

# How Pre-Service Teachers Learn: An Investigation of Motivation and Self-Regulation

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**Abstract.** This study investigated the effect of using a self-assessment tool known as a *Knowledge Survey (KS)* on the motivation and self-regulation of thirty-four pre-service teachers in an introductory educational course. The pre-service teachers were provided with a 115-question KS during the first week of class to use as an independent study guide for a 14-week semester. Data collection included journals entries, observations and focus group interviews. The results provided evidence indicating that the use of KS contributed to an increase in the pre-service teachers' motivation and ultimately improved their own learning through self-regulation. The pre-service teachers employed metacognitive and cognitive strategies to learn the content and skills required for the course through the KS, tracked the progress of this learning, and adjusted strategies as needed.

**Keywords:** pre-service teachers; self-regulation; self-regulated learning; motivation; knowledge survey.

## 1. Introduction

Self-regulation is a significant aspect in pre-service teacher education endeavors. It is crucial to academic success and also to teaching career development (Buzza & Allinotte, 2013). Pre-service teachers need to learn self-regulation skills that enable them to evaluate their teaching and to gradually improve it over time. Ryan and Cooper (2012) depict this notion as follows:

Although it is important to prepare ... teachers for initial practice, it is even more important to help them develop the attitudes and skills that will enable them to become lifelong students of teaching. Ideally, rather than relying on authority... they will continually examine and evaluate their practice, effectiveness, and accomplishments. (p.164)

Unfortunately, developing teacher self-regulation skills is often not perceived as a priority in teacher preparation programs (Dembo, 2001; Bembenuddy, White, & Velez, 2015). The main focus in teacher preparation programs is often restricted to pre-service teacher knowledge of subject matter, knowledge of students, and instructional practices and how to put those practices to effective use in their

classrooms (Edge, 2015). Zimmerman (2008) supported the notion that self-regulation skills are essential for pre-service teachers to develop and thus demanded that current research focus on investigating the ways pre-service teacher motivational feelings influence their self-regulation learning. One way to gather insight into such influence is to provide self-regulation related learning experiences to pre-service teachers (Randi, 2004). Accordingly, this study aimed to address how motivation and self-regulation of pre-service teachers interact in an introductory educational course.

## 2. Background

Self-regulation is a cyclical process of taking control of one's own learning. According to Zimmerman (2000), self-regulated learning (SRL) consists of three stages. The first stage is forethought where a learner analyzes the task and sets goal(s) to complete it. The second stage is performance where the learner selects metacognitive and cognitive strategies to perform the task, monitors the effectiveness of the strategies selected, and adjusts them as needed. The third stage is reflection on performance where the learner evaluates his/her performance on the learning task.

Metacognitive strategies are referred to those used for regulating the learner's own activities, such as thru planning (Nelson & Narens, 1994; Pintrich, 2002). Meanwhile, cognitive strategies are approaches used for processing of information, which learners apply to learn and understand their study material. Examples of this include rehearsal (Duncan & McKeachie, 2005). Jaafar, Awaludin, and Bakar (2014) argued that acquiring a knowledge of metacognitive and cognitive strategies is significant, but insufficient for self-regulation in which learners must be motivated in order to able to use such strategies to regulate their cognition and effort.

Pintrich and Groot (1990) advocated the notion that self-regulation is inspired by motivation. In their study, they proposed three motivational components that influence self-regulation. The first component is an expectancy component, "Can I do this task?" This is self-efficacy, which refers to the beliefs of the learner about his/her ability to perform a certain task (Bandura, 1997). The second component is an emotional component, "How do I feel about this task?" This refers to the emotional reactions of learner when performing a task that might affect the final outcomes. The third component is a value component, "Why am I doing this task?" It represents the learner's reasons for performing the task. The interaction of the three motivational components determines the type and magnitude of the influence on self-regulation.

