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THE ROLE OF GOALS, BELIEFS, AND COGNITIVE ENGAGEMENT IN THE PREDICTION OF PRESERVICE TEACHERS' KNOWLEDGE INTEGRATION

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THE ROLE OF GOALS, BELIEFS, AND COGNITIVE ENGAGEMENT IN THE PREDICTION OF PRESERVICE TEACHERS' KNOWLEDGE INTEGRATION

A Dissertation APPROVED FOR THE
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Dedication

I would like to dedicate this dissertation to the memory of my beloved father who would have been very proud to see one of his children achieve this goal. I entered this program one-year after his death to pay tribute to his life. By God's Grace, my father's spiritual blessing, and with the help of so many people, I have finished this task successfully.

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Abstract

The purpose of this study was to examine the role of achievement goals (learning goal, performance goal, and future goal), epistemological beliefs (authority, certain knowledge, innate ability, simple knowledge, and quick learning), and meaningful cognitive engagement (deep processing and self-regulation) and shallow cognitive engagement in the prediction of knowledge integration. One hundred and one preservice teachers participated in the study and completed an 84-item survey that contained statements on achievement goals, cognitive strategies and epistemological beliefs. A part of a course unit exam and an application paper were scored to obtain two measures of knowledge integration. Regression analyses revealed that both goals and beliefs played an important role in the prediction of cognitive engagement. Learning goals, authority belief and certain knowledge belief were the best predictors for meaningful cognitive engagement. Performance goals, simple knowledge and certain knowledge beliefs were the best predictors for shallow cognitive engagement. Shallow cognitive engagement was the best predictor for the knowledge integration exam measure, with a negative relationship. None of the independent variables came as predictors for the knowledge integration paper measure. Limitations of the study and implications for future research and for practice were discussed.

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CHAPTER I

Learning is more than just acquiring information. It is applying the knowledge gained in future problem solving situations. A student who wants to be a surgeon is learning human anatomy in order to apply that knowledge in her future medical practice. Though she may be taking anatomy one semester and physiology the next semester, she will need to integrate both sources of information before she practices surgery. Similarly, a preservice teacher will need to integrate her knowledge about the different aspects of teaching before she starts teaching in a classroom. Students entering the fields of medicine or education have to integrate not only the information from different courses, but also their new knowledge with their prior knowledge. Hence, successful learning involves not only acquiring information, but also developing that information into complex knowledge structures that can be utilized in future situations.

When students encounter new information, they can process the information as an isolated fact or integrate it with their existing knowledge. Sometimes they may encounter information about the same concept from different sources and they may process and store that information as isolated units, or try to integrate the information into a more complex structure. The process of incorporating related facts into complex structures is referred to as knowledge integration. Knowledge integration enables learners to draw upon their whole knowledge structure in a new learning situation (Walker & Meyer, 1980). Successful knowledge integration not only helps students build a complex and cohesive knowledge structure, but also equips them with the ability to utilize that knowledge in appropriate situations.

Preservice teachers learn about their specific subject content in one set of courses, about human development in another course, and about learning and motivation in a third course. When planning their instruction, they have to draw upon their knowledge in all three areas. Even in the same course, they may learn about different aspects of teaching and learning. If they have not integrated that information, then their success in future classrooms as practitioners will be limited. That is not only detrimental to their professional growth, but also to their future students' learning. The present study was designed to examine cognitive engagement, goals, and beliefs as factors that may influence the knowledge integration process in preservice teachers.

Theoretical Rationale

Cognitive Engagement. Building a complex knowledge structure or integrating knowledge is likely to be influenced by different factors such as goals (Dweck, 1986), epistemological beliefs (Schommer, 1990), and cognitive engagement. Cognitive engagement refers to the processing strategies that students employ when learning new concepts and the techniques they employ to monitor their own cognition. Two students, receiving the same information in a classroom, may learn the information differently because of the difference in their way of processing. For example, one student may use elaboration and organization in order to comprehend and encode the information whereas another student may process the information by merely memorizing the information without trying to comprehend or connect that information with her existing knowledge.

