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The Influence of Pre-Service Teachers' Perceived Instrumentality on Their Motivation and Cognition in Teacher Education Courses

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THE INFLUENCE OF PRE-SERVICE TEACHERS' PERCEIVED INSTRUMENTALITY ON THEIR MOTIVATION AND COGNITION IN TEACHER EDUCATION COURSES

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ABSTRACT

In this dissertation study, I examined ways pre-service teachers' motivational and cognitive variables (i.e., endogenous/exogenous instrumentality, intrinsic/extrinsic motivational goal orientation, metacognitive self-regulation, and cognitive learning strategies) contributed to explaining their use of extensive knowledge integration strategies within teacher education courses. In particular, I explored ways their perceived endogenous/exogenous instrumentality influenced their use of extensive knowledge integration strategies via their intrinsic/extrinsic motivational goal orientations, metacognitive self-regulation, and cognitive learning strategies using path analysis.

Future time perspective (FTP) theory was used as a framework to study pre-service teachers' future goals to become teachers and the effect that future goals have on pre-service teachers' initiation and maintenance of their motivation and learning. A total of 197 college students in teacher education courses participated in this research. Multiple regression analyses and path analysis were used to answer the following research questions:

1. Which is the best predictor of pre-service teachers' self-ratings of their extensive knowledge integration across teacher education courses: their self-ratings of perceived instrumentality (endogenous/exogenous instrumentality), motivational goal orientations (intrinsic/extrinsic motivational goal orientation), metacognitive self-regulation, or use of cognitive learning strategies (rehearsal, elaboration, and critical thinking strategies)?

2. Do ratings of instrumentality significantly predict pre-service teachers' purposeful use of extensive knowledge integration strategies? If so, do their self-ratings of intrinsic/extrinsic motivational goal orientations, use of metacognitive self-regulation strategies, and/or use of

cognitive learning strategies (i.e., rehearsal, elaboration, and critical thinking strategies) significantly predict their use of extensive knowledge integration strategies?

3. What are the direct and indirect effects of pre-service teachers' perceived instrumentality on their self-ratings of intrinsic/extrinsic motivational goal orientations, use of metacognitive self-regulation strategies, use of cognitive learning strategies, and use of extensive knowledge integration strategies?

The multiple regression result of this research indicated that pre-service teachers' ratings on use of elaboration strategies ($\beta = .27$, $p < .01$) and critical thinking strategies ($\beta = .25$, $p < .01$) made statistically significant contributions to the prediction of pre-service teachers' ratings on their use of extensive knowledge integration strategies. Additionally, results from the hierarchical regression analysis showed that, in the first step of the prediction equation, endogenous instrumentality was the significant predictor of extensive knowledge integration, $R^2 = .05$, $F(2, 194) = 4.89$, $p < .01$. In the second step, entering the intrinsic and extrinsic motivational goal orientation variables significantly increased the prediction of pre-service teachers' extensive knowledge integration ($R^2 = .09$, change in $R^2 = .03$, $F(2, 192) = 3.12$, $p < .05$). Then, pre-service teachers' ratings on metacognitive self-regulation were added to the hierarchical regression (step 3) and the predictive power significantly improved ($R^2 = .10$, change in $R^2 = .02$, $F(1, 191) = 4.15$, $p < .05$). Finally, the remaining variables— pre-service teachers' ratings on their use of rehearsal, elaboration, and critical thinking strategies—were entered (step 4). The final model indicated that prediction of pre-service teachers' extensive knowledge integration significantly improved; $R^2 = .19$, change in $R^2 = .10$, $F(3, 188) = 7.49$, $p < .01$.

The path analysis results suggest that pre-service teachers' intrinsic motivational goal orientation, metacognitive self-regulation, and cognitive learning strategies played mediating

roles between their endogenous instrumentality and their use of extensive knowledge integration.

Understanding of the relationship between current academic tasks and their future goals, intrinsic motivational goal orientation, metacognitive self-regulation, and use of deep learning strategies may be necessary for pre-service teachers' effective learning that may promote the development of their teaching expertise. Therefore, educators for pre-service teachers may need to understand and use these motivational and cognitive variables to encourage and promote pre-service teachers' effective learning within and across teacher education courses.

CHAPTER ONE

INTRODUCTION

Within the field of educational studies, students' learning is a fundamental issue, for which effective teachers are considered to be the primary resource (Anderson, Greene, & Loewen, 1988; Darling-Hammond, 2008; National Commission on Teaching and America's Future, 2003). For those who desire to become effective teachers, teacher preparation programs have been established within colleges and universities (Lin & Gorrell, 2003). The intention of teacher education programs is to provide education to students (i.e., pre-service teachers) with a deep and broad understanding of skills in teaching and learning so that they may become effective teachers (Duffy, 1994; Korthagen, 2001; Lin & Gorrell, 2003; Murphy, Delli, & Edwards, 2004). However, evidence shows that teacher education programs do not consistently support pre-service teachers' preparation for entering the teaching profession (Crowson, 1999; Darling-Hammond, 2000, 2006; Goodlad, 1990; Pajares, 1992). In general, teacher education courses emphasize theoretical aspects of teaching that may give pre-service teachers a false sense of confidence because they may not make the cognitive connection to real teaching with real students (Bransford, 2000). Indeed, pre-service teachers tend to have more optimistic beliefs about the effectiveness of their future teaching practices and positive student outcomes compared to in-service teachers who have teaching experience in real class situations (Crowson, 1999; Darling-Hammond, 2006; Pajares, 1992).

After entering the teaching profession, beginning teachers often face professional challenges that conflict with beliefs they established before or during their teacher education programs (Kelchtermans & Ballet, 2002; Tsui, 2007; Volkman & Anderson, 1998). For example, Volkmann and Anderson (1998) described a high school chemistry teacher's dilemmas during

her first year of teaching. She particularly struggled with the teaching context: she felt like a student, but had to act like an adult; she wanted to take care of her students, but had to be strict with them; she did not feel sufficiently knowledgeable about chemistry, but felt that she was expected to be an expert.

Such struggles during their first five years of teaching may cause beginning teachers to leave their jobs. According to the National Commission on Teaching and America's Future (NCTAF; 2003), the percentage of *beginning* teachers who leave the teaching profession increases as the number of teaching-years increases (i.e., 1-5 years). For example, in 1999-2000 the percentage of 1st-year teacher attrition was 14%, whereas the percentage of 5th-year teacher attrition was 46% (NCTAF, 2003). On the other hand, Darling-Hammond (2000) suggested that some teachers become more effective after five years of teaching experience. According to Darling-Hammond (2000), if teachers leave the profession early (i.e., during the first five years), they miss opportunities to improve their teaching. Adding to the teacher-attrition dilemma, the vacancies caused by teacher attrition will likely be filled with new teacher education graduates with less teaching experience. Thus, a revolving door of new hires and teacher attrition may have negative effects on students' learning processes (NCTAF, 2003).

To help alleviate the new-hire teacher-attrition dilemma, teacher education programs may need to change some aspects of their programs to provide more effective pre-service learning opportunities. Studying pre-service teachers' motivation and learning within teacher education courses may help teacher educators develop more effective pre-service learning contexts and activities to facilitate pre-service teachers' extensive knowledge integration (the purposeful integration of knowledge across topics and domains, Shell et al., 2005) to support

their future effective teaching. Indeed, it may be difficult to make meaningful changes to teacher education programs without understanding pre-service teachers' motivation and cognition within teacher education courses. Therefore, this dissertation sought to examine the association between pre-service teachers' perceptions of their future goals to becoming teachers, their motivation to learn, their use of metacognitive self-regulation, their use of shallow and deep cognitive learning strategies within their teacher education courses, and the extent to which they purposefully integrate knowledge across teacher education courses (i.e., extensive knowledge integration).

In the next sections, pre-service teachers' perceptions of their long-term future career goals (i.e., future goals) as a motivational variable—that may have a primary influence on their extensive knowledge integration—are explained. Then, ways that teaching expertise may link to pre-service teachers' extensive knowledge integration is explained.

Influences of Future Goals on Students' Learning

Various researchers have studied the motivational and cognitive components that influence students' learning processes (e.g., Dweck & Leggett, 1988; Husman & Hilpert, 2007). For example, researchers have studied students' motivational and cognitive variables such as self-efficacy (i.e., beliefs in one's ability to achieve a specific goal; Husman & Hilpert, 2007), attributions (i.e., the reasons students give for performance outcomes; Weiner, 1985), achievement goals (e.g., focus on mastering a skill or obtaining a grade; Dweck & Leggett, 1988), and emotions (e.g., boredom; Goetz, 2004, and shame; Turner & Husman, 2008). Perhaps, because "the future is our primary motivational space" (De Volder & Lens, 1982, p. 566), students' future goals have recently received much scholarly attention as an important motivational construct (De Bilde, Vansteenkiste, & Lens, 2011; Kover & Worrell, 2010; Lens, Paixao, Herrera, & Grobler, 2012). As Kruglanski (1996) explained, "Much human activity

revolves around the pursuit of goals. Goals energize our behavior and guide our choices" (p. 599). Having future goals can motivate students to complete their academic tasks successfully (Husman & Lens, 1999; Peetsma, 2000; Phalet, Andriesson, & Lens, 2004). According to Oyserman, Terry, and Bybee (2002), when a student has an image of a *possible self* (a self-image that one would like to have in the future), his/her academic involvement in school increases. For example, when an individual has a possible self of being a teacher, her hoped-for self-image for the future may stimulate her motivation to make efforts to achieve that hoped-for future self (Markus & Nurius, 1986; Oyserman et al., 2002).

Consistent with this idea, students who see their present tasks as having an *instrumental value* in reaching their future goals (i.e., connection between current tasks and future goals) put forth more effort on school tasks than students who do not see this instrumental value (Peetsma, 2000). For example, when a student with the future career goal of becoming a teacher enters a teacher education program, he/she needs to understand the importance of learning the content of a foundational education course in becoming an effective teacher (his/her possible self). When pre-service teachers see the connection between current content and future goals, they may be more likely to make the effort to master the course content and/or get a high course grade in order to achieve these future goals (Malka & Covington, 2005; Peetsma, 2000; Van Calster, Lens, & Nuttin, 1987).

If students' future goals are a powerful motivational construct in their learning, pre-service teachers' future goals of becoming teachers may facilitate their learning in teacher education courses. These future goals may encourage them to acquire and integrate their knowledge within and across courses in their teacher education program. Indeed, students' use of metacognitive self-regulation and cognitive strategies to learn information and to use

purposefully extensive knowledge integration may be needed to facilitate their development of teaching expertise. In the following section, support for the argument about why students' use of metacognitive self-regulation, cognitive learning strategies, and extensive knowledge integration may be key to developing teaching expertise is provided.

Teaching Expertise

According to Berliner (1986, 2001), expert teachers have several important cognitive characteristics that distinguish them from novice teachers: (a) expert teachers organize their knowledge for teaching and learning more efficiently, (b) expert teachers see problems in deeper, more extensive ways, and (c) expert teachers use self-regulation strategies (e.g., cognitive regulation and effort regulation) for personal knowledge acquisition as well as for planning and execution of teaching activities. Expert teachers tend to use metacognitive self-regulation strategies (i.e., thinking about thinking) to monitor their cognitive processes when they acquire new knowledge (Bransford, 2000).

Hattie (2003) explained that "experts possess knowledge that is more integrated, in that they combine new subject matter content knowledge with prior knowledge; can relate current lesson content to other subjects in the curriculum" (p. 5). Thus, to become expert teachers, pre-service teachers not only need deep and extensive knowledge of subject matter and teaching, but they also need to integrate that knowledge (Bransford, 2000). Therefore, to understand better pre-service teachers' development of teaching expertise within teacher education, it is necessary to understand their motivation and cognition (e.g., their use of metacognitive self-regulation, cognitive learning strategies, and extensive knowledge integration strategies). This information could help teacher educators to improve teacher education programs, which in turn could help

pre-service teachers develop teaching expertise in ways that would best prepare them to begin their teaching careers.

Purpose of the Study

The purpose of this study was to investigate the extent to which the following factors are related to pre-service teachers' use of extensive knowledge integration strategies (purposeful integration of knowledge across education courses): (a) perceived instrumentality of required teacher education courses (i.e., the extent to which they see current courses as tied to their future goals), (b) motivational goal orientations (i.e., intrinsic/extrinsic motivational goal orientations), (c) use of metacognitive self-regulation (i.e., purposeful monitoring of thoughts and actions), and (d) cognitive learning strategies (i.e., rehearsal, elaboration, and critical thinking learning strategies).

Research has not investigated how pre-service teachers' motivation impacts their use of metacognitive self-regulation, cognitive strategies to learn information, and use of extensive knowledge integration. While exam scores or final course grades may be useful for assessing students' acquisition of specific content information, they may not be as useful for understanding the extent to which students use extensive knowledge integration. On the other hand, pre-service teachers' use of metacognitive self-regulation (e.g., self-monitoring and goal setting), cognitive learning strategies (e.g., purposefully connecting current course information with prior knowledge), and extensive knowledge integration strategies may be indicators of their intentions for constructing integrated knowledge and for developing teaching expertise.

Another purpose of this study is to explore relationships among the variables of pre-service teachers' perceived instrumentality, cognitive engagement within a course (i.e., motivational goal orientations, metacognitive self-regulation, and use of cognitive learning

strategies), and use of extensive knowledge integration strategies across required courses within teacher education. Understanding the relationships among these variables may provide information that can help to enhance teacher education programs. For example, within teacher education classes, emphasizing meaningful relationships between current academic tasks in a teacher education class and academic tasks in other teacher education courses, in ways that are directly connected with their future career goals (e.g., becoming effective teachers), pre-service teachers' may be encouraged to use extensive knowledge integration strategies within and across teacher education courses. The following are the research questions that guided this dissertation study.

Research Questions

1. Which is the best predictor of pre-service teachers' self-ratings of their extensive knowledge integration across teacher education courses: their self-ratings of perceived instrumentality (endogenous/exogenous instrumentality), motivational goal orientations (intrinsic/extrinsic motivational goal orientation), metacognitive self-regulation, or use of cognitive learning strategies (rehearsal, elaboration, and critical thinking strategies)?

2. Do ratings of instrumentality significantly predict pre-service teachers' purposeful use of extensive knowledge integration strategies? If so, do their self-ratings of intrinsic/extrinsic motivational goal orientations, use of metacognitive self-regulation strategies, and/or use of cognitive learning strategies (i.e., rehearsal, elaboration, and critical thinking strategies) significantly predict their use of extensive knowledge integration strategies?

3. What are the direct and indirect effects of pre-service teachers' perceived instrumentality on their self-ratings of intrinsic/extrinsic motivational goal orientations, use of metacognitive

self-regulation strategies, use of cognitive learning strategies, and use of extensive knowledge integration strategies?

Key Terms

1. ***Future-time perspective (FTP) theory*** provides a theoretical framework to clarify the relationships between present-task motivation and future goals (Miller & Brickman, 2004; Simons, Dewitte, & Lens, 2000). FTP theory highlights the significance of future goals for students' initiation and maintenance of their motivation and learning (Simons, Dewitte, & Lens, 2000).

2. ***Endogenous instrumentality*** occurs when a present task (e.g., mastery of course content) is perceived as being directly related to obtaining a future goal. In this case, the student's perception of instrumentality is that the successful completion of the task itself is internally related to the future goal.

3. ***Exogenous instrumentality*** occurs when the outcomes of a present task (e.g., course grades) are important for the attainment of a future goal. In this case, the student's perception of instrumentality is related to outcomes of the present task.

4. ***Intrinsic motivational goal orientation*** refers to "the doing of an activity for its inherent satisfactions rather than for some separable consequence" (Ryan & Deci, 2000, p. 56). Intrinsic motivation occurs when "a person experiences himself to be the locus of causality for his own behavior" (De Charms, 1968, p. 328). Enjoyment of learning is an example of students' intrinsic motivation.

5. ***Extrinsic motivational goal orientation*** is defined as "a construct that pertains whenever an activity is done in order to attain some separable outcome" (Ryan & Deci, 2000, p. 70). One experiences extrinsic motivation "when [one] perceives the locus of causality for his behavior to be external to himself" (De Charms, 1968, p. 328). Concerns about grades, money, or higher social positions are examples of extrinsic motivation.

6. ***Metacognitive self-regulation*** is defined as "the ability to monitor one's own cognition; it is thinking about thinking" (Babbs & Moe, 1983, p. 423). Metacognitive strategies include strategies for goal-setting and planning (e.g., setting specific academic goals and planning tasks to achieve them), self-monitoring (e.g., overseeing whether the goals are achieved), and self-questioning (e.g., asking oneself questions to check one's understanding of specific knowledge) (Pintrich, 2000; Ross et al, 2006).

7. ***Cognitive learning strategies*** are a type of cognitive regulation. Cognitive regulation is defined as "selecting appropriate strategies such as rehearsal or organization (i.e., cognitive strategies), and overseeing learning using metacognitive strategies such as planning or monitoring" (Berger, 2012, p. 38). In this study, students' use of rehearsal, elaboration, and critical thinking strategies are categorized as cognitive regulation strategies (as opposed to emotion-regulation strategies).

8. ***Extensive knowledge integration*** is a cognitive action that purposefully integrates knowledge across topics and domains (Shell et al., 2005). In this study, it refers specifically to pre-service teachers' purposeful integration of knowledge across teacher education courses.

CHAPTER TWO

LITERATURE REVIEW

In this literature review, the theoretical framework for this dissertation is described. Key concepts of this study are then explained, such as perceived instrumentality, motivational goal orientation, metacognitive self-regulation, cognitive learning strategies, and extensive knowledge integration. In addition, research on the effects of students' perceived instrumentality on their motivation and learning is reviewed.