The current study explores how the interactive relations of the three motivational components influence pre-service teacher self-regulation as they use a self-assessment tool, a *Knowledge Survey (KS)*. A KS is a self-assessment tool that includes the full-breadth of learning objectives of a course, which are presented as a large collection of questions. These questions are designed according to Bloom's Taxonomy (i.e., knowledge, comprehension, application, analysis, synthesis, and evaluation). Learners are not required to answer the KS

questions; rather, they use a rating scale to assess their confidence levels in their abilities to answer each question with competence if the question were to appear on an actual test. That is, what is being surveyed is the confidence learners have in their own judgment compared to actual performance (Nuhfer & Knipp, 2003; Wirth & Perkins, 2005).

Research shows that KS is a useful self-assessment tool that allows pre-service teachers to predict performance and to monitor their learning over time (Claus & Geedey, 2010; Alenazi, 2014). Pre-service can apply a pre-course KS to gain insight into their learning needs, a post-course KS to determine their learning gains, or a KS throughout a course to monitor their learning. KS can be used as a “study guide [to] support students in learning their material, focus their attention on important topics and help them review for quizzes and tests” (Conderman & Bresnahan, 2010, p. 169). Namely, it focuses student attention on what to learn and how to learn it.

However, little is known about whether a KS can motivate pre-service teachers to regulate their own learning. The purpose of this study is to investigate how the three motivational components influence pre-service teachers’ self-regulation learning in an introductory educational course as they apply a KS. This investigation focuses on three sub-questions: Can pre-service teachers answer the KS questions? How do pre-service teachers feel about answering the KS questions? and Why are pre-service teachers answering the KS questions? Analysis of the answers to these questions and the magnitude of self-regulation applied by the pre-service teachers were utilized to understand the extent that KS can motivate pre-service teachers to regulate their own learning.

### **3. Research Question**

To what extent does a *Knowledge Survey* motivate pre-service teachers to regulate their own learning in an introductory educational course?

## **4. Methodology**

### **4.1 Sample**

The current study sample consisted of thirty-four pre-service elementary school teachers from a male college of education at a Southern University in Saudi Arabia. The participants were 19–22 years old with a mean age of 20. The participants needed to successfully complete a four-year teacher preparation program in order to graduate and become certified elementary school teachers. Among the thirty-four participants, fifteen were special education majors, fifteen were art majors, and four were physical education majors. The participants were in their coursework stage of study in the program; this stage precedes the stage that includes student teaching experience. At the time of the present study, the participants were enrolled in a three-hour introductory educational course that emphasizes learning basic principles of curriculum and instruction. All the participants volunteered to participate in the study based on their desire to learn about and to help the researcher learn more about motivation and self-regulation.

## **4.2 Instrument Development**

The instrument for this research was a KS of 115 questions. The KS contains all the content and skills assigned for the course, but are presented in a particular structure, with a question format. In other words, every part of the required course requirements was presented in the KS as a question. For example, the book states the definition of a teaching method as the strategies implemented by the teacher to achieve desired learning goals by students. In the KS, this definition is presented as “What is a teaching method?” The questions in the KS measure all levels of thinking as evenly as possible. The answers to questions of low-level thinking (i.e., knowledge, comprehension, and application) were often found in the required book or readings as opposed to the high-level thinking (i.e., analysis, synthesis, and evaluation) where participants need to generate new answers by examining and breaking information into parts, compiling information together in a different way, and making judgments about certain statements. The process of developing the instrument underwent two stages:

### **4.2.1 Item collection and creation**

Questions were collected or created to cover all the course materials (a 405-page book titled, “*Basic Principles of Curriculum and Instruction*” and readings of 21 pages). First, high-volume questions were collected from: 1) previous exams conducted by the researcher or other instructors during past years of teaching the same course and 2) the literature. Second, other questions were created for parts of the course materials that were not covered by the collected questions. In order to cover such wide range of course materials, most of the collected or created questions were subjective. The reason is that subjective questions (e.g., extended-response essay) cover more content as opposed to objective questions (e.g., multiple choice questions).

