacognitive awareness, their student athlete tutees metacognitive awareness and academic performance (by cumulative GPA). Metacognitive awareness in tutors may have a significant influence on tutoring methods and students' success. The population of tutors and students in the study is represented by 40 pairs of academic tutors and athlete students at one southern U.S. university. Metacognitive Awareness Inventory (MAI) was utilized and adapted for this study. Simple regression analysis results revealed that metacognitive awareness in students can predict their academic performance. Yet, tutors' metacognitive awareness did not predict students' metacognitive awareness and their cumulative GPA scores. Additional research with larger samples and via alternative methods as well as implications about potential of tutors' metacognitive strategies for learners are discussed.

*Key words:* metacognitive awareness, metacognitive knowledge, metacognitive regulation, teachers/tutors, students/tutees, effective learning, academic performance, MAI, GPA

## DEDICATION

I would like to dedicate this research to my Lord God and my family members: my parents, Aleksandr A. Rakhmatov and Liliya B. Rakhmatova, my twin sister Victoriya A. Ragozina, and my brother Andrey A. Rakhmatov.

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## CHAPTER I

### INTRODUCTION

The matter of successful learning and high academic performance is one of the most important issues in education and educational research. One of the most effective ways researchers study and investigate effective learning is through learning strategies and metacognitive strategies. There is an evidence that metacognitive strategies are effective in helping students (Callan, Marchant, Finch & German, 2016). However, metacognitive awareness in teachers and tutors and its relationship to students' achievement is a not well researched field, especially with regard to tutoring. This master's thesis focuses on metacognitive awareness and metacognitive strategies used by teachers, tutors, and students.

Metacognition is defined from different perspectives in literature. Schraw and Dennison (1994, p. 460) define metacognition as “an ability to reflect upon, understand and control one's learning”. Zepeda, Hlutkowsky, Partika, and Nokes-Malach (2018, p.1) referred to Brown (1978) and Flavell (1979) to define metacognition as “both one's knowledge about their own cognition as well as their ability to regulate it.” Thomas (2013) called metacognition “the key to comprehension”, and Zimmerman (1990, p. 5) poses the definition for self-regulated learning as “systematic use of metacognitive, motivational and/or behavioral strategies”. Metacognitive awareness accompanies deeper learning and effective self-regulation skills.

Moreover, metacognitive awareness consists of metacognitive knowledge and metacognitive regulation. Metacognitive knowledge consists of declarative, procedural and

conditional knowledge. Declarative knowledge or personal knowledge is “knowing about things.” Procedural knowledge or strategy knowledge means “to know how to do things.” Conditional knowledge is defined as “to know why and when to do things” (Schraw & Moshman, 1995). For example, a college student might have some knowledge that taking notes during the lecture is beneficial (declarative knowledge). At the same time the student takes the notes in his/her own way applying an understanding of how to take notes (procedural knowledge). Then the same student can take the notes for different classes and different professors differently based on nature of material (e.g. mathematics or history), professor’s expectations, and personal study experience (conditional knowledge).

Wilson and Bai (2010) examined the relationship between these three kinds of metacognitive knowledge. The researchers investigated the relationship between teachers’ understanding of metacognition and instructional strategies they use. They engaged 105 graduate students from a college of education and collected quantitative and qualitative data using a survey with demographic questions and Teachers’ Metacognition Scale (TMS) with 20-likert scale questions. Metacognitive regulation or metacognitive skills demonstrated in metacognitive strategies comprise planning, monitoring and evaluating. Teachers’ declarative, procedural and conditional metacognitive knowledge are interrelated and have an impact on their instructional strategies. Conditional knowledge impacted procedural knowledge. Metacognitive knowledge had a significant impact on teachers’ pedagogical metacognitive knowledge and their instruction strategies in the class (Wilson & Bai, 2010).

In addition, learning strategies and metacognitive strategies accompany effective learning processes. Learning strategies are defined as “the efficient selection and organization of information” and metacognitive strategies are defined as “knowledge concerning one’s own

cognitive processes” (Kállly, 2012, pp. 232-233). Hartman (2001) mentions executive management metacognition and strategic knowledge. Executive management helps to plan, manage and evaluate one’s learning, and strategic knowledge helps with what information or skills one needs to have, and also when and why to use them. An example of executive management is asking the students how they found an answer to the question, or how do students define the meaning of the words they are not familiar with. Strategic knowledge can be represented by procedural and conditional knowledge when students apply the knowledge they possess to particular problem solving.

Simultaneously, teachers make a difference in students’ learning when they use, model and scaffold metacognitive learning skills by creating and sustaining learning environment that support such learning. Hence, teachers’ metacognitive awareness impacts students’ learning in class (Baltaci, 2018; Zimmerman, 1990). Students’ effective learning is crucial, and teachers play an important role in this process as metacognitive role models (Wall & Hall, 2016).

This section includes literature review and empirical research on the following topics: (a) teachers’ and tutors’ metacognitive awareness and academic achievement; (b) the relationship between teachers’ and tutors’ metacognitive awareness and students’ metacognitive awareness; (c) students’ metacognitive skills and academic performance; (d) relationship between teachers’/tutors’ metacognitive awareness and students’ academic performance.

The majority of the literature presented in the literature review focuses on teachers’ and students’ metacognition since available literature on tutors and tutees is extremely limited. Teaching and tutoring both include reciprocal communication between an instructor and students. Tutors’ goals as well as teachers’ goals are to facilitate student’s effective learning. Students need to use effective learning strategies and metacognitive strategies in both scenarios.

Tutoring can be advantageous since tutors' attention is fully focused on a student. However, both teaching and tutoring processes benefit from instructors' scaffolding, effective feedback and modeling effective learning strategies for the students. Therefore, tutoring is considered to be similar to teaching while metacognition in tutors can be approximated by metacognition in teachers and literature reviewed in regard to teachers.

The current literature regarding tutoring mainly consists of information on peer-tutoring and cognitive tutoring systems. The roles for being a tutor and a tutee in student peer-tutoring are utilized reciprocally as students take turns (Backer, Keer & Valcke, 2015; Chan, Phan, Salihan & Dipolog-Ubanan, 2016). Cognitive tutoring systems present artificial intelligence systems in the reviewed literature (Koedinger & Aleven, 2007).

Most of the research on teachers' metacognitive awareness and metacognitive skills has been conducted with pre-service (prospective) teachers. This includes research studies conducted with teacher-candidates in fields such as Music, Geometry, English, etc. (Baltaci, 2018; Dagal & Bayindir, 2016; Guven, 2012; Hakan, 2016). The groups of teachers participating in the studies worked at elementary school, taught physical education classes, mathematics, and represented business economics, social and health, tourism and catering, transport and logistics, electricity, culture, education, etc. (Aktag, Semsek, & Tuzcuoglu, 2017; Doğanay & Öztürk, 2011; Kallio, Virta, Hjärdemaal & Sandven, 2017; Zepeda, Hlutkowsky, Partika & Nokes-Malach, 2018).

The purpose of this thesis is to investigate whether there is a relationship between teachers'/tutors' metacognitive awareness and students' metacognitive awareness that possibly impacts students' academic performance, or cumulative GPA score.

## CHAPTER II

### REVIEW OF LITERATURE

#### **Teachers'/tutors' metacognitive awareness**

Tutors' metacognitive awareness can potentially be affected by various factors. Despite the fact that research studies on tutors are limited, research regarding teachers includes the role of achievement, experience, gender, epistemological beliefs, academic environment, and form of education for teachers-in-training such as distance (online) or formal (face-to-face).

Metacognitive awareness impacts prospective teachers' academic achievement (Doğanay & Demir, 2011). The following literature review incorporates evidence of teachers' and pre-service teachers' metacognitive awareness and their academic achievement. According to research there is a difference between high and low achieving teachers, and experienced and inexperienced teachers' metacognitive awareness. Epistemological beliefs, teachers' gender, educational cultural traditions, and other factors also play an important role in their metacognitive awareness.

#### **Teacher achievement**

According to research, teacher candidates' metacognitive awareness is directly related to their academic achievement (Kállý, 2012). The important components of effective metacognitive environment are scaffolding provided by teachers and professors, and the space for teacher candidates' independence in learning. These two elements provide support in learning by modeling metacognitive behavior (metacognitive strategies), effective feedback and constructivist student-centered approach (Wall & Hall, 2016). Moreover, research reveals a

significant difference between high and low achieving teachers and demonstrated interdependence of using metacognitive strategies and level of teachers' academic achievement (Doğanay & Demir, 2011). Doğanay and Demir (2011) studied the following metacognitive strategies: planning, organizing, self-monitoring, and self-evaluating and used self-report questionnaires and interviews to gather data. The researchers engaged 690 students from two Turkish universities. Parametric tests and two-way ANOVA data analysis revealed that higher achieving teachers, both males and females, had higher level of metacognitive research skills along all researched dimensions. These results may have practical application in regard to university curriculum for teacher candidates. Metacognitive strategies can be intentionally used by college instructors and promoted during the lectures and group projects. In addition, the assignments given to students may incorporate metacognitive awareness via journal logs, and following discussions, and debates.

However, research studies on teachers are few. Research is needed on the level of in-service teachers' achievements and their metacognitive awareness. The majority of research was conducted with prospective teachers. The lack of research among teachers in the real-world classrooms, could stem from the diversity of teacher evaluation methods across the world. In addition, the majority of multiple - choice questions in teacher assessment does not help to reveal various aspects of metacognitive awareness, in particular conditional knowledge. Since conditional knowledge is applied knowledge that shows that the person knows when and how to apply what he (she) knows, observations are needed to record conditional knowledge (Shraw & Moshman, 1995). The combination of qualitative and quantitative research could provide more in-depth information about teachers and their use of metacognitive strategies in the classrooms.

In contrast to Doğanay and Demir (2011), there was no significant difference in metacognition in Iwai's (2016) research between three different stages, which is, initial, middle and final stages of academic achievement of prospective teachers. The stages were considered in regard to prospective teachers' metacognitive reading strategies. The researcher engaged 116 preservice teachers in the study. Differing results between Doğanay and Demir's, and Iwai's research, i.e. significant result in first and non-significant result in the second one may have stemmed from the differences in research procedures and measurement instruments used in research. In addition, teachers in Iwai's study were divided into the levels based on the program stage they were at during the research and not on the level of their achievements. Teachers were tested using MARSİ (The Metacognitive Awareness of Reading Strategy Inventory) in Iwai's (2016) research and with Metacognitive Strategy Scale in Doğanay and Demir's (2011) research.