Future-Time Perspective Theory and Perceived Instrumentality

Nuttin and Lens (1985) asserted that perceptions of the future are prominent in human motivation and behavior. Several researchers have emphasized the role of the future within the fields of education and psychology (e.g., Husman & Lens, 1999; Husman & Shell, 2008). For example, teachers frequently stress that education is important for students' futures and encourage their students to work hard for their own future benefit (Husman & Lens, 1999).

Although the future is simply defined in an English dictionary as, "a period of time following the moment of speaking or writing" (Soanes & Sterenson, 2003), within the fields of education and psychology, the future implies expectation or anticipation of future events (Husman & Lens, 1999; Lens, Paixao, Herrera, & Grobler, 2012; Nuttin & Lens, 1985). Indeed, the *psychological* future (i.e., expectations about the future) is considered to be a motivational construct (Husman & Lens, 1999; Lens et al., 2012). Thus, students' psychological futures can both promote and maintain their motivation to learn (Bembenutty & Zimmerman, 2003). Research suggests that students who perceive the future as important are more motivated to

learn, in terms of study effort and reasons for studying, than those who do not perceive it as important (Creten, Lens, & Simons, 2001).

Future-time perspective theory provides a theoretical framework to explain the effect of one's future goals on present tasks (e.g., Peetsma, 2000; Simons, Dewitte, & Lens, 2000). *Future-time perspective* (FTP) refers to one's perspective of the future (e.g., "a person's conceptualization of the future and connection to that future" (Shell & Husman, 2008, p. 445; Simon, Vansteenkiste, Lens, & Lacante, 2004). FTP highlights the significance of future goals for students' initiation and maintenance of motivation and learning (Peetsma, 2000; Simons, Dewitte, & Lens, 2000). FTP has two components: dispositional and situational (Phalet, Andriessen, & Lens, 2004). Dispositional components of FTP do not change across time or contexts. These components are dispositional *connectedness* (tendencies to connect present tasks and future goals; Husman, Lynch, Hilpert, & Duggan, 2007), s*peed* (one's perception of how quickly future goals are approaching), and *distance* (one's "perception of length between present and future events"; Husman et al., 2007, p. 3). The situational aspect of FTP is *perceived instrumentality* (Phalet et al., 2004). In the following section, the concept of an individual's perceived instrumentality is described. This is a key concept in both FTP and this dissertation.

Perceived Instrumentality

Perceived instrumentality refers to "the connection between successfully completing a present task and reaching a long term future goal" (Husman & Hilpert, 2007, p. 230). Students with strong perceptions of instrumentality are aware that present tasks or behaviors are a means of achieving future goals (Phalet et al., 2004). Perceived instrumentality is considered to be a situational aspect of FTP because an individual's perceived instrumentality of current tasks can vary depending on his/her perceptions of current situations and tasks and on his/her future goals

(Husman & Lens, 1999). For example, one person may perceive that taking a math class has instrumental value to his/her future goal of becoming an engineer, but another person may not perceive taking the same class as having instrumental value to the goal of becoming a poet (Husman & Lens, 1999).

Van Calster, Lens, and Nuttin (1987) found that students who perceived an academic course as having instrumental value to their future goals showed higher motivation to learn (i.e., greater effort and persistence in studying) and higher academic performance. This result was important because the authors focused particularly on students' perceptions of course instrumentality after the students had ample time to evaluate whether the course content was relevant to their future goals. Information from 230 male high school students was collected at three different time points. Data on participants' motivation to learn (i.e., effort for studying, persistence for studying) were collected at the beginning of the semester (Time 1). Participants completed a questionnaire at the mid-point of the semester (Time 2) on their perceived instrumentality of the class and their attitudes toward the future. Finally, participants' exam scores were obtained at the end of the semester (Time 3). For analysis, participants were categorized into three groups according to whether their attitudes toward the future was negative, medium (i.e., somewhat positive) or positive. They were also categorized as having high or low perceived instrumentality based on their mean scores for the perceived instrumentality of the course.

The results of the above study by Van Calster and colleagues (1987) supported their hypotheses. Among participants who had a positive attitude toward the future, those who also had a high level of perceived course instrumentality showed higher mean scores for learning motivation than participants who had a low level of perceived instrumentality (but who also had

a positive attitude toward the future) compared to participants who had medium (i.e., somewhat positive) or negative attitudes toward the future. Furthermore, perceived instrumentality was associated with high exam scores among participants who perceived the future as somewhat positive (i.e., medium) or positive. The study found that high levels of student perceptions of the future (i.e., positive attitude toward the future, perceived instrumentality) positively influenced their learning motivation and academic performance.

Similar to Van Calster et al. (1987), Malka and Covington (2005) found that college students' perceived instrumentality (i.e., connection between current coursework and future goals) was a useful motivational construct for predicting students' academic performance (i.e., final grades). Furthermore, they found that perceived instrumentality was a structurally independent construct from other motivational variables such as perceived value of the current task (task value), confidence in completing the task (self-efficacy), focus on mastering course content (mastery goal), and focus on obtaining high scores (performance goal). Malka and Covington's (2005) findings indicated that among these motivational variables (i.e., task value, self-efficacy, mastery/performance goal orientation, and perceived instrumentality), ratings on perceived instrumentality significantly predicted college students' course achievement. Consistent with the research by Van Calster et al. (1987) and Malka and Covington (2005), several studies have reported that students' perceived instrumentality has had positive effects on their academic performance within various learning settings, including an undergraduate math course (Husman & Hilpert, 2007) and a vocational school English course (Ozcetin & Eren, 2010).

In the next section, two types of instrumentality are explained: endogenous and exogenous instrumentality. These two types of instrumentality are more specific constructs than general instrumentality, and are key constructs in this study. Using these more refined constructs

to study pre-service teachers' learning may provide a clearer understanding of the interconnections among their motivation, metacognitive self-regulation, use of cognitive learning strategies, and use of extensive integration strategies to link their knowledge across topics and domains.

Endogenous and Exogenous Instrumentality

Two types of instrumentality have been identified that describe the individual's understanding of the relationship between the current task and future goals (Husman, McCann, & Crowson, 2000; Simon et al., 2004): *endogenous* and *exogenous instrumentality* (Husman et al., 2000). The following sections describe these two types of instrumentality and provide examples and relevant research.

Endogenous instrumentality. Endogenous instrumentality occurs when one perceives that doing a specific task right now (e.g., mastering course content) is directly related to a future goal. In this case, the student's perception of the current task's instrumentality for the future is linked to the mastery of the present task (Husman et al., 2000). For example, if a high school student wants to be a good engineer and believes that the content of a math course is important and useful for being a good engineer, then mastering the math course content is directly connected to his/her future goal. Therefore, the extent to which one sees a current task as having endogenous instrumentality is determined by whether "the present task(s) and future goal(s) belong to the same (content) category" (Husman et al., 2000, p. 783).

Exogenous instrumentality. Exogenous instrumentality occurs when outcomes that are external to the current task (e.g., course grades) are perceived as being important for the attainment of a future goal, even if the course content itself is not important. In this case, the student's perception of instrumentality is external to the content or mastery of the present task

(Husman et al., 2000). For example, if a high school student wishes to obtain high math grades because he/she wants to attend a high-quality university to obtain a nursing degree, the math grades have exogenous instrumentality for the student in relationship to his/her future goals. In this example, the student does not perceive the math content as being directly related to the goal of being a good nurse. However, because he/she cannot attend a high-quality university without high math grades, the math task outcomes (i.e., grades) are perceived to be indirectly related to the future goal of a nursing career. Thus, the student will perceive that obtaining high math scores in the present is indirectly, yet importantly, connected to the future goal. In other words, he/she will perceive the outcomes of the current math tasks as having high exogenous instrumentality for achieving the future goal.

Endogenous Instrumentality and Learning

Endogenous instrumentality has received more empirical attention than exogenous instrumentality as an important motivational variable in students' learning. Husman, Derryberry, Crowson, and Lomax (2004) investigated the relationships among students' ratings of endogenous instrumentality (connection between current tasks and future goals), intrinsic motivation (enjoyment of learning), task value (perceived value of doing a specific task), and study time (amount of time studying course content) with 207 college students. Their results indicated that endogenous instrumentality, intrinsic motivation, and task value were positively associated. In addition, through structural equation modeling (SEM), Husman and colleagues found that students' endogenous instrumentality supported their intrinsic motivation. Moreover, among five groups categorized according to time spent studying course content per day (0-1 hour, 1.5-2 hours, 2.5-3 hours, 3.5-4 hours, or over 4 hours), the group with the most study time had significantly higher mean self-ratings for endogenous instrumentality and intrinsic motivation.

Students who studied for more than three hours had higher scores for endogenous instrumentality and intrinsic motivation than students who studied less than three hours. In other words, students who reported high endogenous instrumentality for the current course content also reported higher levels of valuing this content, higher levels of intrinsic motivation to study the content, and more time spent studying the content.

In another study, Husman and Hilpert (2007) examined the relationships among students' endogenous instrumentality, self-efficacy, goal orientation, and self-regulation in a college online mathematics course. The course was an online basic algebra course that was required for students who entered the university with poor college entrance test scores. Data for this study were collected at three time points. Students' endogenous instrumentality, self-efficacy, and mastery/performance goal orientations were measured at the beginning of the course (Time 1). Data on students' self-regulation (e.g., time and study environment) were collected at the mid-point of the course (Time 2). Data on students' endogenous instrumentality, self-efficacy, and academic performance were collected at the end of the course (Time 3). A hierarchical multiple regression analysis indicated that the students' course grades (academic performance) were positively related to their perceived endogenous instrumentality of the course, their self-efficacy, and their self-regulation (Husman & Hilpert, 2007). This analysis revealed no relationships between students' goal orientation (i.e., mastery, performance-avoidance, or performance-approach goals) and academic performance. Self-regulation played a mediating role between students' endogenous instrumentality and academic performance. The researchers also found that students' endogenous instrumentality and self-efficacy at Time 3 were significant predictors of academic performance, after controlling for students' endogenous instrumentality and self-efficacy at Time 1 and for self-regulation at Time 2. These results were consistent with

previous research (Creten et al., 2001; Malka & Covington, 2005) that emphasized positive relationships between students' instrumentality and motivational/cognitive variables, as well as the positive effects of students' perceptions of endogenous instrumentality on their academic performance.

More recently, Lee and Turner (2011) found positive correlations among pre-service teachers' perceived endogenous instrumentality of teacher education courses, their intrinsic motivational goal orientations, and their effort regulation. In addition, they found that pre-service teachers with strong future goals of becoming a teacher (i.e., definitely wanted to become a teacher) had significantly higher levels of endogenous instrumentality compared to students with weak future goals of becoming a teacher (i.e., teaching was a backup plan) (Lee & Turner, 2010, 2011). Even more recently, Lee and Turner (2012) found that within teacher education courses, pre-service students' endogenous instrumentality was positively related to their intrinsic motivational goal orientation for teacher education courses, while pre-service students' exogenous instrumentality was positively related to their extrinsic motivational goal orientation for teacher education courses.

Although the above studies have contributed to an understanding of the role of students' perceptions of endogenous instrumentality for their motivation, research has not yet explored the effects of pre-service teachers' endogenous/exogenous perceived instrumentality on their use of advanced cognitive learning strategies (e.g., elaboration and critical thinking) to integrate knowledge across teacher education courses (i.e., extensive knowledge integration). Therefore, the intent of this study was to provide information on the extent to which pre-service teachers' perceived endogenous/exogenous instrumentality influences their learning to construct their own knowledge by integrating knowledge across their teacher education courses.

One way in which pre-service teachers' instrumentality may be connected to their motivation is through their motivational orientations (e.g., intrinsic/extrinsic motivational goal orientations, mastery/performance goal orientations). In the following section, students' intrinsic and extrinsic motivational goal orientations are explained. Studies of the relationships between students' perceived instrumentality and goal orientations (i.e., intrinsic/extrinsic motivational goal orientation, mastery/performance goal orientation) are then reviewed.

Motivational Goal Orientations and Instrumentality

Intrinsic and extrinsic motivational goal orientations are considered to be critical variables that influence students' academic learning and achievement (Eccles & Wigfield, 2002). Originally, De Charms (1968) explained intrinsic motivation as occurring when "a person experiences himself to be the locus of causality for his own behavior" (p. 328) and extrinsic motivation as occurring when "a person perceives the locus of causality for his behavior to be external to himself" (p. 328). More recently, Ryan and Deci (2000) defined intrinsic motivation as "the doing of an activity for its inherent satisfactions rather than for some separable consequence" (p. 56) and extrinsic motivation as "a construct that pertains whenever an activity is done in order to attain some separable outcome" (p. 70). Learning for enjoyment, interest, and/or satisfaction are examples of students' intrinsic motivation. Concerns about grades, money, and/or praise are examples of extrinsic motivation.

When students engage in learning because of personal interests, they may perceive that their behavior is due to their own agency (De Charms, 1968) because they are doing something they enjoy. When students have extrinsic motivational goals for learning, they may feel that external forces are controlling their behaviors (De Charms, 1968) because their motivation is focused on obtaining external incentives. Research has shown that students' motivational goals

are related to the cognitive strategies they use for learning (Ames & Archer, 1988; Pintrich & De Groot, 1990) and to their academic performance (Lin, McKeachie, & Kim, 2003). In particular, intrinsic motivational goal orientation is associated with students' use of strategies that promote deeper learning (Ames & Archer, 1988; Lin, McKeachie, & Kim, 2003; Pintrich & De Groot, 1990).

Research has also focused on students' achievement goal orientations, that is, on mastery versus performance goal orientations. Students with a mastery goal orientation tend to focus on "learning and mastery of the content or tasks" (Pintrich, 2000, p. 544). Conversely, students with a performance goal orientation tend to focus on "their ability and performance relative to others and seems to focus the students on goals of doing better than others or avoiding looking incompetent or less able in comparison to others" (Pintrich, 2000, p. 544). Research has shown that students' self-ratings of mastery goal orientation are strongly associated with their ratings of intrinsic motivational goal orientation, while their ratings of performance goal orientation are associated with their ratings of extrinsic motivation (Elliot & Church, 1997; Elliot & Harackiewicz, 1996; Heyman & Dweck, 1992; Meece, Blumenfeld, & Hoyle, 1988).

Studies of achievement goal orientations with a variety of students have consistently found that students with high mastery goals tend to use more effective cognitive learning strategies (e.g., deep learning strategies) compared to students with high performance goals. Participants in these studies have included junior high school and high school students (Ames & Archer, 1988), college students (Elliot & Church, 1997; Pintrich & De Groot, 1990), and college students in different majors such as pre-service teachers (Ravindran, Greene, & DeBacker, 2005) and nursing students (Simons, Dewitte, & Lens, 2004).

Instrumentality and Motivational Goals

Miller, DeBacker, and Greene (1999) explored the influence of college students' perceived instrumentality on their intrinsic/extrinsic motivational orientations in a required course for teacher education. Results of a multiple regression analysis indicated that pre-service teachers' perceived instrumentality significantly predicted their motivational orientations after controlling for mastery/performance goal orientations. Interestingly, perceived instrumentality had more positive predictive power for students' self-ratings of their extrinsic motivational goals than did students' intrinsic motivational goals. Using the same research design (i.e., purpose of study, variables, and data analysis methods) as Miller et al. (1999), but with different participants (i.e., academically gifted high school students), Kover and Worrell (2010) found that participants' perceived instrumentality and mastery goal orientation predicted their ratings for both intrinsic and extrinsic motivational goal orientations.

Several studies have reported results on perceived instrumentality, students' mastery/performance goals, and motivational goal orientations (Hardre, Crowson, DeBacker, & White, 2007; Walker & Greene, 2009). For example, Hardre et al. (2007) explored the extent to which rural students' perceived instrumentality and mastery/performance goal orientations were associated with their effort on schoolwork. Hardre et al. (2007) hypothesized that students' perceived instrumentality was related to their mastery goal orientation and effort on schoolwork. SEM analysis indicated that the hypothesized model was supported by the data. Rural school students' perceptions of instrumentality were positively related to their effort on schoolwork, and this relationship was mediated by their mastery goal orientation. Similarly, Walker and Greene (2009) investigated predictors of students' mastery/performance goal orientations among various motivational and cognitive variables (i.e., perceived instrumentality of a course, self-efficacy,

and sense of belonging) with a total of 249 high school students. Their results indicated that participants' mastery goal orientation was predicted by these variables.

The research described above has provided empirical evidence that students' perceived instrumentality is positively related to their intrinsic/extrinsic motivational goal orientations (Kover & Worrell, 2010; Miller et al., 1999) and their mastery/performance goal orientations (Hardre et al, 2007; Walker & Greene, 2009). Although these studies have contributed to the understanding of positive relationships between students' perceived instrumentality and their motivation to learn, the studies did not explore the relationships between students' perceived instrumentality and their learning processes. A greater understanding of the role of students' perceived instrumentality in their choice of learning strategies may provide useful information that can help to facilitate students' knowledge acquisition. In the next section, students' metacognitive self-regulation and use of cognitive strategies for learning is explained. Then, relevant research of these metacognitive self-regulation, cognitive learning strategies and perceived instrumentality are discussed.

Metacognitive Self-Regulation and Cognitive Learning Strategies

Self-regulation is a complex concept that includes the regulation of emotions, motivation, and cognition (Liebermann, Giesbrecht, & Müller, 2007). Self-regulation is defined as "self-generated thoughts, feelings, and behaviors that are oriented to attaining goals" (Zimmerman, 2002, p. 65). Self-regulation is necessary for effective learning (Nandagopal & Ericsson, 2012; Pintrich, 2000). Therefore, in this dissertation, self-regulation (i.e., cognitive regulation) in pre-service teachers will be studied.