### **4.2.2 Item identification and selection**

Two faculty members who have taught the course for at least three years were asked to identify the best questions that meet the course objectives from among the questions collected and created in the first stage. Next, the candidate questions were organized into six order-levels according to Bloom’s Taxonomy. To develop the KS, 115 questions were selected and distributed as evenly as possible across Bloom’s Taxonomy and to cover all the content and skills imbedded in the course materials. The KS included a 4-point scale (0 = I cannot begin to answer this problem; 1 = I can partially answer this problem; 2 = I can answer most of the problem; and 3 = I can answer the entire problem with full confidence) that participants can use for each question to predict and monitor their mastery level in the course (See Table. 1).

**Table 1: Excerpt of six items from the 115-item knowledge survey**

<b>Bloom Level</b>	<b>Question</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
1. Knowledge	What are the essential components of curriculum?				
2. Comprehension	Explain how goal seating can contribute to good curriculum design?				
3. Application	Write learning objectives in each level of Bloom's Taxonomy.				
4. Analysis	Compare student-centered leaning to teacher-centered learning.				
5. Synthesis	Develop an original lesson plan in your field.				
6. Evaluation	In your opinion, which is more effective in measuring student-learning outcomes: subjective test questions or objective test questions? Why?				

### 4.3 Procedures

The study was conducted over fourteen weeks. Every participant was handed a hard copy of the 115-question KS during the first week of class for use throughout the semester as a study guide and was instructed on how use it. No obligation was imposed to solve the survey questions. The participants were informed that two mid-term exams would be given in the 6<sup>th</sup> week and the 12<sup>th</sup> week in addition to a final exam at the end of the semester. All exams were counted as 70% towards the total grade of the course (10% for each mid-term and 50% for the final exam). They were also informed that the course exams questions would be drawn from the KS, but not necessarily with the same format or quantity.

To illustrate, answering the following question, "In your opinion, which is more effective in measuring student-learning outcomes: subjective test questions or objective test questions? Why?" The answer of this question entails having an adequate knowledge of the definition, representative examples, and pros and cons of both subjective questions and objective questions. Thus, several sub-questions can be derived from the above question. One sub-question can be elicited as, "Discuss the pros and cons of using subjective questions to measure student-learning outcome." Another sub-question would be, "What are objective test questions? Provide examples."

### 4.4 Data Collection

Data were collected from: (1) one open-ended question survey, (2) participant journals (3) researcher observations and (4) follow-up focus group interviews with the participants. First, participants were asked in the first week to review the KS and then answer the expectancy component sub-question, "Can you answer the KS questions?" This was done through an open-ended question survey in order to gain an insight into the participants' self-efficacy. Second, each participant was asked to write a journal entry every two weeks until before the second mid-term. Skipping the mid-term exam weeks (6<sup>th</sup> and 12<sup>th</sup>), each participant submitted five journal entries to describe in details their experience with using the KS. No limitations or restrictions were imposed.

Third, participants' activities were observed. I took notes when I met participants before class, in the classroom, during breaks, or even when they visited me in my office. I expanded my notes by writing descriptive notes as soon as possible and described what I heard or saw in details. Next, I wrote reflective notes by jotting down my thought and opinions regarding these specific activities. The journal entries and observations were meant to document 1) the participants' statements that could provide answers to the emotional component sub-question, "How do pre-service teachers feel about answering the KS questions?" and the value component sub-question, "Why are pre-service teachers answering the KS questions?" 2) Actions taken by the participants to regulate their learning, if any.