Moreover, Hakan (2016) discovered a negative correlation between metacognitive skills and academic achievement. Surprisingly, pre-service teachers might have metacognitive awareness of declarative knowledge (existing theoretical knowledge) and not use it. The author explained the paradox of lower academic achievement with higher level of metacognitive awareness in his research by possible influence of traditional teaching method teachers used for a long time in Turkey. In this descriptive study Hakan (2016) used Motivational, Cognitive, and Metacognitive Competence Scales (MCMCS). The researcher engaged 131 pre-service teachers in his study.

### **Teaching experience**

Moreover, prior research suggests a relationship between teachers' experience and metacognitive awareness; experienced teachers use metacognitive strategies more than inexperienced teachers do. These effective metacognitive strategies are giving feedback to



students, observing students and following with their learning difficulties and success. Even a year of teaching experience makes a difference (Doğanay & Öztürk, 2011). The investigators used 90 hours of observations and Cognitive Awareness Skills Evaluation Forms (SASEF) for data collection. Doğanay and Öztürk conducted comparative case study with fourteen elementary school teachers, seven experienced teachers (20-25 years of experience) and seven inexperienced teachers (from 2 months up to 1.5 years of experience). Novice teachers taught mostly in a lecturing style and experienced teachers organized and provided student-centered classroom. Inexperienced teachers concentrated mainly on content and did not provide effective feedback to the students and did not follow up on students' learning difficulties. In addition, experienced teachers' planning was done according to students' learning needs, and inexperienced teachers' planning was made according to the required program only.

In contrast, Baltacı (2018) did not find a significant difference between pre-test and post-test scores recorded before using mathematical software program GeoGebra (pre-test) and after (post-test). This phenomenon can be explained by the experience and metacognitive skills all pre-service teachers had as a result of using mathematical software program called GeoGebra. It is a computer aided learning environment for computer technology classes that required certain metacognitive strategies from them, such as individual organization, and evaluation. Baltacı (2018) conducted a quantitative study using worksheets for research preparation and MAI (Metacognitive Awareness Inventory) for research implementation. The researcher recruited 21 male and 21 female pre-service teachers; research design did not include control group. The research shows the potential of computerized environment in learning as an instrument for metacognitive strategies development.

## **Teachers' epistemological beliefs**

Teachers instruct the students according to their epistemological beliefs (Güven, 2012; Hofer, 2001). Ormrod (2012, p. 375) calls epistemological beliefs “epistemic beliefs” and defines them as ideas one has about “knowledge” and “learning.” Positive relationship between perspective teachers' epistemological beliefs and the use of metacognitive strategies was discovered in a correlational study (Güven, 2012). Güven recruited 224 pre-service English language teachers using “personal knowledge” test and Epistemological Belief Scale, and Metacognitive Inventory for research purposes. The researcher compared data for online and face-to-face classes via mean values and standard deviation values. The results showed that the ideas and beliefs teachers have about student learning have an impact on students learning. More developed epistemological beliefs or ideas of teachers about the nature of learning and knowledge positively correlated with more developed metacognitive awareness including self-control and self-evaluation in learning. In addition, significant positive correlation was discovered between metacognition, critical thinking, epistemological beliefs and teachers' professional values; it was demonstrated in the research by Demir, Doganay, and Kaya (2016). The researchers recruited 557 prospective teachers using Professional Value Scale for Elementary School Teachers (TPVS), Metacognition Scale (MS), Critical Thinking Scale (CTS), and Epistemological Belief Scale (EBS). Metacognition Scale (MS) measured three dimensions of metacognition: evaluation, organization, and planning. The research showed that planning and organization as metacognitive skills significantly predict the value of personal and societal responsibility in teachers.

The research outcomes might differ in regard to candidate teachers' demographics due to diverse epistemological beliefs, and cultural features. In addition, research shows that planning

plays an important role in metacognitive awareness and effective teaching. Aktag, Semsek, and Tuzcuoglu (2017) used 5-point Likert type scale for Metacognitive Awareness Inventory (MAI) for data collection of 537 participants and one-way ANOVA Test for data analysis including independent sample *t*-test for gender related data analysis. MAI sub-dimensions were analyzed utilizing Mann Whitney U test. The study revealed that teachers had different ideas regarding planning and lesson preparation; experienced teachers had significantly higher score in planning and had higher level of metacognitive awareness. The results demonstrated relationship between metacognitive awareness, effective planning, and effective teaching.

### **Role of educational cultural traditions**

Education traditions in different countries vary depending on historical and cultural features of an education system. Therefore, teacher candidates' metacognitive awareness and their academic achievement can be unrelated due to the education system **in the country**. Dagal and Bayindir (2016) with 151 conducted quantitative research study with 151 participants; they used Demographic Form, Metacognitive Awareness Inventory (MAI) and Self-directed Learning Readiness Scale (SDLRS) with linear regression analysis. There was no correlation found between metacognitive awareness, self-directed learning readiness and academic achievement of teacher candidates. Some teachers-in-training might not need metacognitive awareness for achieving academically due to the sufficiency of rote learning in their system of education (Hakan, 2016). Additionally, teacher candidates might have metacognitive awareness and not necessarily use it in academics (Dagal & Bayindir).

## **Type of education delivery method**

Nowadays, distance online education is growing in popularity, and in some cases, it may replace the traditional face-to-face format of education. Each form of education has its advantages and disadvantages. Teacher candidates in distance education lack the opportunity to collaborate and work together in a physical classroom. As a result, they miss the opportunities for vivid communication with teachers and other course students. They usually use the books most of the time (Güven, 2012).

According to Güven (2012) distant teacher candidates lack self-control and self-evaluation in comparison to students in face-to-face education programs who have opportunities to collaborate with teachers and other students. They have lower level of metacognitive awareness. Simultaneously, research with 224 participants demonstrated that students in face-to-face program possessed more developed epistemological beliefs, and had higher level of metacognitive awareness, higher self-control and higher self-evaluation. Two first years of face-to-face program are found to be critical for the formation of pre-service teachers' epistemological beliefs and metacognitive strategies.

## **Gender**

Gender is another factor presented in research studies. A study with physical education teachers (Aktag, Semsek & Tuzcuoglu, 2017) engaged 537 teachers (184 females and 353 males). The research revealed that female teachers demonstrated higher level of metacognitive awareness in comparison to male teachers.

However, Hakan (2016) did not identify gender differences in his study with 131 pre-service music teachers. The author engaged 63 males and 68 females in his research. Despite the fact that both studies were conducted in Turkey, the difference in the outcomes might stem from

different measure instruments used, i.e. Metacognitive Awareness Inventory (MAI) versus Motivational, Cognitive, and Metacognitive Competence Scale (MCMCS) along with unequal male-female gender distribution among participants.

### **Tutoring and metacognitive awareness**

Tutoring and metacognition in tutoring in college education context are represented mainly by cognitive digital tutoring system and peer-tutoring among college students in the literature. The lack of literature is possibly stemming from lack of long-term tutoring services at the universities and colleges. It limits the opportunities for collecting data on tutoring since the interactions between tutors and students are mainly occasional. Moreover, cognitive digital tutoring systems can potentially replace the employment of human tutors in colleges. In addition, peer-tutoring among college students is potentially an effective learning tool for both students as they practice their self-regulative skills during peer-tutoring interactions.

### **Digital tutoring systems**

Cognitive tutoring systems engage interactive methods and support metacognitive awareness to provide effective student learning. Koedinger and Aleven (2007) present tutoring as an interactive form of instruction. Cognitive tutoring involves artificial intelligence technologies used for interactive instructions designed for students on individual level. Cognitive feedback provides the tutees with detailed step-by-step feedback. There is also an opportunity to keep track of mastery of students learning skills. The research showed that immediate provision of 'yes/no' feedback (after students made their problem-solving steps) is important. It was also found that feedback with explanations supports performance and learning better than no/yes feedback. Interactive tutoring provides the students with the information on different levels of

problem-solving and learning (starting from beginning level and ending with more advanced ones).

At the same time, an immediate feedback may reduce the opportunity to learn from their errors. Hence, potential benefit of withholding information or help from students is in letting them “to learn by doing, to construct knowledge, to reduce zooming out, to engage recall from long-term memory, and to provide knowledge self-checks” (Koedinger & Aleven, 2007, p. 260). Cognitive tutoring systems demonstrate that it is important for tutors to search for a balance between giving/providing and withholding assistance while tutoring.

Moreover, Intelligent Tutoring Systems (ITS) are computer programs designed for the development of students’ cognitive and metacognitive knowledge in different fields, or subjects. The meta-analysis of Ma, Adesope, Nesbit and Liu (2014) showed that there was no significant difference between ITS and individual tutoring along with small group instruction. Hence, individual tutoring along with small group instruction is beneficial for students’ cognitive and metacognitive knowledge development.

Another computer tutoring system featured in literature is MetaTutor. Meta Tutor is a tool presenting hypermedia learning environment (HLE); “it’s an intelligent, multi-agent tutoring system designed to scaffold cognitive and metacognitive self-regulated learning (SRL)” (Trevors, Duffy & Azevedo, 2014, p.507). Trevors, Duffy and Azevedo suggested that notetaking is related to students’ prior knowledge and requires metacognitive awareness, and self-regulation from students. The results of the research demonstrated that the more students reproduced the content without reflecting on it, the lower was their academic performance. In addition, low or high level of prior knowledge found to be meaningful while taking the notes.

MetaTutor scaffolding also had a significant effect in the study helping the students to take more effective notes and reduce ineffective notetaking.

### **Peer-tutoring**

Peer-tutoring is represented via peer assisted learning (PAL), peer-tutoring programs (PTP), and ASK to THINK-TEL WHY®© model in the literature. These models highlight various aspects of metacognitive awareness and self-regulation in peer-tutoring activities.

Chan, Phan, Salihan, and Dipolog-Ubanan (2016) studied peer assisted learning (PAL) or peer tutoring. The benefits of PAL include intellectual and social awareness, empathy, and a positive effect on learning progress. PAL is based on low power distance when students have the same authority status, i.e. they are both learners playing tutor's role interchangeably. It means that both students are in the position of learning. It is different from officially designated tutor-tutee relationship with a higher power distance when tutor is in the position over the student. The status of tutor and student differ in this case; the tutor delivers the knowledge and the student receives it. The results show that peer-tutoring with embedded metacognitive strategies, such as self-regulation positively influences students' learning.