Self-regulated learners are learners who can purposely regulate their cognitions, emotions, and motivation to reach their academic goals. Such learners tend to use cognitive

strategies (e.g., strategies to help them understand and remember new information) and metacognitive strategies (e.g., strategies for monitoring their learning) (e.g., Ross, Green, Salisbury-Glennon, & Tollefson, 2006). Students who can self-regulate their learning tend to be highly motivated to engage in learning tasks because of their intrinsic motivation (Ross et al., 2006) and their desire to master their learning goals (Ablard & Lipschultz, 1998; Pintrich, 2000; Zimmerman & Martinez-Pons, 1990). Furthermore, in addition to having positive motivation, self-regulated students tend to demonstrate high academic performance (Nandagopal & Ericsson, 2012; Pintrich, 2000).

Cognitive self-regulation is defined as "selecting appropriate strategies such as rehearsal or organization (i.e., cognitive strategies), and overseeing learning using metacognitive strategies such as planning or monitoring" (Berger, 2012, p. 38). Because motivation sustains learning (Shell et al., 2010), understanding the linkages among pre-service teachers' motivational variables and their cognitive regulation for learning is an important undertaking.

The Unified Learning Model (ULM) developed by Shell et al. (2010) posits how knowledge acquisition takes place. According to Shell et al. (2010), knowledge acquisition incorporates four rules of learning: "1. New learning requires attention. 2. Learning requires repetition. 3. Learning is about connections. 4. Some learning is effortless; some requires effort" (Shell et al., 2010, pp. 14-15). According to these rules, sensory information must first be input into working memory. This information is then transferred to and stored in long-term memory through the use of such cognitive activities as paying attention, using the information repeatedly, and making connections among bits of information in long-term memory. This process requires conscious effort. To promote cognitive activities for learning, it is necessary to use appropriate

metacognitive self-regulation strategies (monitoring learning efforts) and cognitive learning strategies. The following sections explain these cognitive regulation strategies (i.e., metacognitive self-regulation and cognitive learning strategies).

Metacognitive Self-Regulation

Metacognition is defined as "the ability to monitor one's own cognition; it is thinking about thinking" (Babbs & Moe, 1983, p. 423). Metacognitive strategies include strategies for goal-setting and planning (e.g., setting specific academic goals and planning tasks to achieve them), self-monitoring (e.g., overseeing whether the goals are achieved), and self-questioning (e.g., asking oneself questions to check one's understanding of specific knowledge) (Pintrich, 2000; Ross et al, 2006). Pintrich and De Groot (1990) found that high school students' positive endorsement of metacognitive strategies was positively associated with their ratings of positive self-efficacy beliefs and intrinsic motivation, and these students reported using cognitive strategies that promoted deeper learning (i.e., elaboration and organization strategies). Ames and Archer (1988) found that among academically gifted students (i.e., students in a school for academically gifted students only), those with a mastery goal orientation tended to use more metacognitive learning strategies than those with a performance goal orientation.

In studies of expertise, researchers have found that experts have different cognitive characteristics than novices (Berliner, 1986, 2001). For example, expert teachers tend to use more self-regulation strategies to acquire deep and extensive knowledge about teaching and subject matter, compared with novice teachers (Berliner, 1986, 2001). Zimmerman (2002) described *how* experts use metacognitive strategies:

> Experts reveal they display high levels of self-motivation and set hierarchical goals for themselves with process goals leading to outcome goals in succession,

such as dividing a formal essay into an introduction, a body, and a conclusion.

Experts plan learning efforts using powerful strategies and self-observe their effects, such as a visual organizer for filling in key information. (p. 69)

Zimmerman's (2002) research indicated that, by setting hierarchical goals combined with focusing on successive process goals and related outcomes, expert learners planned for the future and tied proximal goals (i.e., instrumental tasks) to distal (future) goals. These results supported Schutz and Lanehart's (1994) earlier findings that college students who achieved higher academic performance, also indicated having future goals (i.e., obtaining a college degree) that impacted their use of cognitive learning strategies. Schutz and Lanehart's SEM analysis indicated that, when students set academic sub-goals (related to achievement) to obtain their future goals (goal setting), students used cognitive learning strategies to promote deeper learning and spent more hours studying. Because instrumentality is the connection of proximal tasks with future, distal tasks, it might therefore instigate students' use of metacognitive strategies for self-regulation and use of cognitive strategies for deeper learning. Nandgopal and Ericsson (2012) found that upper-level college students (college juniors and seniors) majoring in science used self-regulated strategies to acquire knowledge about science. It is possible that pre-service teachers (usually college juniors and seniors) use metacognitive self-regulation and various cognitive learning strategies to acquire and integrate knowledge about teaching in order to create the foundations for developing their teaching expertise.

Cognitive Learning Strategies

Although the process of knowledge acquisition is the same for all students (i.e., information is transferred from working memory to long-term memory through repetition and making connections), not all students acquire knowledge in the same way (Shell et al., 2010).

Cognitive learning strategies such as paying attention (e.g., note-taking), using rehearsal strategies (e.g., repeating factual knowledge and reviewing notes for memorization), and using elaboration strategies (e.g., making a concept map to show how concepts are related, making connections between readings and lectures) are used to regulate personal cognitive processing of learning (Pintrich, 2000; Zimmerman & Martinez-Pons, 1986, 1990). For example, Ley and Young (1998) investigated college students' patterns of cognitive strategy use related to their learning. They studied underprepared college students, that is, students who were placed in developmental classes after obtaining low scores on the ACT (American College Testing) exam, and who then did not pass a college diagnostic test, used more memorization strategies, did not use deep cognitive strategies, and used strategies inconsistently compared to students in regular college classes (Ley & Young, 1998). Conversely, academically gifted high school students in a high-achievement track used more cognitive/metacognitive learning strategies, such as organizing information in meaningful ways, reviewing records, goal-setting, and planning for study sessions, compared with students in the regular achievement track (Zimmerman & Martinez-Pons, 1986). This research suggested that academically successful students tend to use deeper cognitive strategies to facilitate deeper learning, and use metacognitive self-regulation strategies to monitor their learning processes. Thus, if pre-service teachers make efforts to be successful learners, they may benefit from using such cognitive and metacognitive strategies to facilitate and regulate their learning.

In addition to providing evidence that academically successful students use deep cognitive strategies, research indicates that their use of such strategies is related to their motivation to learn. For example, Garcia and Pintrich (1992) found that college students' use of deep cognitive strategies (i.e., critical thinking) was positively correlated with their intrinsic

motivation, use of rehearsal and elaboration strategies, and use of metacognitive learning strategies. Further analysis showed that students' use of critical thinking strategies was significantly predicted by their ratings of their own intrinsic goal orientation, use of elaboration strategies, and use of metacognitive strategies. Furthermore, Pintrich (2000) found that high school students with mastery goal orientations frequently used strategies that engaged deeper learning (e.g., elaboration of course material through connections with prior knowledge) while students with performance goal orientations used surface-level memorization strategies (e.g., rehearsal strategies).

The above studies found evidence that students' deep cognitive learning strategies (e.g., elaboration and critical thinking) were positively related to their motivation and effective learning. It is possible that the use of appropriate cognitive learning strategies for knowledge acquisition is an indicator of student learning effectiveness. Pre-service teachers' use of deep cognitive learning strategies and extensive knowledge integration strategies may be particularly helpful for their acquisition of deep and extensive content knowledge, and for their pedagogical knowledge for future effective teaching. In addition to using cognitive strategies, successful learners also need to use metacognitive self-regulation strategies (Bransford, 2000). In the following section, research on the relationships between students' perceived instrumentality, and their use of metacognitive self-regulation and cognitive learning strategies is reviewed.

Metacognitive Self-Regulation, Cognitive Strategies, and Perceived Instrumentality

Greene, Miller, Crowson, Duke, and Akey (2004) found positive relationships among high school students' perceived instrumentality of an English course, their achievement goal orientations, and their use of cognitive learning strategies. Greene and colleagues (2004) found that students' perceived instrumentality was a significant explanatory variable of their mastery

goal orientation and their use of cognitive learning strategies. Phan (2009) also found positive relationships among college students' perceived instrumentality, their mastery and performance approach/avoidance goal orientations, and their use of deep cognitive learning strategies. In particular, Phan (2009) found positive relationships between college students' mastery goal orientations and their reported use of deep cognitive learning strategies.

More recently, Berger (2012) found that vocational school students' perceived instrumentality influenced their use of cognitive strategies (e.g., keeping records, seeking assistance, and organization) and metacognitive self-regulation strategies (e.g., self-monitoring and self-planning) for learning. The purpose of his study was to investigate relationships among motivation (i.e., achievement motivation, perceived instrumentality, and self-efficacy) and the use of metacognitive self-regulation and cognitive strategies in 243 vocational students. The results indicated that students' perceived instrumentality was a significant predictor of their use of metacognitive self-regulation and cognitive learning strategies for reading comprehension, writing, and mathematics.

The above studies demonstrated that students' perceived instrumentality could be related to their use of cognitive learning strategies. However, these studies did not provide information on students' use of deep cognitive learning strategies to integrate knowledge across topics and domains. While motivation and instrumentality are important variables tied to the use of cognitive learning strategies, one reason to use deep strategies for learning may be to promote students' extensive knowledge integration—that is, so that students can connect information across courses (Shell et al., 2005). Extensive knowledge integration may be a cornerstone in developing expertise (e.g., Hattie, 2003; National Research Council, 2000). In the next section, extensive knowledge integration strategies are discussed.

Extensive Knowledge Integration

Knowledge-Building

Knowledge-building is a cognitive activity that involves constructing and integrating one's own knowledge (Shell et al., 2005). The concept of knowledge-building comes from the constructivist theory of learning (e.g., Schunk, 2008). The main concept of this theory is that "individuals form or construct much of what they learn and understand" (p. 235). According to this theory, the individual actively constructs his/her own knowledge through interactions within the learning environment (Richardson, 2003), a process that usually involves collaboration (Scardamalia & Bereiter, 2003). Using this framework, knowledge-building has been studied through exploration of the use of computer-supported, collaborative learning environments (Scardamalia & Bereiter, 1991, 2003; Schoor & Bannert, 2011; Shell et al., 2005) with the assumption that "collective achievements exceed individual contributions" (Scardamalia & Bereiter, 2003, p. 2).

Compared to collaborative knowledge construction, focusing on the cognitive processes of an individual's knowledge-building, Shell et al. (2005) explained that knowledge-building is "accomplished by an in-depth study of a topic that goes beyond simple factual or recall learning. The process requires the construction of new knowledge, connection of new information to existing knowledge and the integration of knowledge across topics and domains" (p. 329). Interestingly, however, much of the research on students' learning processes has focused on only two of these three components: construction of new knowledge (e.g., memorization through surface-level strategies) and connection of new information to existing knowledge (e.g., making connections through elaboration strategies). Furthermore, research has tended to focus on students' learning within one course (Garcia & Pintrich, 1992; Pintrich, 2000; Zimmerman &

Martinez-Pons, 1986, 1990). For example, Pintrich (2000) assessed students' use of rehearsal strategies and elaboration strategies (e.g., making connections between readings and lectures) in order to understand their learning within a course (Pintrich & De Groot, 1990). Therefore, research on students' use of cognitive learning strategies to connect knowledge across courses is needed to understand students' knowledge-building across topics and domains.

Extensive Knowledge Integration

The third component of Shell et al.'s (2005) description of knowledge-building focuses on the importance of knowledge integration across topics and domains. This aspect, particularly knowledge integration across courses, has received little research attention. This lack of scholarly attention to students' use of cognitive strategies for knowledge integration across courses is surprising because studies on developing expertise emphasize that integration of knowledge may be a key indicator of expertise (Bransford, 2000; Hattie, 2003). Experts tend to have more integrated knowledge that they can access more effectively, with more flexibility, than novices (Hattie, 2003). This is because experts' knowledge is organized and interrelated around big concepts, while novices' knowledge is not highly organized, in part because they tend to use surface learning processes (e.g., memorization and recall) (Bransford, 2000).

Chi, Feltovich, and Glaser (1981) found that physics experts used different cognitive processes to solve problems than did novices. Specifically, physics experts were able to use their conceptual categories (i.e., schemas) to solve problems. By contrast, novices did not have conceptual categories but only memorized information, and were therefore unable to conceptualize solutions to these problems. In addition, experts were able to retrieve their integrated and related knowledge efficiently, while novices could not bring forth the relevant knowledge quickly, and the knowledge they tried to use was neither highly organized nor

integrated (Chi et al., 1981). Indeed, novices struggled to find the relevant knowledge within their surface-level schemas.

For this reason, to develop expertise, students may need to use cognitive activities such as purposefully integrating knowledge across courses (Bransford, 2000; Chi et al., 1981; Hattie, 2003). In this study, pre-service teachers' purposeful integration of knowledge (or lack of purposeful integration) across teacher education courses (i.e., extensive knowledge integration) was specifically investigated. However, one problem with researching teachers' use of extensive knowledge integration strategies is that no existing surveys focus explicitly on strategies that connect knowledge across topics and domains. Some scales for different learning strategies contain items about purposefully connecting information *across* different courses, but those items are embedded within subscales that measure learning strategies for making connections *within* the information from one course only. For example, the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991) is widely used in education research. It contains a subscale for assessing the student's use of elaboration strategies (i.e., building on existing information). This elaboration subscale includes two items assessing the student's use of cognitive strategies to connect knowledge across courses (i.e., "I try to relate ideas in this subject to those in other courses whenever possible" and "I try to apply ideas from course readings in other class activities such as lecture and discussion"). However, the other four items in the elaboration subscale (six items total) focus on assessing students' use of strategies to connect information within one course. A newer survey, the Student Perceptions of Classroom Knowledge-Building (SPOCK) (Shell et al., 2005), has a subscale for assessing students' use of strategies for "knowledge building". However, of the 10 items in this survey, only four items focus on connecting knowledge across courses. Because items in a scale should assess one factor

that represents an independent construct (Kline, 1998), having items assessing two different constructs within the same scale obfuscates both constructs (knowledge-building-within and knowledge-building-across courses). For this reason, in this dissertation research, to assess pre-service teachers' use of extensive knowledge integration strategies, only the four items from the SPOCK's knowledge-building subscale that focus on these strategies were used. Therefore, I investigated the relationships between pre-service teachers' use of cognitive strategies for learning *within* a course (e.g., rehearsal, elaboration, and critical thinking) and their use of cognitive strategies for integrating knowledge *across* courses (i.e., extensive knowledge integration).

Extensive Knowledge Integration and Perceived Instrumentality

As mentioned earlier in relation to expertise research (Berliner, 1986, 2001; Bransford, 2000; Hattie, 2003), integration of knowledge across topics and domains may be a key factor in developing expertise. For this reason, pre-service teachers' use of extensive knowledge integration strategies across teacher education courses may be a better indicator than academic performance (e.g., exam scores) of their development of teaching expertise and preparation for the teaching profession.

Research has shown that experts, in any field, have deep and extensive knowledge within their specific area, and that they obtain this knowledge by integrating their knowledge across topics and domains (Berliner, 1986, 2001, 2004; Feldon, 2007). Moreover, because experts tend to use metacognitive self-regulation and cognitive learning strategies successfully in their learning (Berliner, 1986, 2001; Zimmerman, 2002), studying the relationships among pre-service teachers' perceived instrumentality, motivational goals, use of metacognitive self-regulation and cognitive learning strategies, and use of extensive knowledge integration

strategies may provide teacher educators with vital information to help pre-service teachers become expert teachers (see Figure 1).

Studying the relationships among students' perceived instrumentality and their use of extensive knowledge integration strategies can contribute to a better understanding of the significant influence of future goals on pre-service teachers' self-regulation and learning abilities. As stated previously, such self-regulation is important in enhancing their learning so that they can obtain the expertise needed to achieve their future goals of becoming effective teachers.

Research Questions and Justifications

Research Question 1. Which is the best predictor of pre-service teachers' self-ratings of their extensive knowledge integration across teacher education courses: their self-ratings of perceived instrumentality (endogenous/exogenous instrumentality), motivational goal orientations (intrinsic and extrinsic motivational goal orientations), metacognitive perceived self-regulation, or use of cognitive learning strategies (rehearsal, elaboration, and critical thinking strategies)?

***Justification 1 for Research Question 1*:** Research has shown that motivational and cognitive variables are positively associated with students' academic performance. These variables include perceived instrumentality (Malka & Covington, 2005, Van Calster, Lens, & Nuttin, 1987), goal orientation (Lin, McKeachie, & Kim, 2003), and cognitive learning strategies (Pintrich, 2000). However, little research has explored the influences of these motivational and cognitive variables on students' use of extensive knowledge integration strategies. In addition, little or no research has been conducted on the influences of motivational and cognitive variables on pre-service teachers' use of extensive knowledge integration strategies, particularly in terms of integrating knowledge across topics and domains (i.e., connecting knowledge across classes).

Once students are in preparation programs for their future teaching profession, they need to develop deep and extensive knowledge for teaching (Bransford, 2000). Studying the influences of pre-service teachers' motivation and cognition on their use of extensive knowledge integration strategies is appropriate to better understand their motivation and construction of developing expertise.

Hypothesis 1: Pre-service teachers' perceived endogenous instrumentality will be the best predictor of their extensive knowledge integration.

***Justification 1for Hypothesis 1*:** Previous research has found that students' endogenous instrumentality was positively related to motivational cognitive variables (e.g., intrinsic motivation, Lee & Turner, 2010, 2012; self-regulation, Husman & Hilpert, 2007). For this reason, it was hypothesized that endogenous instrumentality may be the best predictor of using extensive knowledge integration strategies, which may be an indicator of developing expertise.