Fourth, focus group interviews were conducted after the second mid-term exam. Each interview lasted for one hour. The class (34 participants) was divided into groups based on their total scores on the two mid-term exams. The mean score was computed for each participant on the two exams. The scores ranged from 50% to 95%. Accordingly, three groups were created using a 15% interval as follows: lower performing participants from 50% to 65% (8 participants), moderate performing participants from more than 65% to 80% (11 participants), and higher performing participants from more than 80% to 95% (15 participants). To obtain meaningful interaction among the participants, the number of group members was restricted to between 5 and 10 in order for the group to be large enough to generate rich discussion, but not so large that some participants were left out. Since each group of moderate and high performing participants included more than 10 members, each group was divided into two smaller groups: (5,6) and (7,8), respectfully. The interviews were mainly conducted to probe participants' statements found in the journals or the survey and actions noticed during the observation regarding the three motivational components and self-regulation activities.

#### **4.5 Data Analysis**

The study involved qualitative data. The survey results, journal entries, observation reflective notes, and interview transcripts were read carefully and searched for participants' answers and actions regarding two categories: 1) the three motivational components and 2) the nature and magnitude of self-regulation. A table of three main columns was created to document the entire participant's answers and actions regarding these two categories. The first column read "participant" that included the participant's name. The second one had a main title read "motivational component" and was divided into three sub-columns, one for each component: expectancy, emotional, and value. The third one read "self-regulation". Each answer or action made by a participant was marked and tabulated under the related category. All the documented answers and actions and their relationships were analyzed in light of participants' learning outcomes and utilized as the basis for arriving at a theoretical understanding of how motivation and self-regulation of pre-service teachers interact as they apply a KS in an introductory educational course.

## 5. Results

The study reports on participant experience with the use of a Knowledge Survey as they progressed throughout the semester. This experience is discussed in two phases. Phase 1 is from week 1 to week 5 (from first day of classes until prior to the first mid-term exam). Phase 2 is from week 7 to week 11 (between the first mid-term exam and the second mid-term exam). All participants' statements were translated from Arabic.

### 5.1 Phase 1 (week 1 to week 5)

#### 5.1.1 The Expectancy Component

The first sub-question addressed in this study was, "Can pre-service teachers answer all the KS questions?" The results from the survey administered in the first week of the semester indicated that 28 participants expressed a positive prediction of their ability to solve the KS. They showed confidence in their ability as they claimed that they will be able to solve the KS questions in one way or another as they progressed through the semester. An example of a typical statement is as follows:

*"Right now, I do not know all the answers for the KS questions, but I am sure I will be able to solve them as the semester proceeds... There are so many high-level questions, but nothing is impossible. I encounter challenges every semester and I enjoy overcoming them...I am confident I will find solutions to the KS questions alone or with the help of classmates."*

#### 5.1.2 Emotional Component

The second sub-question addressed in this study was, "How do pre-service teachers feel about answering the KS questions?" The results from the journal entries indicated that 31 participants expressed that the KS was overwhelming. Accordingly, participant use of the KS was minimal. Evidence was clear from the observation that only two participants brought their copy of the survey to the classroom for every class session. The rest of the participants never brought along the survey to class. There were also no indications of discussion about the KS among the participants inside or outside the classroom. Certain reasons for such disinterest in the use of the KS were found as follows:

##### 5.1.2.1 New Teaching Tool

Participants expressed that using the KS was a new experience for them. This is reflected in the following comments, "I've never seen such a survey. I don't feel comfortable using it," and "I am not used to this method. It is confusing." Additional comments included, "[We] usually get a summary of the course content at the end of the semester to study for the final exam, but [the KS] is different." Another participant suggested applying a traditional approach, commenting, "I think it would better to assign specific areas/sections of the book for us to study. This is what other instructors usually do."

##### 5.1.2.2 Question Volume

The volume of items in the survey was a major complaint from a majority of the participants. They said, "[The survey] has too many questions [and they] do not know if [they] will have the time to answer all these questions". One participant

explained, "I have a busy schedule. It will be challenging for me to answer the entire set of questions alone." Another stated, "I have other courses to study for."