Peer-tutoring programs may be a possible remedy for retention in higher education. Arco-Tirado, Fernandez-Martin and Fernandez-Balboa (2011) stated that PTP, or peer-tutoring programs can address various problems in learning, such as academic failure, lack of social integration, and a lack of metacognitive strategies. The researchers recruited 100 first-year college students and 41 tutors and utilized Pozar's Study Habits Inventory with 90 multiple-choice questions and 5 scales: contextual conditions of study, study planning, use of study materials, learning of study content, and honesty. The research results did not support the idea that PTPs have a positive impact on students' GPA, on students' and tutors' cognitive and

metacognitive strategies. However, study planning and use of study materials had a significant effect. The role of tutors in higher education needs to be further investigated.

Effective peer-mediation is possible due to collaborative inquiry, and construction of new knowledge as well as mutual scaffolding and guidance. It requires metacognitive skills. The ASK to THINK-TEL WHY®© model designed to promote higher-level learning that includes construction of new knowledge and problem solving (King, 1998). The model is a learning method designed as a transactive learning method for same-ability and same-age students where cognition and metacognition are incorporated in the learning environment. ASK to THINK-TEL WHY®© model can be used for working with the new material when both students learn new content without being the experts but practicing metacognitive strategies for learning. The only requirement is the knowledge of the process of looking for the solutions, checking the ideas, adjusting them, and so on. Guided Peer Questioning is a support tool for the students; it includes questions like: “How are ...and similar?”, “Explain how”, etc. Tutor’s and tutee’s role are structured in the model with equal opportunities for both. Tutors’ role is exploring and remaining in the inquiry mode that includes answering the questions, tutees’ role is in asking the questions and elaborating. The model allows the students to take control over their own learning and develop self-regulation skills by practicing cognition and metacognition (King, 1998).

However, literature and data on tutors in the position of instructors and students as tutees is not available. At the same time, one can hypothesize that main principles standing behind peer-tutoring can be applied to official tutor-tutee model with assigned instructors in tutor’s role and students in tutee’s role. These principles are timely given detailed feedback, asking open-ended questions and scaffolding; they would be applicable and effective metacognitive tools for tutor-student relationship during the tutoring process (Arco-Tirado, Fernandez-Martin, & Fernandez-



Balboa, 2011; King, 1998). Furthermore, similarly to how peer-tutoring is purposed to enhance students' learning and academic achievement, tutoring in tutor-student relationships needs to improve students' learning, measured by their grades.

### **Students' metacognitive awareness and academic performance**

Students' GPA often demonstrates their success in learning and academic achievement. The review of existing literature on metacognitive awareness in college shows that there is positive relationship between college students' metacognitive awareness and their academic performance. Metacognitive knowledge and self-regulation in students can predict their cumulative GPA scores (Young, & Fry, 2008). The matter of students' metacognitive skills and its relationship with their learning is in the center of the contemporary research. The ability to use effective self-monitoring and self-regulating metacognitive strategies influences students' success in learning. These are the essential components of learner-centered education. Research demonstrated that students' metacognition, self-regulation, and learning environment have an impact on their academic achievement (Kaur, Saini, & Vig, 2018). Ormrod (2012) defined the elements of self-regulated learning, such as goal setting, planning, self-motivation, attention control, use of effective, goal-relevant learning strategies, self-monitoring, appropriate help-seeking, self-evaluation, and self-reflection. The author also offers the effective learning and study strategies based on the nature of metacognition, such as meaningful learning and elaboration, organization, note taking, identifying important information, summarizing, comprehension monitoring, mnemonics, etc.

Similarly, Zimmerman (1990) considered three factors and three features of self-regulated learning. The factors are metacognitive, motivational and behavioral, and the features are self-regulated learning strategies, students' responsiveness to self-oriented feedback about

learning effectiveness, and interdependent motivational processes. Zimmerman also concluded that self-regulated learning is more frequently seen in adolescents rather than elementary age students. However, gifted children reveal some self-regulation in early years as well and have higher motivation to learn when students demonstrate academic success in their initiation, intrinsic motivation, and personal responsibility. All three factors are important for students' success and complement each other (Zimmerman, 1990).

In addition, according to the research conducted in 63 countries with 475,460 students involved, metacognitive strategies demonstrated the advantage over learning strategies in students' learning (Callan, Marchant & German, 2016). The research was conducted to investigate students' achievement in math, science and reading in relationship to metacognitive and learning strategies. Global search in the countries with diverse socioeconomic background also revealed that beliefs and philosophies in the country affect students' motivation in learning (Callan, Marchant, & German).

### **The relationship between teachers' and students' metacognitive awareness**

Teachers and students interact a lot in the context of college lectures, assignments, projects, etc. The author of this thesis research suggested that teachers' metacognitive awareness and metacognitive skills are related based on the two-way communication (i.e., "teacher to student" and "student to teacher") in learning process. There is lack of information and data on tutoring. Tutoring is considered a form of teaching. This research study conditionally considers teaching and tutoring alike regarding metacognitive knowledge and self-regulation in learning process. Teachers' metacognitive awareness has an important role in forming and developing students' metacognitive skills that impact their academic achievement. Simultaneously, teachers' attitude toward students' learning and classroom learning environment plays an important role.

Teachers are responsible for designing and creating the effective stimulating learning environment in the classroom and facilitating students' effective learning.

For instance, quantitative research in this field has revealed the relationship between metacognitive teacher talk and students' learning. Math teacher in high-achieving classes was more engaged in metacognitive talk in comparison to low-achieving classes (Zepeda, Hlutkowsky, Partika & Nokes-Malach, 2018). Research showed that there is a need in more support and knowledge of how to initiate and develop students' metacognition through various instructional activities. Hence, teachers can influence students in how they gain knowledge, monitor and evaluate their own learning. Zepeda et al. (2018) demonstrated how math teachers influence students' learning. The increase in math teachers' metacognitive talk during instructions resulted in increase in students' use of effective learning strategies. Teachers in high-achieving mathematics classes had made more personal knowledge, monitoring and evaluating. Hence, there is a relationship between teacher's metacognition used and demonstrated in the classroom and students' academic achievement. Despite the fact that students' metacognitive skills trigger their success in learning, teachers can observe students' academic achievement but struggle with noticing their self-regulative skills (Sperling, Richmond, Ramsay & Klapp, 2012).

There is evidence of students' metacognitive awareness and learning improvement as a result of a change in teacher's metacognitive awareness and learning environment in a class (Thomas, 2013). The case study demonstrated how teachers' use of real-world phenomena, formal assessment tasks and metacognitive learning environment produced changes in teaching and learning in the physics classroom regarding the improvement of metacognitive thinking. This fact highlights the importance of metacognitive awareness and metacognitive strategies being included in teacher education courses and teacher trainings. It is important to consider

various metacognitive strategies in education and their influence on students' learning and success.

### **Metacognitive strategies in teaching/tutoring and learning**

The role of learning strategies and metacognitive strategies in effective learning was studied previously. The research conducted in 63 countries with participants of high and low SES (socio-economic status) was conducted using Program for International Student Assessment (PISA) covering reading, math and science and engaged 475,460 students in total (Callan, Marchant, Finch & German, 2016). The research demonstrated that metacognitive strategies are more advantageous for effective successful learning than learning strategies. The authors used understanding, remembering, and summarizing for metacognition. Learning strategies, or cognitive learning were presented by memorization, elaboration, and control strategies.

Presence of metacognitive strategies is important for teachers as well as it is important for students due to their reciprocal engagement in students' learning. Hattie (2009) mentions that teachers who use effective teaching strategies can be effective even in ineffective schools. He lists study skills, self-verbalization, self-questioning, aptitude treatment interactions, matching learning styles and individualized instruction as programs built on different meta – cognitive strategies. In addition, meta-cognitive strategies refer to selecting and monitoring the strategy that refers to the higher-order thinking with active control over cognitive processes involved in learning. It includes planning, monitoring and evaluation of one's comprehension. Metacognitive strategies engage planning and monitoring of where, when and how to use certain learning cognitive strategies (note taking, summarizing, etc.). Moreover, small group instruction is more appropriate for such learning (Hattie).

However, different forms of poor help seeking among students are frequent. It was found that successful in learning students are able to follow their thinking while solving the problems (Koedinger & Alevan, 2007). Furthermore, Hattie (2009, p.186) presented peer-tutoring as an opportunity for the students “to move from being just the students to be the teacher” that requires certain self-regulation skills from the students.

### **Metacognitive strategies in higher education and self-regulation**

Effective independent learning requires different skills including metacognitive strategies and self-regulation skills. Metacognition can be modeled in higher education by instructors but not taught as a separate lesson. Despite the fact that college education model is designed to provide opportunities for students’ independent learning, there is a need in teaching and modeling metacognitive strategies in higher education (Crossland, 2017). Metacognitive strategies can be modeled by asking the students open-ended questions that lead to clarification of the goal, self-assessment, self-evaluation, drawing inferences, self-monitoring and self-regulation. In addition, metacognitive strategies are more effective than learning strategies based on the research (Callan et al., 2016). Hence, modeling, cultivating and promoting of metacognitive strategies by college professors and instructors is crucial, especially for undergraduate students.

For example, think-pair-share teaching and learning strategy is an efficient tool for students to practice “thinking about thinking” in peers and small groups discussions. It creates an opportunity for students to clarify the goals for the task during discussion, self-evaluate their own ideas, share them with others, receive an immediate feedback from the professors and instructors, check on their own understanding using the received feedback, draw the inferences with other students’ ideas etc. In addition, students are exposed to the opportunity to monitor the

task progress during discussion. This strategy also helps students to be aware of their own level of attention on particular task (Crossland, 2017; Long & Long, 1987). Furthermore, Agarwal and Bain (2019) gave an example of students' using metacognitive strategies, such as using metacognitive sheets during the lectures and getting one letter grade above the students that did not use these sheets. They presented this information in "Powerful Teaching" book.