Research Question 2. Do ratings of instrumentality significantly predict pre-service teachers' purposeful use of extensive knowledge integration strategies? If so, do their self-ratings of intrinsic/extrinsic motivational goal orientations, use of metacognitive self-regulation strategies, and/or use of cognitive learning strategies (i.e., rehearsal, elaboration, and critical thinking strategies) significantly predict their use of extensive knowledge integration strategies?

***Justification for Research Question 2*:** Among the variables of perceived instrumentality, motivational goal orientations, metacognitive self-regulation, and cognitive learning strategies, perceived endogenous instrumentality has been shown to have a strong and positive influence on students' motivation and cognition for learning (Greene et al., 2004; Miller et al., 1999). However, the relationship of these variables to students' use of extensive knowledge integration

strategies is not known. Therefore, in this study, a hierarchical regression analysis was used to determine the extent to which individual independent variables (i.e., perceived endogenous/exogenous instrumentality, intrinsic/extrinsic motivation, metacognitive self-regulation, and cognitive learning strategies) influenced pre-service teachers' use of extensive knowledge integration strategies. The independent variables were entered in the following order: perceived endogenous/exogenous instrumentality (Block 1), intrinsic/extrinsic motivational goal orientations (Block 2), metacognitive self-regulation strategies (Block 3), and cognitive learning strategies (Block 4) to predict the dependent variable of pre-service teachers' use of extensive knowledge integration strategies.

Hypothesis 2: According to hierarchical regression analysis, pre-service teachers' perceived endogenous instrumentality (Block 1) will significantly predict their use of extensive knowledge integration strategies. After adding their ratings of intrinsic/extrinsic motivational goal orientations (Block 2), use of self-regulation strategies (Block 3), and use of cognitive learning strategies (Block 4) to the hierarchical regression equation, the final model (Step 4) will significantly predict their use of extensive knowledge integration strategies.

Justification for Hypothesis 2: The sequences of motivational and cognitive variables in this analysis were consistent with previous research (students' future goals impact their motivation and learning; students' learning is influenced by their motivation and self-regulation, Greene et al., 2004; Husman, et al., 2004; Phan, 2009; Pintrich & De Groot, 1990; Schutz & Lanehart, 1994). For this reason, the order of variable entry was determined to test if adding variables contribute to improving prediction power for extensive knowledge.

Research Question 3. What are the direct and indirect effects of pre-service teachers'

perceived instrumentality on their self-ratings of intrinsic/extrinsic motivational goal orientations, use of metacognitive self-regulation strategies, use of cognitive learning strategies, and use of extensive knowledge integration strategies?

***Justification for Research Question 3*:** Research has shown that perceived instrumentality has a positive influence on intrinsic/extrinsic motivation (Berger, 2012; Miller et al., 1999; Kover & Worrell, 2010) and cognitive/metacognitive strategies (Greene et al., 2004; Phan, 2009; Schutz & Lanehart, 1994). Research has also shown positive relationships between intrinsic/extrinsic motivation and cognitive/metacognitive strategies (Ross et al., 2012; Gracia & Pintrich, 1992; Pintrich & De Groot, 1990). However, previous research has not explored relationships among students' perceived instrumentality, intrinsic/extrinsic motivational goal orientations, metacognitive self-regulation, cognitive learning strategies, and extensive knowledge integration strategies. Therefore, a hypothesized model was established based on previous studies of perceived instrumentality and learning, and was tested using path analysis to determine whether or not it was supported by the data collected in this dissertation research.

Hypothesis 3-1: According to path analysis, pre-service teachers' endogenous instrumentality will be related directly, positively, and significantly to their self-ratings of intrinsic motivational goal orientation, use of metacognitive self-regulation strategies, use of elaboration and critical thinking learning strategies, and use of extensive knowledge integration strategies.

Hypothesis 3-2: Pre-service teachers' exogenous instrumentality will be related directly, positively, and significantly to their self-ratings of extrinsic motivational goal orientation and use of rehearsal strategies.

Hypothesis 3-3: Pre-service teachers' self-ratings of intrinsic motivational goal orientation will

be related directly, positively, and significantly to their reported use of metacognitive self-regulation strategies, elaboration and critical thinking learning strategies, and extensive knowledge integration strategies.

Hypothesis 3-4: Pre-service teachers' reported use of metacognitive self-regulation will be directly, positively, and significantly related to cognitive learning strategies, and indirectly related to their reported use of extensive knowledge integration strategies through cognitive learning strategies.

Hypothesis 3-5: Pre-service teachers' endogenous instrumentality will be related indirectly, positively, and significantly to their reported use of elaboration and critical thinking learning strategies and of extensive knowledge integration strategies, through their self-ratings of intrinsic motivational goal orientation and reported use of metacognitive self-regulation strategies.

Hypothesis 3-6: Pre-service teachers' self-ratings of perceived exogenous instrumentality will be related indirectly, positively, and significantly to their reported use of rehearsal learning strategies and extensive knowledge integration strategies, through their self-ratings of extrinsic motivational goal orientation and reported use of metacognitive self-regulation strategies.

Justification for Hypothesis 3: Figure 1 below shows the hypothesized model used in this study, including all the variables discussed above. This model illustrates the relationships among perceived instrumentality and pre-service teachers' use of extensive knowledge integration strategies through their intrinsic/extrinsic motivational goal orientations and cognitive/metacognitive learning strategies. This model is supported by research on the relationships among endogenous instrumentality and intrinsic/extrinsic motivational goals

(Husman et al., 2004; Lee & Turner, 2012). The model is also based on research showing positive relationships among perceived instrumentality, intrinsic/extrinsic motivation (Berger, 2012; Miller et al., 1999; Kover & Worrell, 2010), and metacognitive self-regulation and cognitive learning strategies (Greene et al., 2004; Phan, 2009; Schutz & Lanehart, 1994). Finally, this model is also supported by research showing positive relationships among intrinsic/extrinsic motivational goals and students' use of metacognitive self-regulation and cognitive learning strategies (Gracia & Pintrich, 1992; Pintrich & De Groot, 1990; Ross et al., 2006).

In previous studies, relationships among motivational and cognitive variables have been studied either separately or in partial integration. However, in this study, an integrated model was used to examine the relationships among these variables and the added variable of extensive knowledge integration strategies. No previous research has examined the influence of perceived endogenous/exogenous instrumentality and motivational and cognitive variables (i.e., intrinsic/extrinsic motivational goal orientations, metacognitive self-regulation, and cognitive learning strategies) on students' use of extensive knowledge integration strategies. Therefore, in this study, the hypothesized model shown in Figure 1 was tested to examine the relationships among pre-service teachers' motivational variables, cognitive variables, and their use of extensive knowledge integration strategies.

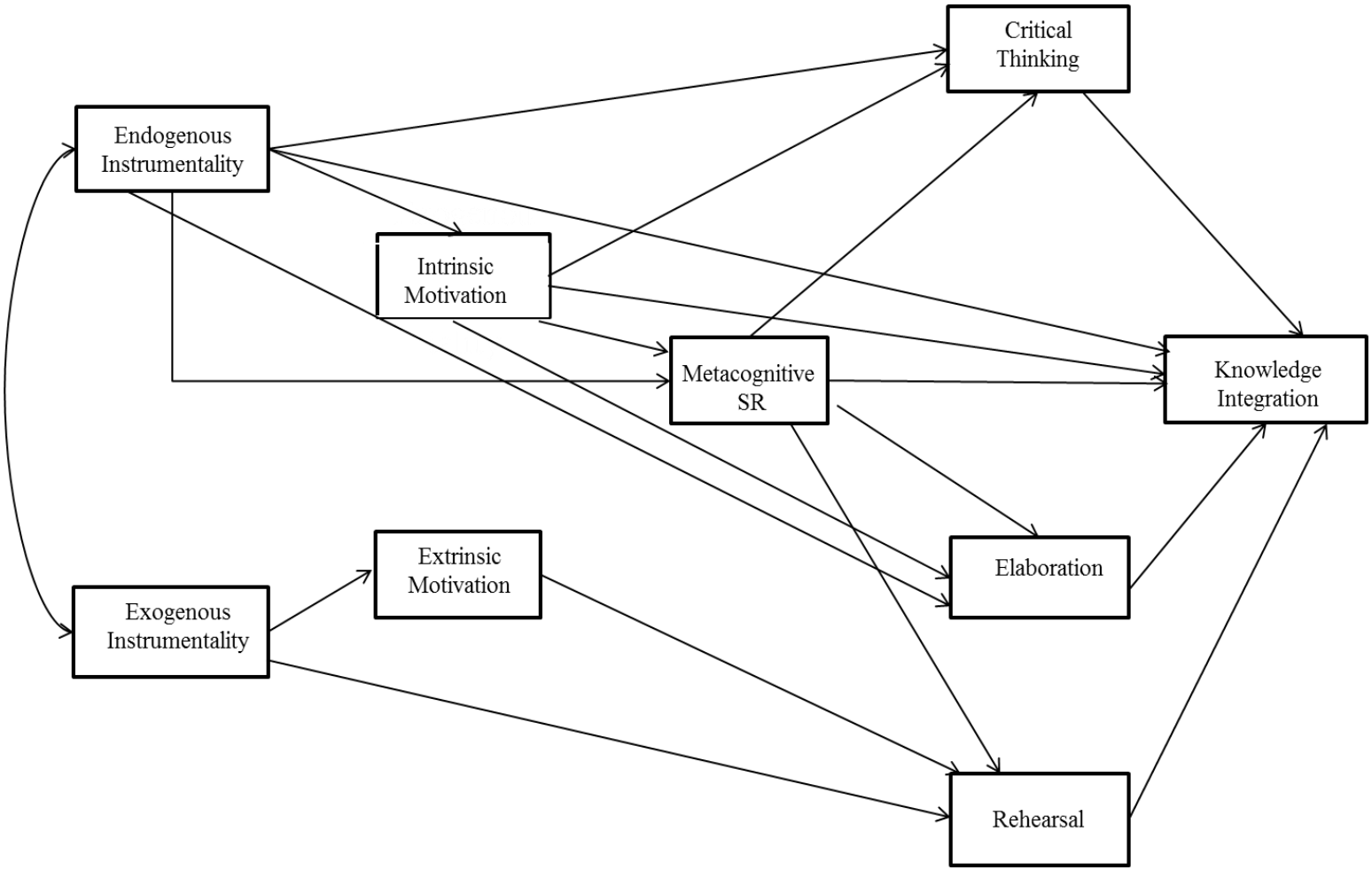

Figure 1. Hypothesized Model

CHAPTER THREE

RESEARCH METHODS

The purpose of this study was to explore the influence of pre-service teachers' perceptions of their future goals (i.e., perceived endogenous/exogenous instrumentality) on their learning processes in required teacher education courses. I examined the extent to which pre-service teachers' reported ratings on motivational and cognitive variables (i.e., endogenous/exogenous instrumentality, intrinsic/extrinsic motivational goal orientation, metacognitive self-regulation strategies, and cognitive learning strategies) contributed to their reported use of extensive knowledge integration strategies across these courses. In addition, I explored how their ratings of perceived endogenous/exogenous instrumentality were related to their use of extensive knowledge integration strategies, mediated by their intrinsic and extrinsic motivational goal orientations, metacognitive self-regulation, and cognitive learning strategies (i.e., rehearsal, elaboration, and critical thinking).

Participants

Students enrolled in required teacher education courses in Fall 2012 in the Florida State University's College of Education (FSU COE) were invited to participate in this study. FSU offers various required courses in the teacher education program (e.g., Educational Psychology and Classroom Assessment) (FSU COE, 2012). After completing all required courses for their teacher education program and passing a teaching certification exam, students receive a Bachelor of Arts or Bachelor of Science degree as well as their teaching credential (FSU COE, 2012). Therefore, because taking required courses for teacher education programs were precondition to receive teaching credential, students in teacher education courses were appropriate subjects for

exploring pre-service teachers' perceptions of their own motivation and learning in teacher education courses.

A total of 195 students were recruited from (1) the FSU COE subject pool, (2) students taking FSU School of Teacher Education classes that did not participate in the COE subject pool. In addition, students who were enrolled in required classes for teacher education (i.e., Classroom Assessment courses) in the University of Western Florida (UWF) also participated in this study by completing online surveys. Ten UWF students took the first survey, but only two of the ten students completed the second survey. Therefore, the two students from UWF were included as participants for this study, to a total of 197 participants.

Gender and Ethnicity

Participants were 190 female and 7 male undergraduate students in required courses for a teacher preparation program (n = 197). The majority of participants were White (n = 167; 85%) and female (n = 190; 96 %) and enrolled as juniors (n = 95; 48%) or seniors (n = 61; 31%). Specific demographics of ethnicity and gender are shown in Table 1.

Table 1
Demographic Descriptions

	Gender	
Ethnicity	Female	Male
White	161	6
Black	12	1
Hispanic	12	0
Asian	4	0
Other	1	0
Total	190 (96%)	7 (4%)

Note: Percentages may not equal 100% due to rounding

Majors, Courses, and Future-Goal Categories

Participants were enrolled in various majors (see Table 2). Most participants (n = 182; 92%) were enrolled in teacher education majors; the remaining students (n = 15; 8%) were enrolled in other majors but were pursuing a teaching credential.

Pre-service teachers in several different teacher education courses participated in this research: (a) Language Principles for Teaching (n = 52; 26%), (b) The Teaching of Elementary School Mathematics (n = 24; 12%), (c) Expressive Arts for Early Childhood Education major (n = 23; 12%), (d) Observation & Participation for Early Childhood Education major (n = 20; 10%), (e) Teaching English Language Learners (n = 18; 9%), (f) Educational Psychology (n = 17; 9%), (g) Education Introduction (n = 16; 8%), (h) Educational Technology (n = 9; 5%), (i) Teaching Reading in Elementary School (n = 9; 5%), (j) Project-Based Instruction (n = 4; 2%), (k) Classroom Assessment (n = 2; 1%), and (l) others (n = 3; 1%).

In addition, participants reported having different future goals, including: (a) definitely planning to obtain a teaching position after graduation (n = 154; 77%); (b) planning to pursue a non-teaching job within the field of education (e.g., being in administration, pursuing a graduate degree in education, or conducting education research (n = 7; 4%); (c) planning to pursue a teaching job temporarily, then pursuing a non-teaching job within the field of education (n = 16; 8%); (d) not currently interested in teaching, but pursuing a teaching credential as a backup plan (i.e., may need to teach in the future) (n = 9; 5%); or (e) other (n = 11; 6%). Therefore, approximately 85% of participants had future goals of becoming teachers after graduation.

Table 2
Numbers and Percentages of Participant Majors

Major	Number	Percent
Elementary Education	81	41
Early Childhood Education	46	23
English Education	32	16
Special Education	12	6
Social Science Education	7	4
Math & Science Education	4	2
Other	15	8
Total	197	100 (%)

Note: Percentages may not equal 100% due to rounding

Calculation of Power

A power analysis was used to determine the number of participants needed for this study. A power analysis can help in determining the appropriate number of participants needed to obtain adequate power to substantiate research findings (Howell, 2007). To use a multiple regression analysis for the first and second questions, I employed the following formula to calculate a sufficient sample size: "$N > 50 + 8m$ (where m is the number of independent variables)" (Tabachnick & Fidell, 2007, p. 123). For this study, to perform a multiple regression analysis with eight independent variables (i.e., endogenous/exogenous instrumentality, intrinsic/extrinsic motivation, rehearsal strategies, elaboration strategies, critical thinking strategies, and metacognitive strategies), I needed at least 114 participants.

In addition to multiple regression analysis, a path analysis was used to examine the relationships between pre-service teachers' perceived instrumentality and their ratings of their own motivation and learning processes, including motivational goal orientation, use of cognitive learning strategies, and use of extensive knowledge integration strategies. Structural Equation

Modeling (SEM) analyses (e.g., CFA and path analysis) require a fairly large sample size, but in general, at least 200 participants are needed (Kline, 2011). Therefore, in this study, I used approximately 200 survey responses (N = 197) for data analysis.

Instruments

In the first survey package, participants were asked to complete a self-report questionnaire that included a short demographic survey. They were also asked to complete a survey consisting of five scales measuring their perceptions of instrumentality (endogenous/ exogenous), ratings of motivational goal orientations (intrinsic/extrinsic), use of metacognitive self-regulation strategies, and use of cognitive learning strategies (rehearsal, elaboration, and critical thinking) for the specific class, along with a fifth scale measuring their use of extensive knowledge integration strategies. In the second survey package, participants were asked to complete the five scales again so that I could understand the extent to which the data collected with these scales predicted students' use of extensive knowledge integration strategies.

Demographic Information

The demographic survey used in this study included items about the participants' gender, race, major, year in school, and future career plans. Regarding future career plans, one item asked students to indicate the extent to which they were currently committed to a teaching career. Students were asked to choose one of the following: (a) Yes, I am definitely interested in obtaining a teaching position after graduation; (b) I plan to pursue a non-teaching job within the field of education (for example, being in administration, pursuing a graduate degree in education, or conducting education research); (c) I plan to pursue a teaching job temporarily, and then to pursue a non-teaching job within the field of education ; (d) I am not currently interested in teaching, but am pursuing a teaching credential as a backup plan; or (e) other (see Appendix A).