#### *5.1.2.3 Question Level*

A few participants seemed to have uncertainty in their ability to solve items designed in terms of higher-order level thinking: analysis, synthesis, and evaluation. Answers to such questions are not usually found directly in the assigned book or suggested readings. Participants needed to make an effort to create the answer. Their statements in the journal entries were similar and included the following, "I could not find answers to some questions (higher-order level thinking) in the book or the readings... we do not usually get this type of question... I think that I will not be able to depend on myself to obtain the correct answers to some questions."

#### *5.1.2.4 Question Type*

Participants reported having a large number of subjective questions in the KS was a turn off for them. They preferred objective questions over subjective questions because such questions entail less time and effort to answer. Pre-service teachers said, "The majority of the questions are subjective. We usually have only one or two subjective questions on exams...we need multiple-choice, false/true, and fill-in-blank questions."

### **5.2 Phase 2 (week 7 to week 11)**

#### **5.2.1 Value Component**

The third sub-question addressed in this study was, "Why are pre-service teachers answering the KS questions?" The survey results, journal entries, and focus group interviews indicated that a majority of participants had strong intrinsic motivation towards the course, as they believed that the course content and skills in the KS are essential for their future teaching career. They often pointed out that their main goal is to master such content and skills by the end of the semester. Using the KS to achieve such goal; however, was overwhelming for them due to the heavy workload associated with it as they preferred to learn through typical instruction such as lectures.

This overwhelming feeling completely changed after the first mid-term exam where a large change was observed in participant behavior in the weeks after the first mid-term exam. Participants started to pay substantial attention to the KS, whereas two main activities were detected. First, there was noticeable continuous discussion about the KS questions amongst the participants inside the classroom during the break as well as outside the classroom. Second, participants started asking me during class, after class, or even during my office hours for clarification about certain questions on the survey.

Most of the journal entries in this time period focused on challenges that were overcome. Participant expressions changed from passive to active, and they switched from describing challenges and how they were difficult to deal with to describing their own ways of overcoming these challenges. The journal entries

from this period mention how the first exam was a main reason for considering the survey in a serious manner, as demonstrated by the following comments:

*"[The instructor] told us that we might have questions with the same format in the exams from the survey, but I had doubted that. I am not used to that... we had two questions out of five in the first exam directly from the survey... I started paying more attention to answering the survey questions... I have the exam questions, this is nice. I will solve all of them no matter what it takes."*

After the first mid-term exam, the participants actively began the regulation process for their own learning. The participants collectively created their own groups and set goals to solve the KS questions as described in representative statements such as, "We believed that we could solve all the KS questions with the help of each other... Thus, we created a WhatsApp group of five members to discuss and share our answers." WhatsApp is an instant messaging application for smartphones that allows users to exchange texts, photos, audios, videos, documents, location, voice calls, and video calls for free anytime anywhere in the world. Since the survey questions were high in volume, the participant explained, "We divided the questions among our group members, and each student selected a mixture of approximately 24 questions from the different sections of the KS to solve throughout the semester...3 questions per week, and posted the answers to the group."

Next, each participant created personal strategies to come up with answers to the allocated set of questions, track the effectiveness of these strategies, and adjust them as needed. One participant said, "I devoted one hour for the KS the night before each class. I looked up answers in the book...once I found an answer in a page in the book, I wrote the page number next to the question in the survey... [And/or] I wrote the question number next to the answer in the book." However, if they encountered difficulty regarding some questions, they responded in various ways. Another participant said, "I had to search the Internet to get more information about some questions." A third stated, "I read a different book to help me find certain answers." In a few cases, lower performing participants sought help from their peers. A lower performing participant claimed that he "asked his friend Ahmed to help him find the answers of a few questions."

On a weekly basis, the participants evaluated their performance progress on the learning tasks of the KS as shown in a participant's statement, "We reviewed our answers weekly during the break in-class...in cases where we could not find or disagree on an answer in our group, we discussed it with another group." Another participant said, "We usually compared our answers with the other groups' answers."