Simultaneously, low-achieving students especially need explicit information on academic task performance. Hartman (2001) presented executive management strategies that help plan, manage and evaluate one's learning, and strategic knowledge that help with what information or skills to have, and then when and why to use them. Some of metacognitive strategies are (a) reading unclear short passage and answer the question and (b) finding the definitions of unknown words for students. Metacognitive strategies for teachers include self-regulation in teaching activities and giving feedback to students.

Research shows that it is important to encourage students to express their level of confidence about learning, answers and mistakes they make. Predicting, revising, reflecting and critiquing are effective metacognitive teaching strategies that can be practiced individually and in groups for think-pair-share strategy as well. Predicting strategy provides students with the opportunity to identify the knowledge and the skills needed for effective task fulfilment. Revising strategy helps students to update their understanding based on teachers' and peer's feedback. Reflecting strategy provides students with an ability to reflect on their learning and evaluate the skills developed. Critiquing promotes verbalizing the thinking students have while giving and receiving feedback (Crossland, 2017).

Long and Long (1987) presented the importance of questions 'how' and 'why' in metacognition. They underlined the importance of "the whole" in learning. Instructors may

develop students' metacognitive awareness by showing how one part of the college course connected to the other one; they model making the inferences by showing them to students.

Pre-assessment as teaching strategy provides teachers with information about students' knowledge, level of their understanding and thinking inferences students have. Pre-assessment can be used as a bridge to students' current metacognitive thinking tendencies and skills that helps teachers/tutors to construct and model metacognitive strategies in teaching/tutoring. Questions teachers ask is one of the tools used for such pre-assessment when students can be also encouraged to think of how they found an answer, what ideas or facts brought them to the solution. It requires students to track their thinking process (Crossland, 2017).

Self-regulatory processes and strategies, such as goal setting, self-monitoring, self-evaluating, self-consequences, environmental structuring and help seeking are the important elements of the metacognitive strategies (Cohen, 2012). They help students to form metacognitive skills: planning how to study for an exam, allocating time for study, being aware of one's level of attention, checking for one's understanding during the learning task, etc.

### **Metacognitive strategies, self-regulation, and peer-tutoring**

Self-regulation and various metacognitive strategies can be certainly considered in the context of peer-tutoring. Backer, Keer and Valcke (2015) studied self-regulation strategies and skills in higher education in the context of reciprocal peer tutoring (RPT) interventions regarding monitoring, evaluation, and orientation. The authors demonstrated significant positive results in how RPT interventions influenced students' self-regulative learning. Orienting is defined as task analysis with the goal of comprehending learning objectives. Planning includes choosing and ordering problem-solving strategies along with thinking about needed resources and working on the action plan. Monitoring then includes identifying and working with the inconsistencies while

problem solving to execute the problem in the most effective way. Evaluation involves students' self-judgment when the problem is solved. The research study showed that RPT has a potential to enhance students' metacognitive regulation skills, in particular monitoring skills on the deep level (Backer, Keer & Valcke, 2015).

### **Measurement instruments in the research**

Contemporary research on teachers' and students' metacognition is conducted in different countries in the context of various cultures using adapted or different measure instruments for adults (Aktag, Semsek, & Tuzcuoglu, 2017; Demir, Doganay & Kaya, 2016; Kallio, Virta, Hjardemaalv & Sandven 2017; Schraw & Dennison, 1994; Wilson & Bai, 2010) and school-age children and adolescents (Mokhtari & Reichard, 2002; Sperling, Richmond, Ramsay & Klapp, 2012).

The Metacognitive Awareness Inventory (MAI) is one of the most commonly used inventories that cover various aspects of metacognition, such as declarative knowledge (the "what?" in learning), procedural knowledge (the "how?" in learning), conditional knowledge (the "when?" in learning); planning, information management, monitoring, debugging, and evaluation as regulation of cognition (Schraw & Dennison, 1994). The instrument is comprised of 52 items with an equal number of items for regulation of cognition and knowledge of cognition. Some other instruments other than MAI measure metacognition in application to the particular learning skills, such as reading strategies (Mokhtari & Reichard, 2002), critical thinking (Demir, et al. 2016), learning and study strategies (Kally, 2012), cognitive skills (Doğanay & Öztürk, 2011) and self-directed learning readiness (Dagal & Bayindir, 2016).

MAI in this thesis research is used due to it being established in previous research studying college students' metacognitive awareness. MAI consists of 52 true or false statements



with 52 possible points (Kaur et al., 2018; Schraw & Dennison, 1994). Varied ways of scoring have been employed with MAI. In Baltaci's (2018) study MAI was used with 52 statements on a 5-point Likert-type scale ranged from *never* (1) to *always true* (5), and in Kállý's (2012) research from *strongly disagree* (1) to *strongly agree* (5). Seventeen questions of the MAI measure the knowledge of cognition with maximum possible 52 points for *true* and *false* version, and 85 points with 5-likert scale. Another thirty-five questions of MAI measure the regulation of cognition with maximum possible 35 points for *true* and *false* version, and 175 maximum points with 5-likert scale. Higher scores indicate higher level of metacognitive knowledge and metacognitive regulation. Each factor scores are calculated by adding the scores for the particular factor. MAI total score is calculated by summing the scores for all 52 statements.

Simultaneously, measurement instruments for measuring metacognitive awareness in tutors are not available in the literature. This is the reason for creating new measuring tool called Metacognitive Strategies Survey (MSS) that includes 12 items with 5-likert scale for regulation of cognition in tutors with maximum possible 60 points.

### **An overview and analysis of the literature review**

Most of the research on teachers' metacognitive awareness and metacognitive skills was conducted with pre-service teachers. This thesis has reviewed research studies conducted among music, preschool, geometry, English, etc. teacher-candidates (Baltaci, 2018; Dagal & Bayindir, 2016; Guven, 2012; Hakan, 2016). The groups of teachers participating in the studies worked at elementary school, taught physical education classes, mathematics, and represented business economics, social and health, tourism and catering transport and logistics, electricity, culture, education, etc. (Aktag et al., 2017; Dođanay & Öztürk, 2011; Kallio et al., 2017; Zepeda et al., 2018). The investigators collected and analyzed data in Turkey, the U.S.A., Finland, Punjabi,

Romania, etc. There are various ethnicity groups such as Hispanic, Caucasian, native American, Asian, African American and “others” (Mokhtari & Reichard, 2002). Research presents ambiguous data regarding the relation between candidate-teachers’ and teachers’ teaching experience and gender on their metacognitive awareness.

The researchers used different instruments to measure teachers’ metacognitive awareness including declarative, procedural and conditional knowledge, which is, respectively, what they know about metacognitive learning strategies, how do they use them and when they think they need to use them. Measurement instruments the investigators used measure metacognitive regulation consisting of planning, debugging strategies (strategies used to correct comprehension and performance errors), evaluation, comprehension monitoring and information managing strategies. Metacognitive inventories as self-report tools mainly measure declarative knowledge. A couple of inventories available online, such as Metacognitive Awareness Inventory (MAI) for students and Metacognitive Awareness Inventory for teachers (MAIT), require only *true* or *false* answers. There is a need for effective metacognitive measurement instruments for school and college level teachers. These instruments need to reflect all elements of metacognitive knowledge more effectively including how and when teachers use metacognitive strategies in the classroom.

It is a challenge to compare various inventories for students and teachers since not all of them are published and available for public use. In addition, the Metacognition Awareness Inventory (MAI) was modified based on local cultural aspects, for example the Metacognition Awareness Inventory (MAI) in Turkey (Baltaci, 2018) and the Metacognition Awareness Inventory for Teachers (MAIT) in Finland (Kallio, Virta, Hjärdemaalv & Sandven, 2017).

Moreover, teachers' epistemological beliefs reflected in the research influence their metacognitive awareness and use of metacognitive strategies. Epistemological beliefs, i.e. what teachers/tutors think about learning and how teaching/tutoring impacts the way they teach/tutor are not easily developed or changed. Teachers/tutors who believe that metacognitive strategies are important for effective learning and academic performance, use metacognitive strategies more frequently (Demir, et al. 2016; Guven, 2012). Unfortunately, education system for pre-service teachers may require rote memorization (mainly for multiple-choice exam questions) when instructors and students have a belief that rote-memorization is sufficient for learning. In this case candidate teachers are able to succeed without conditional metacognitive knowledge, without applying metacognitive awareness knowledge in practice. However, metacognition is a key to successful effective learning. There is a tremendous need in schools and colleges around the world to understand the importance of metacognitive awareness and metacognitive strategies for teachers, students and administrators in education institutions. Pre-service teachers and teachers need to be taught what metacognition is and what kind of metacognitive strategies can be used effectively for different age students.

High quality inventories and measurement instruments can help teachers understand the need for metacognitive strategies practice. Further research can provide data on the relationship between teachers'/tutors' metacognition and students'/tutees' metacognition along with its influence on students' effective learning and academic achievement. Meanwhile, theoretical and practical classes need to be included in pre-service teachers' education. Further research is needed in regard to the influence of teachers' metacognition on students' metacognition and then on students' academic achievement.

Available literature on metacognitive awareness in teaching is limited and also contradictory in terms of research variables, such as gender, teachers' experience, the form of teachers' education, etc. Moreover, the researchers used different measurement instruments or a combination of the instruments in the existing studies. Another interesting fact is that most of the studies presented here are conducted outside of the United States with different population groups that might also influence research results.

Teaching metacognitively requires teachers' thinking about his/her teaching. One can conclude that tutoring metacognitively also requires tutors thinking about how one works with the tutee. "Teaching or tutoring for metacognition" means that the teacher/tutor thinks how his/her metacognition activates students' metacognitive strategies and thinking about their learning (Hartman, p. 149). While planning, management, monitoring, and evaluation as metacognitive awareness elements might differ in tutoring practice, tutors still need to plan how to help the student with his/her assignment effectively, manage and monitor how well the tutor does in working with the tutee. In addition, it is important for the tutors to reflect on how well they have been using the metacognitive strategies and how it influenced the tutee's learning. Hartman states that preparation for the class or session is beneficial for teachers'/tutors' motivation and learning as well. Thoughtful timely feedback is also very important (Hartman, 2001).

Based on Hartman's description of metacognitive teaching, one can apply the description and suggest that tutoring also includes executive management used for planning, managing and evaluating one's learning, and strategic knowledge to be able to identify what information or skills to have, and then when and why to use them. This knowledge helps to understand and reflect on why the tutor uses certain strategies while working with the tutee, i.e. noticing the

tutee confused during the session and deciding he/she needs to reword given explanation.