Endogenous/Exogenous Instrumentality

The Endogenous/Exogenous Instrumentality scale developed by Husman et al. (2004) was used to assess pre-service teachers' perceptions of instrumentality of the course content (endogenous instrumentality) and course outcomes (exogenous instrumentality). This scale contains a total of eight items, of which four items measure perceptions of endogenous instrumentality (e.g., "What I learn in this education course will be important for my future occupational success"; Item 1, 3, 4, 6 in Appendix B). The other four items measure perceptions of exogenous instrumentality (e.g., "The grade I get in this education course will affect my future"; Item 2, 5, 7, 8 in Appendix B). This scale has demonstrated strong overall reliability (Cronbach's α = .86; Husman et al., 2004). Items are rated on a 5-point Likert scale ranging from 1 (not at all true) to 5 (extremely true). Lee and Turner (2010) obtained Cronbach's alphas of α = .88 for endogenous instrumentality and α = .58 for exogenous instrumentality. In this study, the obtained Cronbach's alphas were adequate (for endogenous instrumentality, α = .79; for exogenous instrumentality, α= .61).

Intrinsic/Extrinsic Motivational Goal Orientations

Students' intrinsic/extrinsic motivational goal orientations were measured with two subscales from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991). These subscales contain a total of eight items, of which four items measure pre-service teachers' intrinsic motivational goal orientation (e.g., "In this class, the most satisfying thing for me is trying to understand the content as thoroughly as possible"; Item 1, 2, 6, 8 in Appendix C). The other four items measure pre-service teachers' extrinsic goal orientation (e.g., "Getting a good grade in this class is the most satisfying thing for me right now"; Item 3, 4, 5, 7 in Appendix C). Items are rated on a 5-point Likert scale ranging from 1

(not at all true) to 5 (extremely true). Pintrich et al. (1991) reported adequate reliabilities for these subscales (for intrinsic goal orientation, $\alpha = .74$; for extrinsic goal orientation, $\alpha = .62$). In this study, the obtained Cronbach's alpha for intrinsic motivation was $\alpha = .65$, and for extrinsic motivation was $\alpha = .69$.

Metacognitive Self-Regulation

To assess pre-service teachers' use of metacognitive strategies such as self-monitoring and self-planning, a total of 12 items from the metacognitive self-regulation strategy scale of the MSLQ (Pintrich et al., 1991) was used. Examples of these items include the following: "When reading for this course, I make up questions to help focus my reading" and "When I study for this course, I set goals for myself in order to direct my activities in each study period" (see Appendix D). Items are rated on a 5-point Likert scale ranging from 1 (not at all true) to 5 (extremely true). Pintrich et al. (1991) reported high reliability for this scale ($\alpha = .85$). In this study, the internal consistency for metacognitive self-regulation was $\alpha = .81$.

Cognitive Learning Strategies

Three subscales from the MSLQ (Pintrich et al., 1991) were used to assess participants' use of cognitive learning strategies during the course for which data were collected. These were the subscales for rehearsal, elaboration, and critical thinking. Items on these scales are rated on a 5-point Likert scale ranging from 1 (not at all true) to 5 (extremely true).

The rehearsal subscale (four items) measured students' use of strategies for memorizing factual information (e.g., "I memorize key words to remind me of important concepts in this class"; Item 1, 2, 3, 4 in Appendix E). Pintrich et al. (1991) reported a Cronbach's alpha of .69 for this subscale. In this study, the Cronbach's alpha for this subscale was $\alpha = .71$.

The original elaboration subscale of the MSLQ has a total of six items. However, contents of two items overlap with items of the extensive knowledge integration scale of this study (i.e., "I try to relate ideas in this subject to those in other courses whenever possible", "I try to apply ideas from course readings in other class activities such as lecture and discussion."). For this reason, the two items were excluded for this study. Therefore, a total of four items of the elaboration subscale was used to measure students' cognitive strategies for connecting knowledge within a course (e.g., "I try to relate the material to what I already know from the class"; Item 5, 6, 7, 8 in Appendix E). Pintrich et al. (1991) reported a Cronbach's alpha of .76 with six items. In this study, the Cronbach's alpha for this subscale with four items was $\alpha = .70$.

The critical thinking subscale (five items) was used to assess pre-service teachers' cognitive strategies for thinking critically about the course information (e.g., "Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives"; Item 9, 10, 11, 12, 13 in Appendix E). Pintrich et al. (1991) reported the Cronbach's alpha for this subscale ($\alpha = .85$). In this study, an adequate Cronbach's alpha was obtained for this subscale ($\alpha = .78$).

Extensive Knowledge Integration

In this study, items on the extensive knowledge integration subscale are adapted from the knowledge-building scale of the Student Perceptions of Classroom Knowledge-Building (SPOCK) instrument developed by Shell et al. (1997). The SPOCK measures four factors related to students' learning: knowledge-building, question-asking, self-regulation, and lack of regulation. The items in the instrument are rated on a 5-point Likert scale ranging from 1 (not at all true) to 5 (extremely true). In this study, four items from the knowledge-building subscale were used to measure pre-service teachers' use of extensive knowledge integration strategies (e.g., "As I study the topics in this class, I try to think about how they relate to topics I am

studying in other classes", see Appendix F). Shell et al. (1997) reported the knowledge-building scale has high reliability ($\alpha = .84$). In this study, the items that were chosen to assess pre-service teachers' extensive knowledge integration demonstrated a high Cronbach's alpha, $\alpha = .89$.

Procedures

Consent forms for this research were approved from the FSU research human subject committee before data collection (see Appendix G, H, and I). Two data collection procedures were used for this study. For participants recruited from the FSU COE research subject pool, an online survey system was used. Students enrolled in teacher education courses that used the subject pool system obtained course credit for participating in this study. These participants received two sets of online surveys at two different time points. At the end of the first third of the semester, that is, around the sixth and seventh weeks (Time 1), participants received the first set, which included the instrumentality scale, motivational goal orientation scale, metacognitive self-regulation strategy scale, cognitive learning strategy scale, and extensive knowledge integration scale. They also received a consent form along with the online survey. At the end of the semester (Time 2), they were asked to complete the same set of surveys. To get full course credit for their research participation, students were required to complete both sets, which took 30 minutes each.

Participants were also recruited from six COE teacher education courses that did not use the research subject pool. I contacted the three instructors of these courses to obtain permission to visit their classes and collect data from their students. After obtaining permission, I visited these classes during Fall 2012 at the same two time points as I used with the participants from the research subject pool. At Time 1, I visited the classes and distributed research flyers to recruit participants for this study. Participants received a consent form along with a paper-and-pencil survey package, which included the instrumentality scale, motivational goal orientation scale,

metacognitive self-regulation strategy use scale, cognitive learning strategy scale, and extensive knowledge integration scale. They were informed of the general purpose of the study, and then completed the survey. They were also entered into a raffle to win a $50 gift card. At Time 2, I visited the same classes for the second data collection. Participants received a consent form along with another copy of the survey package, and then completed the survey again.

For students attending the University of Western Florida (UWF), I contacted the dean of the teacher education program to obtain permission to collect data. After receiving permission, I contacted the UWF teacher education instructors to obtain permission to collect data in their classes. After obtaining permission, I sent those instructors a link to the first survey at the end of the first third of the semester (Time 1). The instructors then distributed this link to their students. I sent the instructors a link to the second survey at Time 2 (the end of the semester), and these instructors again distributed the link to their students. The participants at UWF were also entered in a raffle to win a $50 gift card. The raffle was conducted after the second data collection, and a $50 gift card was sent to ten winners.

A total of 281 pre-service teachers completed the first survey, and a total of 218 pre-service teachers completed the second survey. A total of 197 responses, from the participants who responded to both surveys, was used for data analysis. To predict pre-service teachers' use of extensive knowledge integration strategies at Time 2, the participants' ratings of their own endogenous/exogenous instrumentality, intrinsic/extrinsic motivation, metacognitive self-regulation, and use of cognitive learning strategies at Time 1 were used as predictor variables.

CHAPTER FOUR

RESULTS

This study investigated the extent to which pre-service teachers' ratings on motivational and cognitive variables (i.e., endogenous/exogenous instrumentality, intrinsic/extrinsic motivational goal orientations, metacognitive self-regulation, rehearsal, elaboration, critical thinking) predict their ratings on extensive knowledge integration strategies within their required courses for teacher education. Additionally, using path analysis, the extent to which pre-service teachers' perceived instrumentality influenced their use of extensive knowledge integration strategies, through their use of motivational goal orientations, metacognitive self-regulation, and cognitive learning strategies (i.e., rehearsal, elaboration, critical thinking) were examined.

Preliminary Analyses

A Confirmatory Factor Analysis (CFA) was conducted to evaluate whether survey items were adequate, in terms of items being coherent within each subscale, to assess the factors used in this study. As described below, after the CFA analysis, selected items of each subscale were summed and averages obtained for each participant (mean ratings on subscales ranged from 1 to 5). Missing data were coded as 99. A SEM computer software, M-plus 6.0, was used for CFA and path analysis for this study. Maximum likelihood estimates (MLE) was used as the estimation method for CFA and path analysis.

Confirmatory Factor Analysis

To determine how well items of a factor assessed the factor, a CFA was conducted. CFA results for this study were used to determine the adequacy of items of each factor when items were used for composite scores for factors. The χ^2 statistic of was used to assess the fit of the

models. A non-significant χ^2 shows a good model fit, however, the χ^2 statistic is easily affected by sample size (Tabachnick & Fidell, 2007). For this reason, multiple fit indices were used to evaluate the fit of a CFA model for each factor: the comparative fit index (CFI), the standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA).

CFI is the most frequently reported numerical index of model fit and evaluates the model fit compared to a baseline model (Tabachnick & Fidell, 2007). CFI is acceptable to estimate a model fit with small samples (Bentler, 1990). SRMR is an absolute fit index based on the standardized residuals, and small SRMR value indicates a good model fit (Hu & Bentler, 1999; Tabachnick & Fidell, 2007). RMSEA is a measure to estimate "the lack of fit in a model compared to a perfect (saturated) model" (Tabachnick & Fidell, 2007, p. 717). There are cut-off scores for each index to determine an acceptable fit of a CFA model: CFI values larger than .90 (Bentler, 1990; Hu & Bentler, 1999), SRMR values smaller than .10, and RMSEA values smaller than .10 (Browne & Cudeck, 1993; Tabachnick & Fidell, 2007). In addition to those model indices, when a CFA factor-model did not demonstrate an acceptable fit of model, (a) factor loadings of items, (b) the Cronbach's alpha value, and (c) correlation coefficients among items were investigated to determine whether or not to keep or delete items for a subscale.

Table 3 (see p. 57) displays the model fit indices from the CFA (χ^2, CFI, RMSEA, SRMR) for each subscale used in this study. For endogenous instrumentality, a single factor model with four items had a good fit with the data (χ^2 (2) = 2.306, p = .32; CFI= .99; SRMR= .02; RMSEA= .03 with 90% CI: .00, .15). However, one of four items (Instrumentality item 1: "I will use the information I learn in this education course in other classes I will take in the future".) had a standardized factor loading lower than .30 (standardized factor loading coefficient= .24), which was the cut-off score to be removed (Morley, Williams, & Black, 2002), and the Cronbach's alpha of the

composite score increased when the item was excluded (from $\alpha = .73$ to $\alpha = .79$). Correlational coefficients among three items were adequate (statistically significant at $p < .01$; range of inter-item correlation: $r = .45$ - .71). Therefore, the endogenous instrumentality item with the low factor-loading coefficient was excluded, then only three items were used to compute a composite score (i.e., averaged item score) for endogenous instrumentality.

For exogenous instrumentality, two of the three fit indices (i.e., CFI, SRMR) of a single factor model with four items indicated a good fit of model (χ^2 (2) = 6.63, $p = .04$; CFI = .95; SRMR = .04; RMSEA= .11 with 90% CI: .02, .20). However, only one index of the model displayed a poor fit (RMSEA that is larger than .10 shows a poor model fit, Browne & Cudeck, 1993). Even though RMSEA of the exogenous instrumentality model was higher than .10, and the range of inter-item correlations was $r = .10$ - .48 (one item had low correlation coefficients with another item, but not with all other items), all four items were used for a composite score because (a) factor loadings for all four items were larger than .30 and (b) the Cronbach's alpha was the highest with all four items ($\alpha = .61$).

For intrinsic motivational goal orientation, multiple indices of a single factor model with all four items were as follows: χ^2 (2) = 7.99, $p = .02$; CFI = .95; SRMR = .04; RMSEA = .12 with 90% CI: .04, .22. CFI and SRMR of this model indicated this model had a good model fit, but RMSEA of this model indicated this model had a poor model fit. RMSEA of this model was higher than .10 and the range of inter-item correlations was $r = .17$- .53. However, (a) factor loadings of items were larger than .30, (b) the Cronbach's alpha for intrinsic motivational goal orientation with four items had the highest score ($\alpha = .65$), and (c) correlational coefficients for four items were all statistically significant ($p < .05$). Therefore, all four items of intrinsic

motivational goal orientation were used for a composite score of the intrinsic motivational goal orientation scale.

For extrinsic motivational goal orientation, CFI and SRMR of this model indicated this model had a good model fit to the data, but RMSEA suggested this model had a poor model fit (χ^2 (2) = 11.31, p = .00; CFI = .93; SRMR = .04; RMSEA = .15 with 90% CI: .07, .25). Due to inconsistent results of multiple indices of the extrinsic motivation CFA model, the factor loadings of the items and the Cronbach's alpha were investigated. One of four items had low correlation coefficients with another item (but not with all other items; range of inter-item correlation: r = .18 - .54) and the Cronbach's alpha increased slightly (from .69 to .70) when the item was excluded (Motivational goal orientation item 7: "The most important thing for right now is improving my overall grade point average, so my main concern in this class is getting a good grade"). However, the item was kept because (a) factor loadings for all items were adequate (i.e., larger than .39), (b) the Cronbach's alpha was also adequate (α = .69), and (c) correlational coefficients for items were all statistically significant ($p < .05$).

For metacognitive self-regulation, a single factor model with twelve items was originally examined (χ^2 (54) = 109.073, p = .00; CFI = .88; SRMR = .06; RMSEA = .07 with 90% CI: .05, 09). Results of the CFA model indicated that two of twelve items of this model had low standardized factor loadings (standardized coefficients = .09 and -.02) and were not significant at $p < .05$. Interestingly, the two items with low standardized factor loadings were reverse-scored items (negatively-worded items were reversed-scored) and did not have good correlations with other items of this model (Metacognitive self-regulation item 1 and 8: "During class time I often miss important points because I'm thinking of other things;" "I often find that I have been reading for class but don't know what it was all about." This may be because participants

comprehended differently the negatively-worded items compared to positively-worded items, so, their different perceptions of the two items may have influenced their ratings on the two items. Another possibility is that the two items may measure different dimension of metacognitive self-regulation from the other ten items of metacognitive self-regulation. Therefore, in order to have items measuring metacognitive self-regulation clearly and accurately, the two items with low standardized factor loadings (i.e., Metacognitive self-regulation item 1 and 8) were excluded for the CFA model. A single factor metacognitive self-regulation model with ten items was examined and showed a good fit to the data (χ^2 (35) = 61.85, p = .00; CFI = .94; SRMR = .05; RMSEA = .06 with 90% CI: .04, .09). Additionally the Cronbach's alpha for metacognitive self-regulation was high (α = .81). Correlational coefficients of the ten items were all statistically significant at $p < .05$ (range of inter-item correlations was r = .17 - .50).

For rehearsal, a single factor model with four items had a good fit to the data (χ^2 (2) = 4.3442, p = .11; CFI = .98; SRMR = .03; RMSEA = .08 with 90% CI: .00, .18). The Cronbach's alpha for rehearsal was adequate (α = .71) and the range of inter-item correlations was r = .32 - .50. Therefore, four items for rehearsal strategies were used for a composite score of rehearsal.

For elaboration, multiple indices of a single factor model with four items indicated a good fit of this elaboration model (χ^2 (2) = 1.96, p = .38; CFI = 1.00; SRMR = .02; RMSEA = .00 with 90% CI: .00, .14). The Cronbach's alpha for elaboration was adequate (α = .70) and correlational coefficients for four items were statistically significant at $p <$ .05 (range of inter-item correlations, r = .18 - .55). Therefore, four items for elaboration strategies were used for a composite score.

For critical thinking, a single factor model with five items had a good fit to the data (χ^2 (5) = 8.16, p = .37; CFI = .99; SRMR = .03; RMSEA = .06 with 90% CI: .00, .12). The

Cronbach's alpha for the critical thinking subscale was strong (α = .78). Correlational coefficients among five items were statistically significant at $p < .05$ and the range of inter-item correlations was r = .25 - .58. Therefore, all five items for critical thinking strategies were used for a composite score.

Table 3
Fit Indices from CFA

Model	χ^2	df	CFI	RMSEA	SRMR
Endogenous Instrumentality (4 items*)	2.31	2	.99	.02	.03
Exogenous Instrumentality (4 items)	6.63	2	.95	.11	.04
Intrinsic Motivation (4 items)	7.99	2	.95	.12	.04
Extrinsic Motivation (4 items)	11.31	2	.93	.15	.04
Metacognitive Self-Regulation (10 items)	61.85	35	.94	.06	.05
Rehearsal (4 items)	4.34	2	.98	.08	.03
Elaboration (4 items)	1.95	2	1.00	.00	.02
Critical Thinking (5 items)	8.15	5	.99	.06	.03
Extensive Knowledge Integration (4 items)	9.94	2	.98	.14	.02

Note: n=197. *df*=degrees of freedom, CFI=comparative fit index; RMSEA=root mean square error of approximation, SRMR=standardize root mean square residual. *Fit indices for endogenous instrumentality with 4 items is reported even though 3 items were used for composite score for endogenous instrumentality.