Ultimately, the majority of participants improved their grades on the second mid-term exam compared to the first mid-term exam as shown in Table 2. They also expressed interest in having a KS for all the classes they attend. They agreed that the KS can be time-consuming and requires considerable effort, but the benefits of using it made it a load they could handle and deal with. In their

opinion, the KS provided them from day one with a clear road map of what and how to master by the end of the course.

**Table 2: Comparison of participants' scores on mid-term exam 1 and mid-term exam 2**

P	MTE 1	MTE 2	P	MTE 1	MTE 2
1	7	8	18	8	9
2	4.5	5.5	19	9	9.5
3	6.5	7.5	20	7.5	10
4	4	9.5	21	5	9.5
5	6	9	22	8.5	8
6	7	9	23	5.5	8
7	6	7	24	6	10
8	3	7	25	6.5	10
9	5	6	26	8	8.5
10	7	10	27	7.5	9.5
11	5	8	28	6	6
12	9	9.5	29	8	10
13	9	8.5	30	7	7.5
14	7	9.5	31	5	9
15	7	10	32	4.5	7
16	6.5	10	33	6	8.5
17	5.5	7	34	7	9.5

Note. P: Participant, MTE: Mid-tem Exam.

## 6. Discussion and Conclusion

The study aimed to investigate to what extent a Knowledge Survey can motivate pre-service teachers to regulate their own learning in an introductory educational course. The study results suggest that the sample of pre-service teachers in this study often utilized the KS designed for the course, which produced a positive learning outcome. These results provided evidence indicating that the use of the KS contributed to an increase in the participant motivation and improvement in their own learning through self-regulation.

These positive learning outcomes were the end result of the interaction between the three motivational components of the self-regulated learning: the expectancy component, the emotional component, and the value component. The expectancy component involved the answer to the question, "Can pre-service teachers answer the KS questions?" The participants were able to recognize what questions they could and could not answer after an initial scanning of the survey at the beginning of the semester. All but a few participants claimed they were confident with their ability to learn the content and skills covered in the KS in one way or another. This alone, however, was insufficient for self-regulation.

The reason for this is that the expectancy component was negatively affected by the emotional component, "How do pre-service teachers feel about answering the KS questions?" The participants had negative feelings towards the KS due to the high volume of work associated with it. They claimed that the content and skills needed was explicit and systematic in the KS and they were clear on what to learn. However, the application of the KS requires abundant effort and is very

time-consuming. Thus, they preferred to ignore the KS and learn the required content and skills through typical in-class instruction.

Thus, the value component, "Why are pre-service teachers answering the KS questions?" was the most effective in changing behavior. The participants firmly believed that the content and skills impeded in the KS was important to their future teaching career and mastering them a key to success in this course. Still, they showed a clear disinterest in the KS until after the first mid-term exam. Interestingly, participant interest changed from non-interested to very-interested in the KS after the first mid-term exam, which included two questions directly from the KS and three others with equivalent formatting.

Although the participants were informed in the beginning of the study that all the course exams questions would be drawn from the KS with the same format or an equivalent one, they apparently doubted this as this type of tool was new to them. Once this doubt became a certainty, the instrumental value became real and clear to them. This contributed to a noticeable increase in their motivation to use the KS and learn the content and skills required in the course through self-regulation. In fact, the participants were not interested in the KS itself, as solving the entire set of questions can be tedious and very time-consuming. They were actually interested in the outcomes of solving the KS questions, which was mastering the content and skills required in the course and obtaining good grades as a result (Panadero & Tapia, 2014).