Management strategies include the assessment of the prior knowledge of the topic, or a type of the problem or a task by the tutee. In addition, monitoring, and evaluation as metacognitive skills can be promoted while tutor and the tutee are working together on homework assignment and monitoring students' progress. Both tutors and tutees can offer feedback, identify the difficulties and plan for the effective further steps for successful completion of tutee's tasks, assignments, quizzes, tests, and exams (Hartman, 2001).

This literature overview demonstrates the need for research regarding teaching and tutoring. The researcher considered three research questions and research hypotheses derived from them related to tutors' metacognitive awareness, students' metacognitive awareness, and students' cumulative GPA scores.

### **Research questions**

The purpose of this thesis research was to study the effect the relationship between academic tutors' metacognitive awareness and undergraduate students' metacognitive awareness as well as students' academic performance. The research questions are:

1. What is the relationship between tutors' metacognitive awareness and students' metacognitive awareness?
2. What is the relationship between undergraduate students' metacognitive awareness and their academic performance?
3. What is the relationship between tutors' metacognitive awareness and students' academic performance?

## Statement of hypotheses

Based on the literature review, the following hypotheses were formulated for each of the research questions:

Hypothesis 1: academic tutors' metacognitive awareness is positively related college students' metacognitive awareness.

Hypothesis 2: academic college students' metacognitive awareness is positively related to their academic performance; higher metacognitive awareness scores are related to the higher cumulative GPA scores.

Hypothesis 3: academic tutors' metacognitive awareness is positively related to college students' academic performance represented by their cumulative GPA scores.

Academic performance is measured using GPA scores as research outcome variable, or as a research study outcome. Metacognitive awareness scores for learning and teaching represent research study predictor variables.

## CHAPTER III

### METHODS

#### **Participants**

The population of this thesis research study is academic tutors and undergraduate college students whom they tutored on one-to-one basis through fall semester 2019. The sample consists of 47 pairs of academic tutors and athlete students from a comprehensive four-year public university in the south of the US: 34 females and 13 males tutors, and 22 females and 25 males students. Academic tutors were 74.5% White, 10.6% African American, 6.4% Asian, 4.3% Latino/a, and 4.3% indicated as other. Students' make up included: 36.2% White students, 51.1% African American students, 4.3% Asian students, and 8.5% indicated as other. In regard to tutors' age, 72.4% of the tutors' were between 19 and 21 years old, 17.1% were between 22 and 25 years old, and 8.5% between 26 and 48 years old. In regard to students' age, 72.3% of the students' were between 18 and 20 years old, and 27.6% were between 21 and 28 years old (see Table 1).

Table 1

*Descriptive Statistics for Age, Number of Tutoring Sessions for Tutors and Students, Tutoring Experience, Last Grade Reported by Tutors and Students, and Students' GPA*

Variable	M	SD	Mdn
Tutors' age	22.13	4.55	21.00
Students' age	19.81	1.70	19.00
Tutor Sessions	16.46	11.63	12.50
Student Sessions	17.00	10.11	13.00
Tutoring experience (in years)	1.92	1.00	2.51
Last grade (reported by tutors)	86.66	13.18	90.00
Last grade (reported by students)	86.50	13.40	90.00
Students' GPA	2.64	.85	3.00

Statistics for tutoring experience, statistics for number of tutoring sessions given by tutors and students, statistics for the last grade provided by tutors and students and statistics for students' GPA are represented by the mean (*M*), median (*Mdn*) and standard deviation (*SD*) in Table 1. In this research, students' cumulative GPA scores present the outcome variable for second and third research questions. The GPA scores vary from 2.20 points up to 3.90 points. Statistics for the number of tutoring sessions per week during about 16 weeks of fall semester as reported by tutors and students are shown in Table 1.

The tutors and the students represented 49 different majors that were grouped in eight major fields. The largest number of tutors is concentrated in science and business fields, and the largest number of students is concentrated in social sciences, business and education fields (including kinesiology). At the same time, the minority of tutors are majoring in math field, and the minority of students are majoring in engineering field (see Table 2).



Table 2

*Descriptive Statistics for Gender, Ethnicity, Tutors' and Students' Majors, and Frequency of Tutoring Sessions Per Week Reported by Tutors and Students*

Variable	Tutors		Students	
	<i>n</i>	%	<i>n</i>	%
<u>Gender</u>				
Male	13	27.7	25	53.2
Female	34	72.3	22	46.8
<u>Ethnicity</u>				
White	35	74.5	17	36.2
African American	5	10.6	24	51.1
Asian	3	6.4	2	4.3
Latino/a	2	4.3		-
Other	2	4.3	4	8.5
<u>Major</u>				
Social Sciences	7	14.9	11	23.4
Science	13	27.7	8	17.0
Humanities/Art	3	6.4	3	6.4
Business	11	23.4	9	19.1
Math	1	2.1		-
Engineering	5	10.6	1	2.1
Education	6	12.8	9	19.1
Other	1	2.1	6	12.8
<u>Frequency of sessions</u>				
Every day	2	4.3	-	-
Four times a week	3	6.4	2	4.3
A few times a week	7	14.9	8	17.0
Twice a week	15	31.9	16	34.0
Once a week	19	40.4	17	36.2
Rarely	-	-	1	2.1

As shown in Table 3, the field in highest demand among tutors engaged in the research is a Science field with 34.0% of tutors' population, and the fields in the lowest demand are Humanities/Art and Engineering with 2.1 % of tutors presented in each of the fields. The students were engaged in nine sports including men and women sports. The preponderance of

students were in track and field (29.8 %), and the minority of students was engaged in volleyball (2.1%).

Table 3

*Descriptive Statistics for Tutoring Field Subjects and Students' Sports'*

Variable	<i>n</i>	%
<u>Tutoring field</u>		
Science	16	34.0
Math	15	31.9
Social Studies	11	23.4
Business	2	4.3
Humanities/art	1	2.1
Engineering	1	2.1
Other	1	2.1
<u>Sports</u>		
Basketball	6	12.8
Football	10	21.3
Soccer	6	12.8
Softball	3	6.4
Track and field	14	29.8
Baseball	7	14.9
Volleyball	1	2.1

### Measures

#### Metacognitive Awareness Inventory (MAI)

Metacognitive Awareness Inventory (MAI; Schraw & Dennison, 1994) was used for measuring metacognitive knowledge (knowledge about cognition) and metacognitive regulation in previous research. MAI presents students' declarative knowledge, procedural knowledge and conditional knowledge along with regulation of cognition. Regulation of cognition includes planning, comprehension monitoring, information management strategies, debugging strategies

and evaluation. The inventory has been tested in various research (Kaur et al. 2018; Harrison & Vallin, 2017; Schraw & Dennison, 1994).

MAI can be used for analyzing the relationships between metacognitive awareness, specific academic skills, cumulative GPA and other standardized scores (Young & Fry, 2008). MAI consists of 52 *true* or *false* statements. Seventeen questions of the inventory related to the knowledge of cognition with maximum possible 17 points, and 35 statements related to the regulation of cognition with 35 maximum possible points. Higher scores indicate higher level of metacognitive knowledge and metacognitive regulation. Each factor scores are calculated by adding the scores for the particular factor. MAI total score is calculated by summing the scores for all 52 statements. See Appendix E for MAI measure.

According to Shraw and Denisson (1994), the MAI Inventory showed “excellent” reliability (i.e., Cronbach’s  $\alpha = .90$ ) for two factors (i.e., knowledge of cognition and regulation of cognition). The factors are intercorrelated ( $r = .54, p < 0.01$ ). Young and Fry (2008) reported the correlation between these two factors to be even higher,  $r = .73, p < 0.01$ . Hence, MAI’s reliability and validity are endorsed by empirical evidence from previous studies. It is also internationally recognized and used for measuring metacognitive awareness in different contexts (Akin et al., 2007; Baltaci, 2018; Kállly, 2012; Kaur et al. 2018; Abdullah and Soemantri, 2018).

46 tutors and 46 students out of 47 completed Metacognitive Awareness Inventory (MAI). The maximum score was 52; tutors’ scores ranged from 28 to 52, and students’ scores ranged from 22 to 52.

### **Metacognitive Strategies Survey for tutors (MSS)**

Metacognitive Strategies Survey (MSS) was created in an attempt to assess the specific practices tutors engage in with their students that may promote metacognitive awareness. The

survey was created for this thesis research study based on the existing literature review and MAI. MSS is a 5-likert scale survey ranging from *never* (1) to *always* (5) and containing 12 questions that cover four metacognitive awareness strategies: management, planning, monitoring, and evaluation. MSS total score is calculated by summing the scores for all 12 statements with maximum 60 scores possible. Items 1, 4 and 5 include management; Items 7, 9 and 12 include planning, Items 2, 3 and 8 include monitoring, and Items 6, 10 and 11 include evaluation skill. MSS's Cronbach's  $\alpha$  is .697 that demonstrates marginally "acceptable" internal consistency of the survey. Tutors' metacognitive awareness for tutoring score (MSS) varied between 39 and 58 scores with maximum 60 points possible in this study. See Appendix F. for full measure of the MSS.

### **Procedures**

The research study includes undergraduate students and their tutors recruited through Templeton Athletic Academic Center administration in fall semester 2019 at Mississippi State University. The researcher was able to recruit 47 out of all 88 academic tutors working at the Center and their individual students. Five mentors were excluded from the original list of potential 88 tutors and mentors altogether. Mentors focused on helping the athlete students with their learning skills rather than supporting them for particular college classes. Seven student-tutor pairs had information gaps on main research variables, such as GPA, MAI and MSS, and were thus excluded from statistical analysis by SPSS. MAI and MSS were used for measuring metacognitive awareness for learning in students and for measuring metacognitive awareness for tutoring in tutors as self-report tools. Demographics part of the survey contained the question about students' cumulative GPA. The cumulative GPA score was also voluntarily presented by students.

Data were collected after IRB approval during late fall term via self-report paper surveys from athletic academic tutors at MSU and the undergraduate student athletes. The survey included questions about participants' demographic information, the 52-item Metacognitive Awareness Inventory (MAI), and the 12-item Metacognitive Strategies Survey (MSS) for tutors. The student participants completed demographic information and MAI, and tutors completed demographic information, MAI and MSS.