Finally, for extensive knowledge integration, a single factor model with four items was examined and two indices showed this model had a good fit to the data (χ^2 (2) = 9.94, p = .01; CFI = .98; SRMR = .02; RMSEA = .14 with 90% CI: .06, .24). Only one index (i.e., RMSEA) indicated a poor model fit of the knowledge integration scale. However, (a) factor loadings of all four items were adequate (larger than .70), (b) the Cronbach's alpha for the extensive knowledge integration scale was very high (α= .89), and (c) correlation coefficients among four items were statistically significant at $p < .05$ (range of inter-item correlation, r = .58 - .65). Therefore, all four items were used for a composite score of extensive knowledge integration.

Descriptive Analysis

After composite scores for each subscale (average scores of items for each factor) were calculated, the range, mean, standard deviations, and reliability estimates for subscales were computed and were presented in Table 4. Cronbach alpha coefficient (α) for each factor was moderately high (α = .61 - .89).

As an initial analysis, correlations were calculated to explore relationships among pre-service teachers'' ratings on variables. Table 5 shows the correlations among pre-service teachers' ratings of the nine variables (i.e., endogenous/exogenous instrumentality, intrinsic/extrinsic motivational goal orientations, metacognitive self-regulation, rehearsal, elaboration, critical thinking, and extensive knowledge integration).

Results indicated pre-service teachers' ratings on all variables, except the correlation between exogenous instrumentality and extrinsic motivational orientation, had at least moderate correlations. For example, participants' ratings for the extent to which the course was exogenously related to their future goals were significantly and positively related to their ratings for (a) the extent to which the course-information was endogenously related to their future goals

($r = .41$, $p < .01$), (b) intrinsic motivational goal orientation ($r = .29$, $p < .01$), (c) extrinsic motivation goal orientation ($r = .24$, $p < .01$), (d) use of metacognitive self-regulation strategies ($r = .19$, $p < .01$), (5) use of elaboration strategies ($r = .22$, $p < .01$), and (e) use of extensive knowledge integration strategies ($r = .15$, $p < .05$).

Table 4
Descriptive Statistics for Major Variables

Variables	Min-Max	Mean	*SD*	α
Endogenous Instrumentality	2.00-5.00	4.31	.65	.79
Exogenous Instrumentality	2.25-5.00	4.31	.66	.61
Intrinsic Motivation	1.50-5.00	3.61	.63	.65
Extrinsic Motivation	1.50-5.00	3.62	.84	.69
Metacognitive Self-Regulation	1.20-4.90	3.11	.64	.81
Rehearsal	1.00-5.00	3.10	.89	.71
Elaboration	1.25-5.00	3.26	.79	.70
Critical Thinking	1.20-4.80	3.00	.75	.78
Extensive Knowledge Integration	1.00-5.00	3.58	.87	.89

Note. n=197; SD=standard deviation; α=Cronbach's alpha coefficient

Table 5
Correlations among Students' Instrumentality, Motivation, Metacognitive Self-Regulation, and Learning Strategies

	1	2	3	4	5	6	7	8
1. Endogenous Instrumentality	-							
2. Exogenous Instrumentality	.41**	-						
3. Intrinsic Motivation	.35**	.29**	-					
4. Extrinsic Motivation	.19**	.24**	.29**	-				
5. Metacognitive Self-Regulation	.32**	.19**	.52**	.28**	-			
6. Rehearsal	.28**	.08	.22**	.32**	.51**	-		
7. Elaboration	.32**	.22**	.37**	.28**	.69**	.50**	-	
8. Critical Thinking	.21**	.10	.53**	.24**	.55**	.28**	.49**	-
9. Knowledge Integration	.21**	.15*	.23**	.03	.25**	.34**	.33**	.25**

*p <. 05, **p < .01 (two-tailed)

Regression Analyses

Multiple Regression Analysis

To answer Research Question 1, a multiple regression analysis was conducted. Through the multiple regression analysis, the best predictor of pre-service teachers' ratings of extensive knowledge integration was explored.

Research Question 1: *Which is the best predictor of pre-service teachers' ratings of purposefully integrating knowledge across teacher education courses (i.e., extensive knowledge integration): pre-service teachers' ratings of perceived instrumentality (endogenous/exogenous instrumentality), their ratings of motivational goal orientations (intrinsic/extrinsic motivational goal orientation), their ratings on metacognitive self-regulation strategies, or their ratings of cognitive learning strategies (rehearsal, elaboration, and critical thinking)?*

To predict pre-service teachers' ratings on extensive knowledge integration, all independent variables (IVs: students' ratings of endogenous/exogenous instrumentality, intrinsic/extrinsic motivational goal orientations, metacognitive self-regulation, rehearsal, elaboration, critical thinking in Time 1) were entered simultaneously in a regression equation using SPSS, version 18. In the regression model, each IV was evaluated to understand how each contributed to predict the dependent variable (DV, pre-service teachers' ratings on their use of extensive knowledge integration strategies in Time 2). Table 6 shows the results of this multiple regression analysis.

Table 6
Summary of Simple Regression Analysis for Variables Predicting Knowledge Integration

Variables	Extensive Knowledge Integration		
	B	SE *B*	*β*
Endogenous Instrumentality	.14	.10	.10
Exogenous Instrumentality	.07	.10	.06
Intrinsic Motivation	.03	.12	.02
Extrinsic Motivation	-.09	.08	-.09
Metacognitive Self-Regulation	-.04	.14	-.03
Rehearsal	-.15	.08	-.16
Elaboration	.30**	.11	.27**
Critical Thinking	.30**	.10	.25**
R^2		.19	
Adjusted R^2		.16	
F		5.65**	

Note. *$p < .05$, **$p < .01$

Table 6 displays the unstandardized regression coefficients (*B*), the standard error of *B* (SE *B*), the standardized regression coefficients (β), and R^2. As displayed in Table 6, pre-service teachers' ratings on use of elaboration strategies ($\beta = .27$, $p < .01$) and critical thinking strategies ($\beta = .25$, $p < .01$) made statistically significant contributions to the prediction of pre-service teachers' ratings on their use of extensive knowledge integration strategies. Results of the analysis indicated that 19% of variance in pre-service teachers' ratings on knowledge integration was explained by the regression model with eight IVs, $R^2 = .19$, $p < .01$.

Hierarchical Regression Analysis

In order to investigate relationships among the reported ratings of pre-service teachers that predicted their use of extensive knowledge integration strategies, a hierarchical regression analysis was used.

Research Question 2: *Do ratings of instrumentality significantly predict pre-service teachers' purposeful integration of knowledge across teacher education courses (i.e., extensive knowledge integration strategies)? If instrumentality ratings significantly predict pre-service teachers' use of extensive knowledge integration strategies, do pre-service teachers' ratings of intrinsic/extrinsic motivational goal orientations, their use of metacognitive self-regulation strategies, and/or their use of cognitive learning strategies (i.e., rehearsal, elaboration, and critical thinking strategies) significantly add to the prediction of pre-service teachers' use of extensive knowledge integration strategies?*

A hierarchical regression analysis was employed to examine if entering variables sequentially to a prediction equation improves the prediction power of pre-service teachers' ratings of extensive knowledge integration. SPSS (version 18) was used for this analysis.

Table 7 presents the results of the hierarchical regression analysis, showing the unstandardized regression coefficients (B), the standard error of B (SE B), the standardized regression coefficients (β), and R^2 for each step. The F-statistic for R^2 change in each step is also displayed in the table.

As the first step, the two instrumentality variables, endogenous instrumentality and exogenous instrumentality were entered into the regression equation to predict pre-service teachers' rating of extensive knowledge integration. Adding endogenous instrumentality and exogenous instrumentality in the first step had significant predictive power of knowledge

integration; $R^2 = .05$, $F(2, 194) = 4.89$, $p < .01$. In the first step, pre-service teachers' ratings on endogenous instrumentality significantly predicted their use of extensive knowledge integration ($\beta = .17$, $p < .05$), while ratings on exogenous instrumentality did not.

The motivation variables, intrinsic and extrinsic motivational goal orientations, were then entered into the second step of the regression. Results showed that, in this second step, entering the intrinsic and extrinsic motivational goal orientation variables significantly increased the prediction of pre-service teachers' ratings for use of extensive knowledge integration strategies; $R^2 = .09$, change in $R^2 = .03$, $F(2, 192) = 3.12$, $p < .05$. In this second step of the hierarchical regression, pre-service teachers' ratings on intrinsic motivational goal orientation was a significant contributor for predicting their use of extensive knowledge integration strategies ($\beta = .19$, $p < .05$), while their ratings on extrinsic motivational goal orientation was not. Additionally, their ratings on endogenous instrumentality were no longer a significant predictor for their use of extensive knowledge integration strategies.

In the third step of the hierarchical regression, the metacognitive self-regulation variable was entered. The predictive power of the third step of the regression significantly improved; $R^2 = .10$, change in $R^2 = .02$, $F(1, 191) = 4.15$, $p < .05$. Results showed that students' ratings for metacognitive self-regulation was a significant predictor of their use of extensive knowledge integration strategies ($\beta = .17$, $p < .05$), while intrinsic motivational goal orientation became a non-significant predictor of their use of extensive knowledge integration strategies.

Finally, the learning strategy variables—rehearsal, elaboration, critical thinking learning strategies—were entered into the fourth, and last step to predict pre-service teachers' rating of extensive knowledge integration. The final model indicated that prediction of extensive knowledge integration significantly improved; $R^2 = .19$, change in $R^2 = .10$, $F(3, 188) = 7.49$,

$p < .01$). With the full model, 19% of the variance on students' use of extensive knowledge integration strategies was explained with all variables in the regression equation; 10% of the variance was explained by students' use of cognitive learning-strategy variables. In the final step, significant contributors for predicting their ratings on use of extensive knowledge integration strategies were their ratings on use of elaboration strategies ($\beta = .27$, $p < .01$) and critical thinking strategies ($\beta = .25$, $p < .01$). Results of this hierarchical regression analysis suggest that pre-service teachers' intrinsic motivational goal orientation, metacognitive self-regulation, and cognitive learning strategies might play mediating roles between their endogenous instrumentality and their use of extensive knowledge integration.

Path Analysis

Research question 3 examined direct and indirect relationships among the variables; therefore, a path analysis was employed.

Research Question 3: *What are the direct and indirect effects of pre-service teachers' perceived instrumentality on their ratings of intrinsic/extrinsic motivational goal orientations, use of metacognitive self-regulation strategies, use of cognitive learning strategies (i.e., rehearsal, elaboration, and critical thinking strategies), and their purposeful integration of knowledge across teacher education courses (i.e., extensive knowledge integration strategies)?*

Path analysis to test the hypothesized model (Figure 1, see p. 36) was conducted using the M-Plus program, then the model was modified based on results. As Table 8 (p. 70) shows, only one index of the hypothesized model suggested the data had a poor fit while two indices showed the hypothesized model had an acceptable fit with the data: χ^2 (16) = 49.58, $p = .00$; CFI = .93; SRMR = .08; RMSEA = .10 with 90% CI: .07, .14.

Table 7

Summary of Hierarchical Regression Analysis for Variables Predicting Knowledge Integration

Variables	Model 1			Model 2			Model 3			Model 4		
	B	SE *B*	*β*	*B*	SE *B*	*β*	*B*	SE *B*	*β*	*B*	SE *B*	*β*
Endogenous Instrumentality	.23	.10	.17*	.16	.11	.12	.13	.11	.10	.14	.10	.10
Exogenous Instrumentality	.10	.10	.08	.10	.11	.07	.10	.10	.07	.07	.10	.06
Intrinsic Motivation				.26	.11	.19*	.16	.12	.12	.03	.12	.02
Extrinsic Motivation				-.07	.08	-.06	-.09	.08	-.09	-.09	.08	-.09
Metacognitive Self-Regulation							.23	.11	.17*	-.04	.14	-.03
Rehearsal										-.15	.08	-.16
Elaboration										.30	.11	.27**
Critical Thinking										.30	.10	.25**
R^2		.05			.09			.10			.19	
F for R^2*change*		4.89**			3.12*			4.15*			7.49**	

Note. *$p < .05$, **$p < .01$.

As suggested by the modification indices of the path analysis and based on results of previous research, a covariance between the residuals of intrinsic and extrinsic motivational goal orientations was added to the hypothesized model. This relationship has been found in several studies (significant correlation between intrinsic motivational goal orientation and extrinsic motivational goal orientation; Hayamizu, 1997; Lee & Turner, 2012; Wolters, 1998). The revised model 1, with a covariance between the residuals of intrinsic motivational goal orientation and extrinsic motivational goal orientation, demonstrated a better model fit than the hypothesized model (χ^2 (15) = 39.14, p = .00; CFI= .95; SRMR= .06; RMSEA= .09 with 90% CI: .06, .13). The chi-square difference test between the hypothesized model and the revised model 1 showed that the revised model 1 fit the data significantly better than the original model (χ^2_{dif} = 10.44; df_{dif}=1).

Subsequently, based on the modification indices, a covariance between the residuals of rehearsal and elaboration was added to the revised model 1 to improve the model data fit. Past research has found that students' use of rehearsal learning strategies was significantly correlated with their use of elaboration learning strategies (Pintrich, Smith, García, & McKeachie, 1993; Wolters, 1998). Perhaps, before using elaboration strategies (e.g., making connections between course knowledge and prior knowledge), using rehearsal strategies (e.g., reading course notes several times) is necessary. For this reason, a covariance between the residuals of rehearsal and elaboration was added to the revised model 1. The revised model 2, with a covariance between the residuals of rehearsal and elaboration, had a better model fit than the revised model 1 (χ^2 (14) = 30.60, p = .01; CFI = .96; SRMR= .06; RMSEA= .08 with 90% CI: .04, .12). Results of the chi square difference test between the revised model 1 and the revised model 2 showed that the revised model 2 fit was better than the revised model 1 (χ^2_{dif} = 8.44; df_{dif} = 1). Therefore, the

revised model 2 was chosen over the previous models.

Finally, non-significant paths between variables were omitted from the revised model 2 in order to reach a simpler model. Non-significant paths were removed between (a) endogenous instrumentality and critical thinking, (b) endogenous instrumentality and elaboration, (c) endogenous instrumentality and extensive knowledge integration, (d) intrinsic motivational goal orientation and elaboration, (e) intrinsic motivational goal orientation and extensive knowledge integration, (f) metacognitive self-regulation and extensive knowledge integration, and (g) exogenous instrumentality and rehearsal. As Table 8 displays, the final path model demonstrated a good fit of the data: χ^2 (21) = 38.49, p = .01; CFI = .96; SRMR= .06; RMSEA = .06 with 90% CI: .03, .09.

Chi square difference between the revised model 2 and the final path model was not significant (χ^2_{dif} = 7.79; df_{dif}=7). Therefore, the final path model was chosen to represent the data because it was simpler than the revised model 2.

Table 8
Goodness of Fit in Models

Model	chi-square	df	CFI	RMSEA	SRMR
Hypothesized Model	49.58	16	.93	.10	.08
Revised Model 1	39.14	15	.95	.09	.06
Revised Model 2	30.60	14	.96	.08	.06
Final Path Model	38.49	21	.96	.06	.06

Note: df=degrees of freedom, CFI = comparative fit index, RMSEA = root mean square error of approximation, SRMR = standardize root mean square residual.

In Table 9, direct and indirect effects of variables on extensive knowledge integration are displayed. The path analysis demonstrated that three variables had direct effects on extensive knowledge integration: critical thinking ($\beta = .25$, $p < .01$), elaboration ($\beta = .29$, $p < .01$), and rehearsal ($\beta = -.17$, $p < .05$).

Table 9
Direct, Indirect, and Total Effects

Effects	Direct	Indirect	Total
On Knowledge Integration			
Critical Thinking	.25**	-	.25**
Elaboration	.29**	-	.29**
Rehearsal	-.17*	-	-.17*
Metacognitive SR	-	.22	.22**
Intrinsic Motivation	-	.19	.19**
Extrinsic Motivation	-	-.03	-.03
Endogenous Instrumentality	-	.10**	.10**
Exogenous Instrumentality	-	-.01	-.01
On Critical Thinking			
Metacognitive SR	.38**	-	.38**
Intrinsic Motivation	.34**	.17**	.51**
Endogenous Instrumentality	-	.23**	.23**

Table 9 - continued

Effects	Direct	Indirect	Total
On Elaboration			
Metacognitive SR	.69**	-	.69**
Intrinsic Motivation	-	.32**	.32**
Endogenous Instrumentality	-	.21**	.21**
On Rehearsal			
Metacognitive SR	.47**	-	.47**
Intrinsic Motivation	-	.22**	.22**
Extrinsic Motivation	.17*		.17*
Endogenous Instrumentality	-	.14**	.14**
Exogenous Instrumentality	-	.04*	.04*
On Metacognitive SR			
Intrinsic Motivation	.46**	-	.46**
Endogenous Instrumentality	.16*	.15**	.31**
On Intrinsic Motivation			
Endogenous Instrumentality	.33**	-	.33**
On extrinsic Motivation			
Exogenous Instrumentality	.22**	-	.22**

Note. *$p < .05$, **$p < .01$.

The total effects on extensive knowledge integration with statistically significant p values were endogenous instrumentality ($\beta = .10$, $p < .01$), intrinsic motivational goal orientation ($\beta =$

.19, $p < .01$), metacognitive self-regulation ($\beta = .22$, $p < .01$), rehearsal strategies ($\beta = -.17$, $p < .05$), elaboration strategies ($\beta = .29$, $p < .01$), and critical thinking strategies ($\beta = .25$, $p < .01$). Metacognitive self-regulation had a statistically significant direct effect on critical thinking strategies ($\beta = .38$, $p < .01$), elaboration strategies ($\beta = .69$, $p < .01$), and rehearsal strategies ($\beta = .47$, $p < .01$). Total effects on metacognitive self-regulation from endogenous instrumentality ($\beta = .31$) and intrinsic motivational goal orientation ($\beta = .46$) were statistically significant at $p < .01$. Furthermore, endogenous instrumentality had a direct effect on intrinsic motivational goal orientation ($\beta = .33$, $p < .01$), and exogenous instrumentality had a direct effect on extrinsic motivational goal orientation ($\beta = .22$, $p < .01$).