To regulate their own learning of the KS content and skills, the participants employed the first and third stages of SLR collectively and the second one individually at most. The first stage (i.e., forethought) was done collectively where the participants set goals with certain properties to solve all the KS questions. The goal properties were labeled as specific, short-term, and achievable. The following sentence is a representative example of these goals, "each student selected a mixture of approximately 24 questions from the different sections of the KS to solve throughout the semester (specific) ...3 questions per week (short term)... we could solve all the KS questions with the help of each other (achievable)." Schunk (2001) argued that these three goal properties are empirically found to boost motivation and enhance self-regulation. The reason is that 1) specific goals determine a clear framework and the amount of effort needed to perform a certain task as opposed to general goals, 2) overly easy goals and overly difficult goals do not usually motivate people. Moderately difficult goals that are perceived as achievable do motivate, and 3) short-term goals are clearer and are executed quicker than long-term goals.

The second stage (i.e., performance) was mostly done individually where each participant created their own strategies to come up with answers to the allocated set of questions, monitored the effectiveness of the strategies, and adjust them as needed. In limited cases, some participants performed the second stage with the help of another participant. The third stages (i.e., reflections on performance) was done collectively where the participants evaluated the entire group

performance on the learning task as a whole. This finding is consistent of the view of that learners employ different types of regulations during cooperative learning situations: self-regulation (an individual learner regulates his/her own learning), co-regulation (an individual scaffolds and regulates another individual's learning), and shared-regulation (individuals work together to regulate each other's learning) (Hayes, Smith & Shea, 2015; Fernandez-Rio, Cecchini, Méndez-Gimenez, Mendez-Alonso, & Prieto, 2017)

One might argue that the KS served as an extrinsic motivation that could undermine participant intrinsic motivation to learn. While the KS is considered to be a form of extrinsic motivation, it did provide the participants with more autonomy, which linked their motivation more closely with internal causality (Harmes et al., 2015). The results showed that the participants were already motivated intrinsically to learn the content and skills of this course because they believed that this course was important to their future teaching career. The KS was just a boost to stimulate their existing intrinsic motivation. What differed is that the participants usually engage in learning course materials throughout the semester in typical in-classroom instruction. The KS was a new approach, and also a unique change in instruction, that highly energized them to learn the course materials.

In view of the results of the study, there is one main implication for researchers studying pre-service teacher self-regulation. The study suggests the inclusion of self-regulation in teacher preparation programs as a priority. This suggestion, however, does not imply deemphasizing the main priorities of the programs that include knowledge of subject matter, students, and instructional practices. Rather, it suggests including self-regulation within these priorities in two forms. First, teaching self-regulation skills with the subject matter. Pre-service teachers become motivated to apply a certain self-regulation approach once they acknowledge its benefits to their subject matter knowledge compared to other approaches. In fact, they may learn how to self-regulate during a general self-regulation program, but they should be given the opportunity to practice it in a classroom. Once they experience self-regulation benefits on their own learning of the subject matter they are studying, they are more likely to apply it to other subject matter. Ekeke and Telu (2015) went further to argue that learning self-regulation in school helps extend its effect to life. That is, learners become intrinsically encouraged to apply it to in all facets of their lives and become lifelong learners, which is an important goal in education.

Second, teaching self-regulation can be accomplished through tools that consider the three motivational components in their design. On the one hand, the pre-service teachers in the present study described solving the tasks of the tool as overwhelming (the emotional component), which indicated a negative feeling towards the tool tasks. On the other hand, they described the tasks as achievable (the expectancy component) and significant to their future career (the value component). Regardless of the negative result of the emotional component, they applied the tool and produced positive learning outcomes as a result of the interaction between the three motivational components. It is axiomatic, then,

that pre-service teacher would learn better via a tool that provides them with a positive result regarding the three motivational components. In other words, the tasks of a tool that are perceived as achievable, interesting, and valuable are more likely to motivate self-regulation.

This study, however, has limitations. One limitation of the study is that the KS mostly included subjective questions. Tools in future studies should include a balanced mixture of subjective questions and objective questions in order to obtain better insight into pre-service teacher self-regulation. Another limitation is the absence of female participants in the study. Although the present study resulted in insights on self-regulation, the sample only included males. A sample with a mix of male and female participants may yield qualitatively different results.

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