Surveys were presented individually to the pairs of tutors and students at Athletic Academic Templeton Center during mandatory academic study hall sessions. The participants read and signed the consent forms. The surveys were completed anonymously and took approximately 10-15 minutes to complete. The researcher coded the completed surveys using 'T' for tutors, 'S' for students so that each student and tutor pair was matched up for data analysis purpose. The Academic Center coordinator helped the researcher avoid approaching the same pairs of tutors and students. One pair of a tutor and a student was excluded from data since the same name from this pair was mentioned twice. The researcher recruited as many pairs as it was possible due to the tutors' and students' schedule.

Simple and multiple regression analysis were conducted for the hypothesis with three variables: an outcome variable which is academic performance (GPA), and two predictors which are tutors' and students' metacognitive awareness. Gender was added to hierarchical regression to control the effect of gender.

## CHAPTER IV

### RESULTS

The researcher ran correlational SPSS analysis to identify significant correlations between different variables before running the regression analysis with variables from the research hypotheses. Intercorrelations between variables show that MAI and MSS significantly correlate with  $p < .01$  (see Table 4). It means that newly created tutoring metacognitive awareness measurement tool (MSS) correlates with existing Metacognitive Awareness Inventory that is characterized by high reliability and validity ( $\alpha = .90$ ). There is a significant positive correlation between students' GPA score and their metacognitive awareness (MAI) for learning with  $p < .05$ . It means that research study with the larger sample could possibly show significant effect regarding students' metacognitive awareness and their GPA scores. In addition, there is a significant negative correlation between tutors' MSS and their gender. Another significant correlation ( $p < .05$ ). Moreover, there is positive correlation between tutoring experience and students' gender with  $p < .05$ , which is likely produced by chance due to the small sample size (see Table 4). Intercorrelations table demonstrates a significant correlation only for Research Question 2; there is a correlation only between students' metacognitive awareness (MAI) and their GPA scores. Intercorrelation between tutors' metacognitive awareness (MAI and MSS) and students' metacognitive awareness (MAI) is not found as well as between tutors' metacognitive awareness (MAI and MSS) and students' GPA.

Table 4

*Descriptive Statistics, Internal Consistency Reliability, and Intercorrelations*

Measure	Descriptive Statistics			Internal Consistency Cronbach's $\alpha$	Pearson Correlations							
	Valid <i>n</i>	<i>M</i>	<i>SD</i>		(1)	(2)	(3)	(4)	(5)	(6)	(7)	
(1) Tutors' gender	47			—	—							
(2) Students' gender	47			—	.10	—						
(3) Tutoring experience	46	1.92	2.51	—	.14	.31*	—					
(4) Tutors' MAI	46	41.98	6.56	.90	-.21	-.19	-.21	—				
(5) Tutors' MSS	46	49.65	4.79	.70	-.31*	.11	-.01	.46**	—			
(6) Students' MAI	46	40.46	8.10	—	-.16	.12	.01	.17	.28	—		
(7) Students' GPA	42	3.06	0.44	—	-.02	.10	.08	.01	.16	.33*	—	

Note. \*\* $p < .01$ ; \* $p < .05$ .

### Simple regression analysis

Simple regression analysis was used to test three Research Questions: whether metacognitive awareness in academic tutors significantly predicted metacognitive awareness in college students, whether metacognitive awareness in college students significantly predicted their academic performance presented in cumulative GPA scores, and whether metacognitive awareness in tutors, both for learning and for tutoring, significantly predicted athlete students' cumulative GPA scores.

Simple regression regarding Research Question 1 hypothesizing that tutors' metacognitive awareness measured by Metacognitive Awareness Inventory (MAI) as learners can predict students' MAI showed that the regression model was non-significant,  $R^2 = .028$ , adjusted  $R^2 = .006$ ,  $F(1, 43) = 1.253$ ,  $p = .269$ . It was found that tutors' metacognitive awareness for learning does not predict students' metacognitive awareness for learning in current sample,  $\beta = .168$ ,  $t = 1.119$ ,  $p = .169$ .

Simple regression regarding Research Question 1 hypothesizing that academic tutors' metacognitive strategies in tutoring measured by Metacognitive Strategies Survey (MMS) can predict students' MAI showed that the regression model was non-significant,  $R^2 = .077$ , adjusted  $R^2 = .055$ ,  $F(1, 43) = 3.576$ ,  $p = .065$ . It was found that tutors' metacognitive awareness for tutoring does not predict students' metacognitive awareness in current sample,  $\beta = .277$ ,  $t = 1.891$ ,  $p = .065$ .

Simple regression regarding Research Question 2 hypothesizing that college athlete students' metacognitive awareness in learning measured by MAI can predict their GPA showed that the regression model was significant,  $R^2 = .108$ , adjusted  $R^2 = .085$ ,  $F(1, 39) = 4.737$ ,  $p =$



.036. It was found that students' metacognitive awareness predicts their academic performance presented by GPA score in current sample,  $\beta = .329$ ,  $t = 2.177$ ,  $p = .036$ .

Simple regression regarding Research Question 3 hypothesizing that tutors' metacognitive awareness measured by Metacognitive Awareness Inventory (MAI) as learners can predict students' GPA showed that the regression model was non-significant,  $R^2 < .001$ , adjusted  $R^2 = -.026$ ,  $F(1, 39) = .004$ ,  $p = .953$ . It was found that tutors' metacognitive awareness for learning (MAI) in tutors does not predict students' GPA in current sample,  $\beta = .010$ ,  $t = .059$ ,  $p = .953$ .

Simple regression regarding Research Question 3 hypothesizing that academic tutors' metacognitive awareness in tutoring measured by Metacognitive Strategies Survey (MMS) can predict students' GPA showed that the regression model was non-significant,  $R^2 = .026$ , adjusted  $R^2 = .001$ ,  $F(1, 39) = 1.058$ ,  $p = .310$ . It was found that tutors' metacognitive awareness for teaching does not predict students' GPA in current sample,  $\beta = .163$ ,  $t = 1.029$ ,  $p = .310$ .

### **Multiple regression analysis**

Multiple regression analysis was used to test if metacognitive awareness in college students and tutors' metacognitive awareness significantly predicted students' academic performance as measured by cumulative GPA scores. Stepwise multiple regression model is less significant than simple regression model due to the three predictors (multiple predictors) and one outcome variable that create smaller statistical power. Multiple regression model is more representative in regard to tutors' and students' population as it analyses all variables from research hypotheses together and not solely as shown in simple regression analysis. There is no multicollinearity issue in the model and the residuals are uncorrelated in the model. Moreover,

gender was controlled for in the model because as a covariant gender could possibly have an effect on variables-predictors in the current research, and possibly have effect on the outcome (GPA). The predictors are students MAI score that stands for students' metacognitive awareness for learning, tutors' MAI score that stands for academic tutors' metacognitive awareness for learning and tutors' MMS that stands for metacognitive awareness for tutoring. The outcome variable is students' academic performance, or GPA score (see Table 5).

The results of the regression indicated that students' metacognitive awareness in learning as a predictor explained 12.3% of the variance ( $R^2 = .123$ ). It was found that students' metacognitive awareness scores did not significantly predict better academic performance for students in current sample,  $B = .018$ ,  $\beta = .337$ ,  $t = 1.983$ ,  $p = .055$ . Also, tutors' metacognitive awareness in learning and metacognitive awareness in tutoring as a GPA predictor explained 13.6% of the variance ( $R^2 = .136$ ). MAI and MMS scores in tutors did not significantly predict athlete college students' academic performance in current sample,  $B = -.007$ ,  $\beta = -.099$ ,  $t = -.553$ ,  $p = .584$  for MAI for learning for tutors, and  $B = .011$ ,  $\beta = .118$ ,  $t = .622$ ,  $p = .538$  for MMS for tutoring for academic tutors. See Table 5.

Table 5

*Results of Hierarchical Regression*

Step		<i>b</i>	<i>SE</i>	$\beta$	<i>t</i>	<i>p</i>
1	(Constant)	3.015	.113		26.686	< .001
	Tutors' gender	-.006	.162	-.006	-.036	.972
	Students' gender	.097	.144	.110	.671	.506
2	(Constant)	2.274	.363		6.263	< .001
	Tutors' gender	.066	.158	.067	.420	.677
	Students' gender	.043	.140	.048	.305	.762
	Students' MAI	.019	.009	.347	2.138	.039
3	(Constant)	2.067	.805		2.567	.015
	Tutor' gender	.082	.167	.083	.491	.627
	Students' gender	.016	.148	.018	.105	.917
	Students' MAI	.018	.009	.337	1.983	.055
	Tutors' MAI	-.007	.012	-.099	-.553	.584
	Tutors' MSS	.011	.017	.118	.622	.538

Note.  $R^2 = .012$ , Adjusted  $R^2 = -.041$  for Step 1,  $F(2, 37) = .225$ ,  $p = .799$ ;  $R^2 = .123$ , Adjusted  $R^2 = .050$  for Step 2,  $F(3, 36) = 1.689$ ,  $p = .187$ ;  $\Delta R^2 = .111$  for Step 2,  $F(1, 36) = 4.572$ ,  $p = .039$ ;  $R^2 = .136$ , Adjusted  $R^2 = .009$  for Step 3,  $F(5, 34) = 1.070$ ,  $p = .394$ ;  $\Delta R^2 = .013$  for Step 3,  $F(2, 34) = .782$ ,  $p = .247$ .

## CHAPTER V

### DISCUSSION

The current research study was conducted at a large Southern university that offers academic tutoring service to student athletes through an athletic supported center. Student athletes work with the tutors throughout the semester which gave the researcher an opportunity to investigate the relationship between tutors' and tutees' metacognitive awareness. The research questions and the hypotheses in this thesis research were formulated based on current literature review regarding metacognitive awareness in teachers, tutors, and students, and its relationship to students' academic performance. Research findings for two out of three research questions do not support information presented in the literature review both in simple regression and multiple regression analysis.

This research showed that there is no significant relationship between tutors' metacognitive awareness in learning and students' metacognitive awareness in learning, as well as between tutors' metacognitive strategies for tutoring and students' metacognitive awareness in learning in this current sample. The relationship between tutors' metacognitive awareness and students' metacognitive awareness, as hypothesized for research question 1, is not supported by this research study. Yet, a positive impact of teachers' metacognitive awareness on students' metacognitive awareness is reviewed and supported by previous literature in research studies conducted by Thomas (2013) and Zepeda, et al. (2018).