The final path model (displayed in Figure 2 in the following page) suggests that pre-service teachers' ratings of endogenous instrumentality influenced their ratings of extensive knowledge integration through their ratings of intrinsic motivational goal orientation, metacognitive self-regulation, and cognitive learning strategies (i.e., elaboration, critical thinking). In addition, their use of cognitive learning strategies (i.e., rehearsal, elaboration, critical thinking strategies) was influenced by their perceptions of endogenous instrumentality through their ratings of intrinsic and extrinsic motivational goal orientations and their use of metacognitive self-regulation strategies.

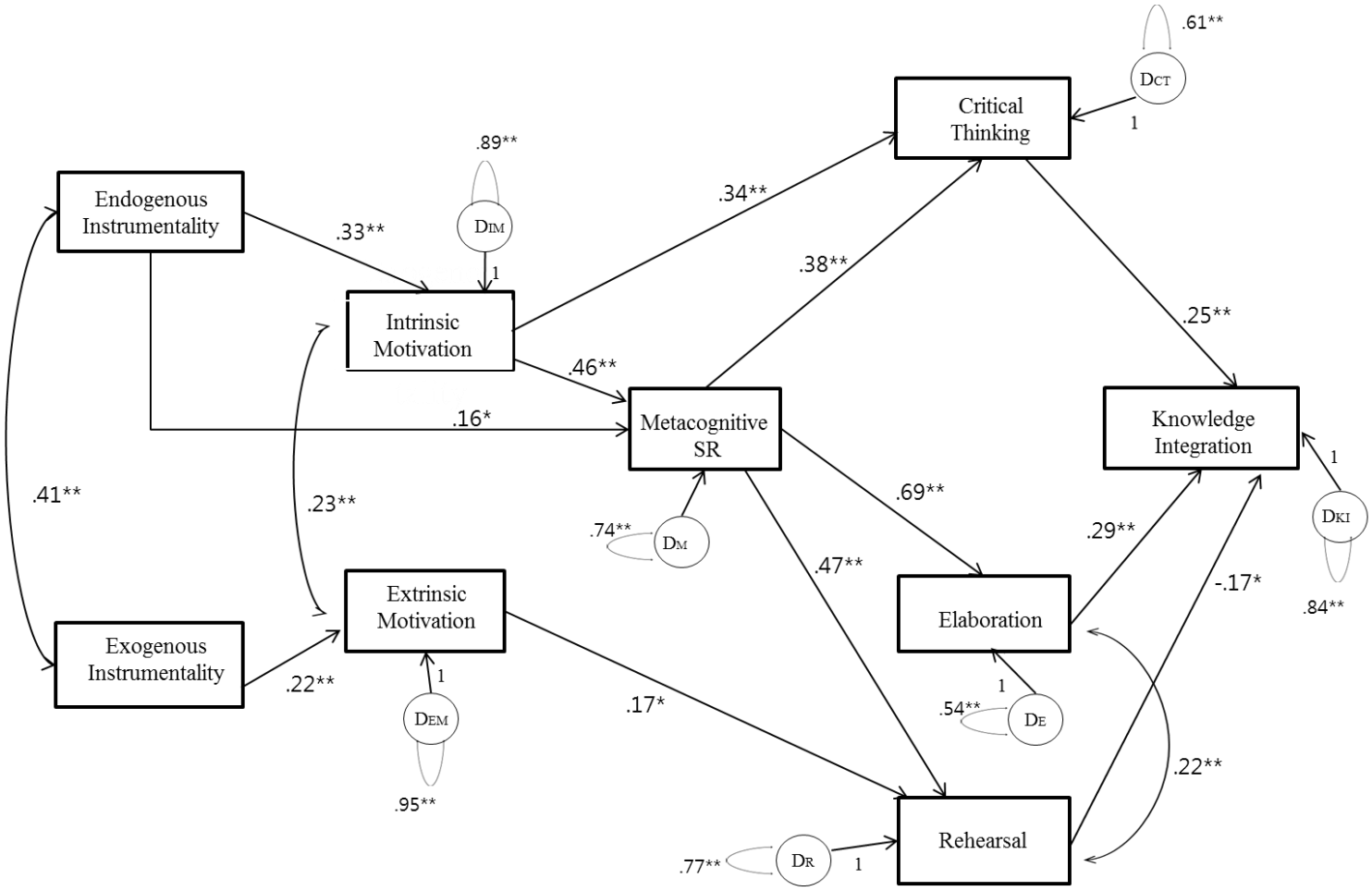

Figure 2. Final Path Analysis Model
Notes. D = Residual of each variable

CHAPTER FIVE

DISCUSSIONS

Understanding pre-service teachers' motivation and cognition within teacher education courses is necessary to promote their successful learning so that they may become effective teachers. For this reason, the purpose of this research was to study relationships among pre-service teachers' motivation and cognition for learning within required teacher education courses. In particular, this research examined the extent to which pre-service teachers' perceived instrumentality of required courses may influence their purposeful integration of knowledge across required teacher education courses (use of extensive knowledge integration strategies). Although extensive knowledge integration may be an essential cognitive activity to develop students' expertise within a specific area (e.g., Hattie, 2003; Bransford, 2000), students' use of extensive knowledge integration strategies has not been examined, particularly in teacher education. Another aspect of this study was the extent to which pre-service teachers' perceived instrumentality of a particular course, their learning motivation, their ability to engage in metacognitive self-regulation, and their use of cognitive learning strategies predicted their use of extensive knowledge integration strategies—and ways these variables may be related. The next sections provide interpretations for this study's results, limitations of this study, and recommendations for future research.

Deep Learning and Knowledge Integration

Answering research question 1, of the variables that were collected, pre-service teachers' use of elaboration and critical thinking strategies were the best predictors of their use of extensive knowledge integration strategies. The hypothesis for research question 1 was that pre-service teachers' endogenous instrumentality, a motivation variable, may be the best predictor of

their use of extensive knowledge integration strategies; however, results suggested that pre-service teachers' tendency to engage in cognitive activities for deep learning (elaboration, e.g., making connections between readings and lectures; critical thinking, e.g., applying prior knowledge to different situations for problem solving) has significant contributions to explain their cognitive integration of knowledge across their required courses. Thus, specific types of learning-related cognitions were more powerful than motivation.

Research has shown that successful learners (e.g., gifted students, academically advanced students) tend to frequently use deep learning strategies such as elaboration strategies and critical thinking strategies (Garcia & Pintrich, 1992; Ley & Young, 1998; Zimmerman & Martinez-Pons, 1986). Integrating knowledge across topics and domains is also a deep learning strategy that is needed to develop expertise (Bransford, 2000; Hattie, 2003; Shell et al., 2005). As learning patterns of successful learners and experts have shown, deep learning and making connections among knowledge domains are vital cognitive processes for effective learning (Shell et al., 2010).

This study suggests that deep understanding about a specific topic and domain, such as using strategies for elaboration of knowledge and critical thinking of that knowledge, can contribute to engaging in strategies that further connect one's knowledge across topics and domains. Therefore, teacher educators may need to create learning tasks that demand pre-service teachers' deep learning within and across teacher education courses. This is because students do not use appropriate cognitive learning strategies if they do not have academic tasks that require high levels of cognitive engagement (Pintrich & Schrauben, 1992). To promote pre-service teachers' knowledge integration, teacher educators may need to create course assignments and activities that require students to connect current course knowledge to knowledge in other courses. Additionally, deep learning strategies (e.g., critical thinking) can be learned when

appropriate instructions are provided (Halpern, 1998; Lehman & Nisbett, 1990; Pintrich & Schrauben, 1992). Therefore, class instructions could include explanations and examples of using deep learning strategies and extensive knowledge integration strategies. This may help students not only acquire effectively deep and extensive knowledge but also teach them how to integrate their knowledge.

Pre-service Teachers' Motivation and Cognition

Results of the hierarchical multiple regression analysis suggests that pre-service teachers' intrinsic motivational goal orientation, metacognitive self-regulation, and cognitive learning strategies (i.e., elaboration, critical thinking) might have mediating roles in the relationship between pre-service teachers' perceived endogenous instrumentality and their use of extensive knowledge integration strategies. Therefore, as previous research has emphasized (e.g., Elliot, McGregor, & Gable, 1999; Pintrich & Schrauben, 1992), the current results also suggest that students' motivation, use of deep learning strategies, and self-regulation may have an important role in promoting their learning. Perhaps, this means that pre-service teachers' perceived endogenous instrumentality can promote their intentions to acquire deep and extensive knowledge of teacher education courses when they have an appropriate level of intrinsic motivational goal orientation and they are able to plan and monitor their learning. Additionally, results suggested that pre-service teachers' deep learning may need specific types of motivation (e.g., intrinsic motivation, mastery goal orientation), as well as self-regulation (e.g., metacognitive self-regulation, effort regulation) (e.g., Elliot et al., 1999; Meece et al., 1988; Pintrich, 1999).

Endogenous Instrumentality

Correlation results of this study showed that endogenous instrumentality had strong correlations with all other variables. This suggests that a pre-service teacher who understands that the course content is important for becoming a teacher is more likely to (a) believe there is an important relationship between the course grade and his/her future goals to become a teacher (exogenous instrumentality, extrinsic motivational orientation), (b) learn for his/her enjoyment or satisfaction (intrinsic motivational orientation), (c) make schedules, set goals, and monitor learning processes for his/her own learning (metacognitive self-regulation), (d) memorize course content (rehearsal), (e) connect the course knowledge to prior knowledge (elaboration), (f) solve problems in different ways (critical thinking), and (g) relate course knowledge to knowledge in other courses (extensive knowledge integration).

Path analysis results suggested that pre-service teachers' perceptions about the role of the content of current academic classes to become a teacher (i.e., endogenous instrumentality) was both directly and indirectly related to their intrinsic motivation and learning processes (using metacognitive self-regulation and cognitive learning strategies to acquire knowledge successfully) in their required courses for teacher education. Pre-service teachers' perceptions exogenous instrumentality (e.g., the course grade was important for achieving their future goals) were directly related to their extrinsic motivation and indirectly influenced their use of rehearsal strategies. This is consistent with previous research about positive relationships between endogenous instrumentality and intrinsic motivation, and between exogenous instrumentality and extrinsic motivation (Husman et al., 2004; Lee & Turner, 2010, 2012). Furthermore, results of this study support previous research that demonstrated significant, positive relationships between students' perceptions of endogenous instrumentality and use of cognitive strategies in learning

situations (e.g., self-regulation; Husman & Hilpert, 2007; use of cognitive strategies, Berger, 2012; Phan, 2009).

Extensive Knowledge Integration

Because integrating knowledge across topics and domains is considered to be a key cognitive activity to develop expertise (Bransford, 2000; Hattie, 2003; Shell et al., 2005), in this research, pre-service teachers' use of extensive knowledge integration strategies was studied to understand pre-service teachers' motivation and cognition related to their teaching expertise development. Findings of this dissertation study suggest that pre-service teachers' use of extensive knowledge integration strategies was significantly correlated with all motivational and cognitive variables except extrinsic motivational orientation. This suggests that students who integrate knowledge across topics and domains are more likely to (a) understand the importance of the current course content to achieve their future goals to become teachers (endogenous instrumentality), (b) understand the relationship between their course grades and their future goals (exogenous instrumentality), (c) want to learn for their enjoyment or interest (intrinsic motivational goal orientation), (d) are able to set goals and self-monitor their learning (metacognitive self-regulation), and (e) tend to use various cognitive strategies—both surface and deep—for their learning (rehearsal, elaboration, and critical thinking). Because pre-service teachers' use of extensive knowledge integration strategies has significant correlations with motivational and cognitive variables that are considered to be related to effective learning (e.g., endogenous instrumentality, intrinsic motivational orientation, deep learning strategies), this result suggests pre-service teachers' use of extensive knowledge integration strategies may be an essential cognitive learning strategy for effective learning. Results of this study indicate that to develop pre-service teachers' teaching expertise, pre-service teachers need to have strong

understanding between the current course content and their future goals, adequate levels of intrinsic motivational goal orientation, intentions to do goal setting and self-monitoring for learning, and intentions to have deep learning. However, this study did not assess students' learning *per se*. Future research could focus on the relationship of the variables used in this study and outcome variables such as pre-service teachers' knowledge, problem-solving, scores on the teacher certification exams, and whether or not they continue their teaching career beyond the first five years of teaching.

Limitations

One limitations of this study was the lack of coherence for some of the scales to assess variables. In this research, to assess pre-service teachers' various motivational/cognitive variables, several established measures were employed: (a) the instrumentality scale developed by Husman et al. (2004), (b) intrinsic/extrinsic motivational goal orientation scales, metacognitive self-regulation scale, and cognitive learning strategy scales adopted from MSLQ (Pintrich et al., 1991), and (c) the extensive knowledge integration scale adopted from the SPOCK (Shell et al., 1997). These scales have been reported with adequate reliability and validity (endogenous/exogenous instrumentality scale, Husman et al., 2004; MSLQ, Pintrich et al., 1991; SPOCK, Shell et al., 2005), and used widely and frequently in educational research. However, the CFA that was conducted as a preliminary analysis of this study, as a check of scale coherence, showed that four scales had poor model fit with the data of this study. These exogenous instrumentality scale (RMSEA = .11), intrinsic motivational goal orientation scale (RMSEA = .12), extrinsic motivational goal orientation scale (RMSEA = .15), and extensive knowledge integration scale (RMSEA = .14) had high RMEAS value, which is recommended to be lower than .10 for an acceptable model fit (Browne & Cudeck, 1993; Tabachnick & Fidell,

2007). Because those scales had only four items respectively, it was inappropriate to remove items to improve CFA model fit. Therefore, it was difficult to say that these scales assessed these variables well for this study. Perhaps, other measures assessing these variables may need to be employed in future research.

One possible limitation was that participants were recruited from various teacher education courses. In various teacher education courses, pre-service teachers learned different content (e.g., teaching-method course, foundations course, field experience preparation course) and had different assignments. For example, one teaching preparation course focused on discussions among students to share their thoughts about teaching before they go to schools for their student-teaching. In the course, no assignments or readings were required for students; therefore, students may have perceived the course was not relevant. Anecdotally, one student in this teaching preparation course stated during data collection that, "we don't study in this class." Because the cognitive learning-strategy scales for this study included items regarding students' use of cognitive learning strategies to acquire knowledge from readings and assignments of the course, students in the discussion-focused course may not have been appropriate participants for this study. Different course-content may influence participants' ratings on scales differently. Therefore, in future research, recruiting participants from similar educational courses (e.g., from all teaching method courses, or all foundations courses) may be more appropriate to understand relationships among students' motivation and cognition within a specific education class.

Implications for Future Research

Based on limitations of this study above, in future research, using different scales to assess exogenous instrumentality, intrinsic/extrinsic motivational orientation may be proper to have valid data from participants. Therefore, for future research, using other established scales

that have good reliability and validity support such as Patterns of Adaptive Learning Scales (PALS); Midgley, Maehr, Hruda, Anderman, Anderman, Freeman, & Urdan, 2000) may provide more accurate results.

Research on influences of pre-service teachers' personal backgrounds (e.g., students' future goals to become teachers, students' prior experiences) and course contexts (e.g., teacher effects, peer effects) on their learning may help provide understanding of how these variables impact students' motivation and learning within the teacher education context. Students' motivation to learn is influenced by their emotions, prior knowledge and experiences, and their motivation to learn determines the level of effort for learning (Shell et al., 2010). Therefore, in future research, studying various pre-service teachers' personal variables along with contextual variables that promote or hinder their knowledge integration may provide valuable information to improve the quality of teacher education. In addition, research on students' motivations and perceptions of instrumentality within teacher education courses can be extended to future research regarding the development of curricula of teacher education courses in order to increase students' interest, perceptions of relevance and knowledge integration.

Research on education courses within different professional preparation programs (e.g., medical school, nursing school) may be good places to conduct research to understand relationships among students' perceptions of future goals and their ratings of motivational and cognitive variables. Students in these professional preparation programs may enter the specific program with strong future goals (e.g., to be a doctor, to be a nurse), therefore, perhaps, future research within other professional preparation programs may provide evidence to support this study.

Research on specific and practical intervention implementations to promote pre-service teachers' motivation and cognition for effective learning is needed before various interventions are fully implemented into real teacher education courses. Therefore, future research on ways that practical interventions in teacher education courses influence pre-service teachers' motivation and cognition for learning is needed.

Finally, research regarding the influences of motivational and cognitive variables used in this study (e.g., endogenous instrumentality, extensive knowledge integration) on learning outcomes (e.g., teacher certification exam, course final grade) is needed to investigate how these variables are associated with outcomes of students' learning. If significant relationships between motivational/cognitive variables and learning outcomes are found in future research, it would support the findings of this dissertation and provide additional evidence to understand the important roles these motivational/cognitive variables have for actual pre-service teachers' learning.

Implications for Practice

To become effective teachers in the future, pre-service teachers need to be well-prepared during their teacher education. Well-prepared pre-service teachers can adapt easily to the teaching profession (Darling-Hammond, 2000); in school contexts, well-prepared teachers are essential to promote students' learning (Bransford, 2000). Attending university-based teacher education programs is considered the general way to become a teacher; therefore, improvement of the quality of teacher education programs may directly influence the quality of teachers.