However, there is a significant relationship between students' metacognitive awareness (MAI) and their academic performance or GPA according to the results of simple regression model data analysis. This finding supports the second hypothesis, suggesting that academic college students' metacognitive awareness impacts their academic performance; higher metacognitive awareness scores are related to higher cumulative GPA scores. The relationship between undergraduate students' metacognitive awareness and their academic performance is supported by simple regression analysis and is not supported by multiple regression analysis. It demonstrates that larger sample would have a significant impact on research study outcomes. This outcome supports Young and Fry's (2008) research demonstrating that college students' metacognitive awareness predicts their cumulative GPA score.

Furthermore, tutors' metacognitive awareness in learning (MAI) does not predict athlete undergraduate students' GPA according to simple regression analysis, as well as tutors' metacognitive awareness in tutoring (MSS). The findings of the current research do not support the third research hypothesis, suggesting that academic tutors' metacognitive awareness affects college students' academic performance represented by their cumulative GPA scores. However, previous studies showed the relationship between pre-service teachers' metacognitive awareness and their academic performance in research conducted by Kály (2012), and Doğanay & Demir (2011).

Overall, according to the results of multiple stepwise regression data analysis, there is no significant relationship between an outcome variable and the predictors. Students' metacognitive awareness in learning, tutors' metacognitive awareness in learning, and tutors' metacognitive awareness in tutoring do not predict students' academic performance according to the model. It

means that according to multiple regression stepwise analysis all three hypotheses are not supported.

### **Limitations**

There are some limitations to this work that should be noted. First, there is a lack of available literature on the relationship between teachers/tutors, college students, their metacognitive awareness and academic performance of students. The available literature is limited and presents ambiguous data in terms of research variables, such as gender, teachers' experience, the form of teachers' education, etc. in the context of metacognitive awareness. Most of the studies presented in literature review are conducted outside of the United States.

Second, there are limitations regarding measurement tools that measure metacognitive awareness in students, teachers, and tutors. In previous studies researchers used different tools to measure teachers' metacognitive awareness including declarative, procedural and conditional knowledge, i.e., what they know about metacognitive learning strategies, how do they use them, and when they think they need to use them. The measurement instruments the investigators used revealed the scores for teachers' planning, debugging strategies (strategies used to correct comprehension and performance errors), evaluation, comprehension monitoring and information managing strategies. The Metacognitive Inventories mainly measure declarative knowledge and show what teachers know, not necessarily what they apply with the students or going to do as teachers. A couple of available online Inventories, such as Metacognitive Awareness Inventory (MAI) for students and Metacognitive Awareness Inventory for teachers (MAIT) require only true or false answers. There is a need in effective metacognitive measurement instruments for college level teachers/tutors. These instruments need to reflect all elements of metacognitive awareness, i.e. reveal what metacognitive knowledge teachers possess and how they use it. In

addition, literature on tutoring is limited especially regarding use of metacognitive strategies.

Metacognitive strategies surveys and inventories for tutoring are not developed. Moreover, the Metacognition Awareness Inventories were modified based on local cultural aspects, for example MAT (Metacognition Awareness Inventory) in Turkey (Baltaci, 2018) and MAIT (Metacognition Awareness Inventory for Teachers) in Finland (Kallio, et al., 2017). Moreover, the self-report nature of the inventory used is another limitation to this research. The researcher cannot guarantee that all participants were open, truthful, and accurate in their assessments.

A third limitation in the thesis research study is that the number of research participants is limited. The smaller is the sample size, the less is the statistical power of the data analysis model. The research hypothesis is potentially reasonable for the larger sample according to the simple regression analysis where students' metacognitive awareness in learning (MAI) can predict their academic performance reflected in cumulative GPA score. In addition, there is a suggestion that measurement tools for tutors' metacognitive strategy use with higher reliability can possibly be significant with the larger sample of students and tutors.

A related limitation is that some student athletes are required to attend tutoring sessions while others can do so voluntarily. Voluntary participation in tutoring sessions can be the act of help-seeking when students realize that they need external academic support. Help-seeking, in turn, is one of the metacognitive strategies used by college students and is worth researchers' attention in future studies. However, the researcher did not collect such an information from academic tutors and student athletes in this research so it is unknown which of the athletes were required to attend and which sought it out on their own. In addition, students at the academic tutoring center worked with other tutors besides the ones that filled in the survey for through the

semester. The researcher did not have any information on which tutors the students worked with the most during the fall semester.

Another limitation and a gap in this research is that students' cumulative GPA scores used as a research outcome variable is not directly connected to students' current academic performance and thus may not be directly related to a particular tutor's metacognitive strategies influence. Students' GPA scores present generalized academic performance of the students as a result of students' previous and current achievements, both personal and obtained while working with various college instructors and tutors. It would be more effective to view the grades each student gets during the semester working with a particular tutor. The cumulative grade for the class would better demonstrate the result of tutor's and student's mutual work on student assignments than general cumulative GPA score.

Finally, tutoring experience may be a more important issue than originally considered. Hartman (2001) mentions that teaching and the most probable tutors' effectiveness depends on teaching/tutoring experience. The experience of the majority of tutors (about 80%) in the thesis research study ranged between a couple of months and two years. Many of the academic tutors and student athletes in the study were primarily of the same age. Therefore, the lack of the relation between tutors' metacognitive awareness used while tutoring and students' metacognitive awareness may be explained by the lack of tutoring experience.

### **Recommendations for future research**

Metacognition is a key to successful effective learning according to the reviewed literature. There is a tremendous need in schools and colleges around the world to understand the importance of metacognitive awareness and metacognitive strategies for teachers, students and



administrators in education institutions. Pre-service teachers, teachers, and tutors need to be taught what metacognition is and what kind of metacognitive strategies can be used effectively. It might be more effective to combine quantitative study with the qualitative study including interviews and observations for metacognitive awareness research. Open-ended questions would give the researchers more information on teachers' and tutors' knowledge of how and when they use metacognitive strategies personally and with the students. Furthermore, the existing inventories reveal teachers' metacognitive awareness in general but do not show what teachers do to support students in developing their own metacognitive strategies. Qualitative research would help to determine conditional metacognitive knowledge and cognition of regulation in practice, as well as the evidence of metacognitive talk among teachers and tutors.

Additional research should be done with regard to the newly developed measurement tool (MSS) for measuring metacognitive strategies in tutors. Currently, it suffers from marginal reliability, but insight into it will be helped with larger samples of students and tutors. Factor analysis is needed to understand if metacognitive strategies in MSS represent one big concept, or metacognitive strategies comprise different factors and different sub-scales/dimensions in Metacognitive Strategies Survey (MSS). It is possible that most of the sub-scales are loaded on a single factor empirically, and various domains are the part of one factor that is "metacognitive strategies in tutors." The researcher needs more data for such factor analysis as well as MSS's validity and reliability testing.

Furthermore, the inventory for tutors could include the following open-ended questions: "How do you know that your student is deeply learning in the session? How do you know that your lesson with the student was successful? How do you identify the gaps in your own tutoring/teaching? What do you do to make sure you follow the key points in using various

materials and resources for the lesson with the student?” The other group of questions could target tutors’ role in students’ metacognitive awareness. It can include questions like “What do you do when your student struggles with reading comprehension and understanding of unfamiliar words? What do you say or what instructions do you give to the student when he/she loses the track of the task or can’t find the solution?” These questions could reveal tutor’s procedural knowledge (how to apply the knowledge they have). Thereby, mixed research with quantitative and qualitative data can give deeper understanding about tutors’ and students’ use of metacognitive strategies.

Longitudinal study is another suggestion that would allow the researchers to follow the same participants for the longer period to exclude possible external variables, such as participants’ personality, character, family background, etc. Longitudinal research would help to reveal metacognitive strategies the tutors use with their tutees while having sustained relationships. However, it is challenging to have a longitudinal study in tutoring since it is not common in a college environment to have the same tutors for longer periods of time. In addition, such research could be applied for teachers as well, especially when they approach students individually during the class tasks/assignments. There is not much literature available on metacognitive awareness in teachers and tutors. This paper’s theoretical foundation is primarily based on research done with teachers and prospective teachers. However, research conducted with tutors is also valuable and can be used for classroom practice with teachers/instructors. Therefore, future research with tutors and tutees can be helpful not only for tutors but for teachers as well.

The advantage of considering metacognitive awareness in tutors and tutees rather than in instructors and students is in the intensity of one-on-one tutor-tutee and tutee-student interaction.

In addition, the mechanisms of forming and using metacognitive strategies can be observed more effectively in tutor and tutee interactions in pairs. The disadvantage of investigating metacognitive strategies in tutor-tutee context is that some metacognitive strategies such as discussions in small groups, using think-pair-share strategy, mutual feedback among students, and extended modeling metacognitive talk demonstrated by the instructor are not quite possible. However, in both cases, whether it is working with the class or with an individual student the tutors need to incorporate metacognitive knowledge and metacognitive self-regulation in students' learning.

Furthermore, Metacognitive Awareness Inventory subskills can be studied and tested further. Experimenting with the shorter MAI version with 5-point Likert scale to provide the participants with more options for the answers is also recommended. It would be interesting to analyze data based on wider range of answers rather than simply 'yes' or 'no' options. Also, detailed factor analysis of current and new instruments is needed for further studies.

Metacognitive Strategies Survey (MSS) developed for the tutors needs to be improved including factor analysis of survey items. Reliability of the metacognitive awareness subscales in tutoring, such as planning, management, monitoring, and evaluation needs to be improved and tested on a large group of tutors. Developed high quality measurement instruments can help tutors to see the need in metacognitive strategies practice.

Further research is needed in regard to the influence of teachers' metacognition on students' metacognition and students' academic achievement using the larger sample size. The researcher can hypothesize that MAI in tutors has less relation with students' MAI than tutors' MSS for the future research. There is a possibility that MSS can be related to students' MAI with the larger sample size. Simple regression analysis also shows that tutors' metacognitive

awareness (MSS) in tutoring is potentially more related to students' metacognitive awareness (MAI) than tutors' metacognitive awareness for learning (MAI). It could be also explained by latent character of metacognitive characteristics in MAI. Since MAI is focused on metacognitive awareness in learning, tutoring oriented survey or inventory would be more effective explicitly reflecting on tutoring rather than solely on learning. In addition, step 3 of multiple regression demonstrates that tutors' MAI is not optimal predictor of students' academic performance, or GPA score. Metacognitive strategies in tutors are more related to students' metacognitive awareness than tutors' metacognitive awareness (MAI). It also means that research design needs to be reconsidered for the future studies regarding research predictor variables.