Students' goals have been considered as a basic cognitive motivator of learning, and goals having higher value are associated with higher motivation to learn and greater efforts on learning (Shell et al., 2010). When students' current academic tasks are related to their future

goals (long-term goals), they tend to have higher levels of motivation and academic performance (Husman & Hilpert, 2007). Tabachnick et al. (2008) suggested that students' lack of perceived instrumentality of school tasks (e.g., don't understand why they need to complete assignments or think assignments are useless) may lead to larger problems (e.g., not completing required courses for school graduation).

According to Keller (2010), establishing *relevance* within classroom contexts (such as endogenous instrumentality) is necessary to promote students' learning. For example, asking students why they are taking the class and providing examples of ways the course fits their reasons for taking it can stimulate students' motivation to learn and their intentions to complete academic tasks (Keller, 2010). Other specific strategies to establish relevance within classroom contexts, suggested by Keller (2010), are providing class materials and assignments that include statements or examples describing how course knowledge is related to future achievement or describing what students will be able to do after acquiring course knowledge. In line with Keller (2010)'s suggestions, results of this study also suggest that students' perceived instrumentality of teacher education courses may be used as a motivator to establish relevance for effective learning.

In this study, pre-service teachers' perceptions of future goals were considered to be a motivator of effective learning. Because "goals drive processing" (Shell et al., 2010, p. 69), studying the influences of pre-service teachers' perceptions of future goals on their motivation and cognition for learning may provide essential information about pre-service teachers' learning processes within required courses for teacher education. Having a concern for students' perceived instrumentality, and creating effective learning environments to facilitate their learning

motivation and use of self-regulation strategies, may be important for pre-service teachers to be prepared fully for their future teaching profession.

Although students who want to become teachers should take required courses in teacher education programs, instructors for teacher education courses should consider their students' interests toward the courses and their intrinsic motivation for learning. According to Keller (2008), to stimulate and sustain students' motivation to learn, supporting their initial curiosity toward course content and providing relevance of the course content should be promoted with appropriate instruction so that their motivation to learn can have instrumental value for achieving their goals. He suggested that, "motivation to learn is promoted when the knowledge to be learned is perceived to be meaningfully related to a learner's goals" (p. 177). Additionally, Tabachnick et al. (2008) suggested that "goal-based intervention" (p. 639) can help students who don't have future goals to set future goals which can then foster their motivation and learning. As findings of this dissertation suggests, instructional designs to encourage students' goal-setting may promote their learning motivation and self-regulation, which may be a key to promoting effectively students' deep learning.

Because one's deep and extensive knowledge within a specific area is a characteristic of experts (Bransford, 2000), instructions that encourage pre-service teachers to use deep learning strategies and extensive knowledge integration strategies may be key to developing their expertise during teacher education. If pre-service teachers are given effective instructions that stimulate their interests and motivation toward course content and instructions to encourage their use of various self-regulation strategies, perhaps, they would use their experiences as learners to better facilitate their students' learning in their future teaching endeavors.

In conclusion, improving the quality of teacher education may influence ultimately students' learning, therefore, researching pre-service teachers and teacher education is needed to continue. Results of this study may contribute to making valuable and specific ideas to create effective learning environments for pre-service teachers' successful learning in teacher education courses. Additionally, understanding pre-service teachers' motivation and cognition for learning may be fundamental resources to improve teacher education.

APPENDIX A

DEMOGRAPHIC INFORMATION SURVEY

1. What is your gender?
   Female □ Male □

2. What is your primary racial or ethnic identity?
   African American □ White □ Hispanic □

   Native American □ Asian □ Other □ (please specify) _____

3. In what program of study are you currently enrolled? (e. g., English Education, Mathematics Education, etc.)

   _____

4. Currently, my school-level is :
   □ Freshman □ Sophomore

   □ Junior □ Senior

   □ Other (please specify) : _____

5. Do you intend to teach after your graduation? (please check only one answer):
   □ Yes, I am definitely interested in obtaining a teaching position after graduation

   □ I plan on pursuing a job within the field of education, but not teaching (for example, being in administration, pursuing a graduate degree in education, conducting research in education)

   □ I plan on pursuing a job as a teacher for a short while, then pursuing a job within the field of education, but not teaching (for example, being in administration, pursuing a graduate degree in education, conducting research in education)

   □ I'm not currently interested in teaching at this time, but am pursuing a teaching credential as a "back-up plan;" I may need to teach in the future.

   □ Other (please specify) _____

6. Do you intend to seek teacher certification in Florida?

   Yes □ No □

   Undecided □ N/A □

7. Is teaching a lifetime career for you?
   Yes □ No □

8. If you chose "No" in Item 7, how many years do you plan to serve as a teacher? (please check only one answer):
   □ 0 year □ 3-5 years □ 6-10 years

   □ 1-2 years □ more than 10 years

9. In how many teacher education classes are you currently enrolled?

   _____

10. How many teacher education classes have you completed in the past?

    _____

11. For which teacher education course are you taking this survey?

    _____

12. Is this course a required course for you?

    Yes □ No □

APPENDIX B

ENDOGENOUS/EXOGENOUS INSTRUMENTALITY SCALE

This measure concerns your feelings or beliefs about the relationship between this education course and your future goals. Please indicate the extent to which each statement below is true for you using the scale below:

1 = Not at All True For Me
2 = A Little Bit True For Me
3 = Somewhat True For Me
4 = Very True For Me
5 = Extremely True For Me

	Not at All True	A Little True	Somewhat True	Very True	Extremely True
1. I will use the information I learn in this education course in other classes I will take in the future.	1	2	3	4	5
2. The grade I get in this education course will not affect my ability to continue on with my education.	1	2	3	4	5
3. What I learn in this education course will be important for my future occupational success.	1	2	3	4	5
4. I will **NOT** use what I learn in this education course.	1	2	3	4	5
5. I must pass this education course in order to reach my academic goals.	1	2	3	4	5
6. I will use the information I learn in this education course in the future.	1	2	3	4	5
7. The grade I get in this education course will **NOT** be important for my future academic success.	1	2	3	4	5
8. The grade I get in this education course will affect my future.	1	2	3	4	5

APPENDIX C

INTRINSIC/EXTRINSIC MOTIVATIONAL GOAL ORIENTATION SCALE

Please indicate the extent to which each statement below is true for you about your feeling for this education course. Please rate your level of agreement for each item, using the scale below:

1 = Not at All True For Me
2 = A Little Bit True For Me
3 = Somewhat True For Me
4 = Very True For Me
5 = Extremely True For Me

	Not at All True	**A Little True**	**Somewhat True**	**Very True**	**Extremely True**
1. I prefer course material that arouses my curiosity, even if it is difficult to learn.	1	2	3	4	*5*
2. In this class, I prefer course material that really challenges me, so I can learn new thing.	1	2	3	4	*5*
3. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.	1	2	3	4	*5*
4. If I can, I want to get better grades in this class than most of the other students.	1	2	3	4	*5*
5. Getting a good grade in this class is the most satisfying thing for me right now.	1	2	3	4	*5*
6. The most satisfying thing for me in this class is trying to understand the content as thoroughly as possible.	1	2	3	4	*5*
7. The most important thing for right now is improving my overall grade point average, so my main concern in this class is getting a good grade.	1	2	3	4	*5*
8. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.	1	2	3	4	*5*

APPENDIX D

METACOGNITIVE LEARNING STRATEGY SCALE

Please indicate the extent to which each statement below is true for you about your learning for this education course. Please rate your level of agreement for each item, using the scale below:

1 = Not at All True For Me
2 = A Little Bit True For Me
3 = Somewhat True For Me
4 = Very True For Me
5 = Extremely True For Me

	Not at All True	A Little True	Somewhat True	Very True	Extremely True
1. During class time I often miss important points because I'm thinking of other things (Reversed).	1	2	3	4	5
2. When reading for this course, I make up questions to help focus my reading.	1	2	3	4	5
3. When I become confused about something I'm reading for this class, I go back and try to figure it out.	1	2	3	4	5
4. If course materials are difficult to understand, I change the way I read the material.	1	2	3	4	5
5. Before I study new course material thoroughly, I often skim it to see how it is organized.	1	2	3	4	5
6. I ask myself questions to make sure I understand the material I have been studying in this class.	1	2	3	4	5
7. I try to change the way I study in order to fit the course requirements and instructor's teaching style.	1	2	3	4	5
8. I often find that I have been reading for class but don't know what it was all about (Reversed).	1	2	3	4	5
9. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying.	1	2	3	4	5
10. When studying for this class, I try to determine which concepts I don't understand well.	1	2	3	4	5

11. When I study for this class, I set goals for myself in order to direct my activities in each study period.	1	2	3	4	5
12. If I get confused taking notes in class, I make sure I sort it out afterwards.	1	2	3	4	5

APPENDIX E

COGNITIVE LEARNING STRATEGY SCALE

Please indicate the extent to which each statement below is true for you about your learning for this education course. Please rate your level of agreement for each item, using the scale below:

1 = Not at All True For Me
2 = A Little Bit True For Me
3 = Somewhat True For Me
4 = Very True For Me
5 = Extremely True For Me

	Not at All True	A Little True	Somewhat True	Very True	Extremely True
1. When I study for this class, I practice saying the material to myself over and over.	1	2	3	4	5
2. When studying for this class, I read my class notes and the course readings over and over again.	1	2	3	4	5
3. I memorize key words to remind me of important concepts in this class.	1	2	3	4	5
4. I make lists of important terms for this course and memorize the lists.	1	2	3	4	5
5. When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions.	1	2	3	4	5
6. When reading for this class, I try to relate the material to what I already know from the class.	1	2	3	4	5
7. When I study for this course, I write brief summaries of the main ideas from the readings and the concepts from lectures.	1	2	3	4	5
8. I try to understand the material in this class by making connections between the readings and the concepts from the lectures.	1	2	3	4	5
9. I often find myself questioning things I hear or read in this course to decide if I find them convincing.	1	2	3	4	5

10. When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.	1	2	3	4	5
11. I treat the course material as a starting point and try to develop my own ideas about it.	1	2	3	4	5
12. I try to play around with ideas of my own related to what I am learning in this course.	1	2	3	4	5
13. Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives.	1	2	3	4	5

APPENDIX F

EXTENSIVE KNOWLEDGE INTEGRATION SCALE

Please indicate the extent to which each statement below is true for you about your learning for this education course. Please rate your level of agreement for each item, using the scale below:

1 = Not at All True For Me
2 = A Little Bit True For Me
3 = Somewhat True For Me
4 = Very True For Me
5 = Extremely True For Me

	Not at All True	A Little True	Somewhat True	Very True	Extremely True
1. As I study the topics in this class, I try to think about how they relate to the topics I am studying in other classes.	1	2	3	4	5
2. Whenever I learn something new in this class, I try to tie it other facts and ideas that I have already learned from other classes.	1	2	3	4	5
3. As I study a topic in this class, I try to consider how the topic relates to other things I learn from other classes.	1	2	3	4	5
4. As I study the topics in other classes, I try to think about how they are relate to the topics I am studying in this class.	1	2	3	4	5

APPENDIX G

IRB APPROVAL LETTER

The Florida State University
Office of the Vice President For Research Human Subjects Committee Tallahassee,
Florida 32306-2742
(850) 644-8673 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 9/21/2011

To: Jumi Lee

Dept.: EDUCATIONAL PSYCHOLOGY AND LEARNING SYSTEMS

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
The Effect of Future Goals on Pre-service Teachers' Motivation and Academic Performance in Required Courses of teacher education.

The application that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and one member of the Human Subjects Committee. Your project is determined to be Expedited per 45 CFR § 46.110(7) and has been approved by an expedited review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 9/18/2012 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is FWA00000168/IRB number IRB00000446.

Cc: Jeannine Turner, Advisor
HSC No. 2011.6876

APPROVAL MEMORANDUM (for change in research protocol)

Date: 10/5/2012

To: Jumi Lee

Dept.: EDUCATIONAL PSYCHOLOGY AND LEARNING SYSTEMS

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research (Approval for Change in Protocol)
Project entitled: The Effect of Future Goals on College Students' Motivation in Required Courses of teacher education.

The form that you submitted to this office in regard to the requested change/amendment to your research protocol for the above-referenced project has been reviewed and approved.

If the project has not been completed by 8/27/2013, you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is FWA00000168/IRB number IRB00000446.

Cc: Jeannine Turner, Advisor
HSC No. 2012.9121

APPENDIX H

INFORMED CONSENT FORM WITH RESEARCH SUBJECT POOL

I freely, voluntarily, and without coercion consent to be a participant in the research project titled *The Effect of Pre-Service Teachers' Future Goals on Their Motivation and Learning in Required Courses for Teacher Education*. This research is being conducted by Jumi Lee, a graduate student in the Department of Educational Psychology and Learning Systems at Florida State University and is under the supervision of Dr. Jeannine Turner. I understand the purpose of this research project is to investigate relationships between pre-service teachers' future goals and motivation in required courses for teacher education. My participation will involve completing surveys at two different times.

I understand my participation in this study is through COE Research subject pool. I will receive course credit for my participation. The benefit of participation is that I may obtain personal insight to my motivation and learning within teacher education courses. However, I may stop participating at any time; I will then need to complete an alternative assignment for my course. Furthermore, I understand that I will not be penalized if I decide *not* to participate in this study nor will I be penalized if I decide to stop participating in this study. I understand that I am able to stop my participation in this project at any time and complete an alternative assignment.

To reduce any risks to me, I understand all responses I give on the surveys will be kept confidential, to the extent allowed by law. Each survey will be identified by my name and email, which will be removed once my two surveys are completed. I understand my responses will be kept in a password-protected computer until SEPTEMBER 31, 2013; at which time the surveys will be destroyed. My name will not appear in the final data set or results. Furthermore, I understand all information obtained from this research will be reported by group-findings and not individually.

If I choose to participate in this study, completing a survey at two different time points will take approximately 30 minutes up to 1 hour respectively and I will receive 2 course-credits.

I am aware that I am able to request and receive a copy of the group results that are found in this project.

If I have any questions about my rights as a participant in this project or if I feel that I have been placed at risk due to my participation, I may contact the chair of the Human Subjects Committee, Institutional Review Board, through the Florida State University Office of the Vice President for Research at (850) 644-9694 or e-mail kemper@research.fsu.edu

I have read and understand this consent form.

_____ _____

Participant Name (Please Print) FSU email address

_____ _____

Participant Signature Date

APPENDIX I

INFORMED CONSENT FORM WITHOUT RESEARCH SUBJECT POOL

I freely, voluntarily, and without coercion consent to be a participant in the research project titled *The Effect of Pre-Service Teachers' Future Goals on Their Motivation and Learning in Required Courses for Teacher Education*. This research is being conducted by Jumi Lee, a graduate student in the Department of Educational Psychology and Learning Systems at Florida State University and is under the supervision of Dr. Jeannine Turner. I understand the purpose of this research project is to investigate relationships between pre-service teachers' future goals and their motivation in required courses for teacher education.

I understand my participation in this project is voluntary and I may stop participating at any time. The benefit of participation is that I may obtain personal insight to my motivation and learning within teacher education courses. My participation will involve completing surveys at two different times. I understand that I am not required to participate and may sit quietly while others are completing the survey packet.

I understand that I am able to stop my participation in this project at any time. Furthermore, I understand that I will not be penalized if I decide *not* to participate in this study or I will not be penalized if I decide to stop participating in this study.

To reduce any risks to me, I understand that all responses I give on the surveys will be kept confidential, to the extent allowed by law. Each survey will be identified by my name and email, which will be removed once my two surveys are completed. I understand my responses will be kept in a password-protected computer until SEPTEMBER 31, 2013; at which time the surveys will be destroyed. My name will not appear in the final data set or results. Furthermore, I understand all information obtained from this research will be reported by group-findings and not individually.

If I choose to participate in this study, completing a survey at two different time points will take approximately 30 minutes up to 1 hour respectively.

I understand that I will have an opportunity to win a gift card in a raffle if I participate in this research. If I complete both surveys, my name will be entered into the raffle twice.

I am aware that I am able to request and receive a copy of the group results that are found in this project.

If I have any questions about my rights as a participant in this project or if I feel that I have been placed at risk due to my participation, I may contact the chair of the Human Subjects Committee, Institutional Review Board, through the Florida State University Office of the Vice President for Research at (850) 644-9694 or e-mail kemper@research.fsu.edu

I have read and understand this consent form.

_____	_____
Participant Name (Please Print)	Email address
_____	_____
Participant Signature	Date

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BIOGRAPHICAL SKETCH

I, Jumi Lee, the daughter of Jae-Ho Lee and Gil-Soon Kim, was born on January 24, 1974, in Daegu, South Korea. I graduated from Keimyung University at Daegu, South Korea with a Bachelor of Arts in Education in 1996. In 1997, I entered Kyungpook National University at Daegu in South Korea to pursue my Master degree in educational psychology. I received my Master degree in Educational and Counseling Psychology in 2000 and then worked as a family counselor at Family Court of Daegu District, Daegu, South Korea for 3 years, followed by working as a manager of education for adult women at Chung-cheong-buk-do Provincial Government, Cheong-Ju, South Korea for 2 years. After working as a public official for five years, I moved to Tallahassee, Florida to pursue a doctoral degree in Educational Psychology at the Florida State University. During my pursuit of my doctoral degree, I worked as a teaching assistant for several graduate/undergraduate courses and taught an undergraduate course for 2 years. Currently, I am employed by the Florida Center for Reading Research for data management. In the future, I plan to pursue an academic position at a Korean University, where I will continue my research. I also plan to take care of my old, decrepit major professor when the time comes.