Furthermore, it can be informative and interesting to engage in experimental design research around these issues. For example, future work could compare an experimental group of tutors to a control group where the experimental group would be trained to use metacognitive strategies for tutoring effectively. This in conjunction with future research with larger sample sizes and more effective metacognitive awareness inventory tool for tutors with higher reliability (for the whole inventory and its sub-dimensions) can better demonstrate the link between tutors' and students' metacognitive awareness.

Another area for potential future work is to investigate the difference in metacognitive awareness between groups of students attending tutoring sessions voluntarily or because of the necessity. Future research can include students' motivation for help-seeking and learning as well in the context of students;' metacognitive awareness in learning.

## **Implications**

Since students' metacognitive awareness is positively related to their GPA score, tutors should pay attention to the metacognitive strategies students use including planning, learning management, and evaluation of used learning strategies, help-seeking, summarizing, asking "how" and "why" questions, etc. Despite the fact that tutors' metacognitive strategies used for tutoring were not significantly related to students' metacognitive awareness and their GPA in this research with a limited sample, it remains a promising area. Tutors can be aware of the metacognitive strategies they use to support and encourage students in utilizing metacognitive strategies for their learning. Students can benefit from observing how tutors model appropriate metacognitive behaviors and strategies, e.g. the types of questions they ask and how they plan approaches to studying, etc. College instructors and students can also benefit from using metacognitive strategies in learning process. Discussions during the lectures, instructor's and peer feedback, promotion of help-seeking when it is needed, checking on students' understanding, and other metacognitive strategies can enhance students' learning and potentially improve students' academic performance in college educational setting. The idea of incorporating metacognitive strategies in college curriculum for instructors and tutors is worthy of attention.

## **Conclusions**

Overall, the topic of metacognitive awareness regarding learning effectiveness and students' academic performance is demonstrated as a research field worthy of scholars' serious attention and further research based on current literature review and research studies. Practical application of metacognitive strategies in higher education can potentially make a difference in how college students study and learn courses material effectively. In addition, metacognitive

awareness can potentially affect the way university instructors and tutors pass on the knowledge to the students and help them demonstrate better academic performance.

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APPENDIX A  
IRB APPROVAL



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**Protocol Inactivated: IRB-19-412, The impact of teachers' metacognitive awareness on undergraduate students' metacognitive awareness and academic performance**

1 message

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Protocol ID: IRB-19-412

Review Type: EXEMPT

Principal Investigator: Anastasia Elder

You are receiving this inactivation notification for one of the two following reasons:

## 1) Exempt Determinations:

This protocol is has been granted an exemption determination. Based on this exemption, and in accordance with Federal Regulations which can also be found in the MSU HRPP Operations Manual, your research does not require futher oversight by the HRPP.

Therefore, this study has been inactivated in our system. This means that recruitment, enrollment, data collection, and/or data analysis can continue, yet personnel and procedural amendments to this study are no longer required. If at any point, however, the risk to participants increases, you must contact the HRPP immediately.

## 2) Non-Exempt Approvals (Expedited or Full Board):

A request to inactivate (with the submission of a final report) your non-Exempt protocol was submitted and approved. If this is the case, there should be no further data collection or data analysis conducted under this protocol.

For additional questions pertaining to this study, please contact the HRPP at [irb@research.msstate.edu](mailto:irb@research.msstate.edu).

APPENDIX B  
CONSENT FORM

The impact of teachers' students' metacognitive awareness and academic performance

The purpose of this research is to study the relationship between teachers' metacognitive strategies, students' metacognitive strategies and academic performance

These measures are intended to assess tutors' and ' ,

\_\_\_\_\_

\_\_\_\_\_ Antonina Rakhmatova at  
[ar2708@msstate.edu](mailto:ar2708@msstate.edu)(

\_\_\_\_\_

If you agree to participate in this research study, please sign below. You will be given a copy of this form for your records.

Print Full Name: \_\_\_\_\_

\_\_\_\_\_  
Participant Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Investigator Signature

\_\_\_\_\_  
Date



APPENDIX C

DEMOGRAPHICS SURVEY FOR TUTORS

### Survey

Dear Academic Tutor, please answer several questions to assist us in our research. All data are confidential and will not be used in any manner to identify you.

Age: \_\_\_\_\_

What is your tutoring experience? Please, specify the number of years \_\_\_\_\_

What was/is your major (field)? \_\_\_\_\_

What is your gender?

M

F

Other

I do not wish to say

What is your cultural identity? Please check all that apply.

African American (not of Hispanic origin)

Native American

Asian or Pacific Islander

Latino/a

White (not of Hispanic origin)

Other (please specify) \_\_\_\_\_

How many tutoring sessions have you had this semester with this student? \_\_\_\_\_

How often do you see your students? \_\_\_\_\_

In what subject area have you most recently tutored this student? \_\_\_\_\_

What was the grade for the last *assignment or /test* you helped with this student? \_\_\_\_\_

APPENDIX D

DEMOGRAPHICS SURVEY FOR STUDENTS

### Survey

Dear Student, please answer several questions to assist us in our research. All data are confidential and will not be used in any manner to identify you.

Age: \_\_\_\_\_

**What is your year in school?**

- Freshman
- Sophomore
- Junior
- Senior
- Other (please specify)

**What is your major?** \_\_\_\_\_

**What sport are you in?** \_\_\_\_\_

**What is your gender?**

- M
- F
- Other
- I do not wish to say

**What is your cultural identity? Please check all that apply.**

- African American (not of Hispanic origin)
- Native American
- Asian or Pacific Islander
- Latino/a
- White (not of Hispanic origin)
- Other (please specify) \_\_\_\_\_

**What is the estimate of your current cumulative GPA?** \_\_\_\_\_

**How many tutoring sessions have you had this semester with your tutor?** \_\_\_\_\_

**How often do you see your tutor?** \_\_\_\_\_

**What was the grade for the last *assignment/test* your tutor helped you with?** \_\_\_\_\_

APPENDIX E

METACOGNITIVE AWARENESS INVENTORY (MAI)

## Part I

### Metacognitive Awareness Inventory (MAI)

Check True or False as appropriate about you as a learner. There are no right or wrong answers in this list of statements. It is simply a matter of what is true for you. Read each statement carefully and choose the one that best describes you. Take your time and answer honestly for each question.

	True	False
1. I ask myself periodically if I am meeting my goals.		
2. I consider several alternatives to a problem before I answer.		
3. I try to use strategies that have worked in the past.		
4. I pace myself while learning in order to have enough time.		
5. I understand my intellectual strengths and weaknesses.		
6. I think about what I really need to learn before I begin a task		
7. I know how well I did once I finish a test.		
8. I set specific goals before I begin a task.		
9. I slow down when I encounter important information.		
10. I know what kind of information is most important to learn.		
11. I ask myself if I have considered all options when solving a problem.		
12. I am good at organizing information.		
13. I consciously focus my attention on important information.		
14. I have a specific purpose for each strategy I use.		
15. I learn best when I know something about the topic.		
16. I know what the teacher expects me to learn.		
17. I am good at remembering information.		
18. I use different learning strategies depending on the situation.		
19. I ask myself if there was an easier way to do things after I finish a task.		
20. I have control over how well I learn.		
21. I periodically review to help me understand important relationships.		
22. I ask myself questions about the material before I begin.		
23. I think of several ways to solve a problem and choose the best one.		
24. I summarize what I've learned after I finish.		
25. I ask others for help when I don't understand something.		
26. I can motivate myself to learn when I need to		
27. I am aware of what strategies I use when I study.		
28. I find myself analyzing the usefulness of strategies while I study.		
29. I use my intellectual strengths to compensate for my weaknesses.		
30. I focus on the meaning and significance of new information.		
31. I create my own examples to make information more meaningful.		

## Part II

	True	False
32. I am a good judge of how well I understand something.		
33. I find myself using helpful learning strategies automatically.		
34. I find myself pausing regularly to check my comprehension.		
35. I know when each strategy I use will be most effective.		
36. I ask myself how well I accomplish my goals once I'm finished.		
37. I draw pictures or diagrams to help me understand while learning.		
38. I ask myself if I have considered all options after I solve a problem.		
39. I try to translate new information into my own words.		
40. I change strategies when I fail to understand.		
41. I use the organizational structure of the text to help me learn.		
42. I read instructions carefully before I begin a task.		
43. I ask myself if what I'm reading is related to what I already know.		
44. I reevaluate my assumptions when I get confused.		
45. I organize my time to best accomplish my goals.		
46. I learn more when I am interested in the topic.		
47. I try to break studying down into smaller steps.		
48. I focus on overall meaning rather than specifics.		
49. I ask myself questions about how well I am doing while I am learning something new.		
50. I ask myself if I learned as much as I could have once I finish a task.		
51. I stop and go back over new information that is not clear.		
52. I stop and reread when I get confused.		

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

APPENDIX F  
METACOGNITIVE STRATEGIES SURVEY (MSS)



## Metacognitive Strategies Survey

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

1 = never      2 = rarely      3 = sometimes      4 = often      5 = always

1. I provide my student with clear examples of how one aspect of the college course is connected to another one	1 2 3 4 5
2. I check on student's understanding periodically	1 2 3 4 5
3. I provide my student with clear and detailed feedback	1 2 3 4 5
4. I help the student to organize an information (notes) using diagrams, pictures, mind maps, etc.	1 2 3 4 5
5. I help the student to paraphrase and rephrase the ideas	1 2 3 4 5
6. I help the student to highlight the most important information in the text, or lecture	1 2 3 4 5
7. I help the students organize his/her time to best accomplish his/her goals	1 2 3 4 5
8. I ask the student open-ended 'how' and 'why' questions	1 2 3 4 5
9. I help my student to set specific goals before he/she begins working on his/her tasks	1 2 3 4 5
10. I discuss task/assignment/test results with my student to consider more effective ways for them to study.	1 2 3 4 5
11. I help my student to summarize the information	1 2 3 4 5
12. I help my student to think of several ways to solve a problem and choose the best one	1 2 3 4 5