Craik and Lockhart (1972) called these two ways of processing shallow and deep levels. They stated that deep level processing was associated with more elaborate processing that enables learners to store and retrieve the information effectively. On the other hand, when students employ shallow processing the information may be encoded superficially and may not be available for later retrieval. For successful knowledge integration, effective or deep processing is a necessary step during the learning process. If students do not employ deep processing, then there is less elaboration and organization. When engaging in a learning task at only a surface level, students are likely not to connect the old and new information to form a complex knowledge structure.

In addition to processing strategies, students' ability to monitor their cognitive process also influences learning and the knowledge integration process. Knowing about one's own cognition is called metacognition (Flavell, 1987). Metacognition, also referred to as "Knowing about Knowing" by Garner and Alexander (1989), has two aspects: (a) knowledge about cognition and (b) the regulation of cognition (Abromitis, 1994). The knowledge about cognition is an individuals' awareness of her own cognitive resources and the regulation of cognition is the action part of metacognition activity (Schmitt, 1986).

In order to integrate new information into their knowledge structure, learners need to employ both cognitive and metacognitive activities. They have to activate their existing knowledge and connect the new information to the existing knowledge structure. If they are aware of their cognitive resources, then they will be able to apply them to the given task of comprehending the new information and connecting it with the old information.

Although cognition and metacognition are two separate factors related to learning, they are interrelated. By employing her metacogitive knowledge, an individual enriches her cognitive development by building on her existing schemata.

The role of existing schemata. Long before formal instruction begins students encounter many new situations and interact with different people and places. Based on these encounters, they come to the classrooms with their own beliefs and knowledge about different concepts. Those beliefs and knowledge are thought to be organized in their minds as schemata (Alexander, Schallert, & Hare, 1991; Anderson, 1990). Schemata are the mental structures that individuals construct in their memory about different concepts. An individual's schema about a concept is based on his or her own experiences with the environment. For example, people residing in cities may have a building schema that includes skyscrapers and big shopping malls, whereas people living in rural areas will have a different building schema.

Similarly, a farmer will have a farming schema, which will be different from the city dwelling individual's farming schema. A child's schema about a car will be different from a mechanic's or physicist's schema of a car. An individual's schemata form the basis for new learning and play a significant role in learning. If the new information supports their own beliefs and knowledge, then the learners will not have much trouble in integrating the new information with the old. In other words, assimilation of knowledge will occur. The new information can be easily encoded and connected to the existing schema.

Research indicates that learners recall new information easily if that information was related to an existing schema (Backman, 1991; Recht & Leslie, 1988; Spilich, Vesonder, Chiesi, & Voss, 1979). On the other hand, if the new information does not fit with their existing knowledge, then learners may reject the new information or embrace it by abandoning their previous schema. Yet another response is to alter the existing schema to a small degree to include the new information, or to reorganize their schema to a greater degree based on the new information. In modifying the existing schemata, they may be engaging in any one of these processes.

Individuals may go through this knowledge organization process without being aware of it, or it may be a conscious process. Rumelhart and Norman (1978) described these processes as tuning and restructuring of schemata. In tuning, the new information is assimilated into the existing knowledge with a minimal degree of change in the existing knowledge structure. In restructuring, the existing knowledge is radically altered to build a new knowledge structure. Successful tuning or restructuring is essential for building complex knowledge structures.

<u>The role of beliefs</u>. Though any student entering a new learning situation will have his or her own beliefs and preconceptions about that situation, and will have to go through a process of knowledge integration, preservice teachers'

challenge for knowledge integration is more evident. They have been students for more than a decade and, based on their experiences, they will have well-developed schemata about learning and teaching. Those schemata will serve as tools in evaluating the new information. Some of those schemata may be based on their knowledge about teaching and learning and some may be based on their beliefs about the nature of knowledge itself.

According to Schommer (1994), beliefs about the nature of knowledge, or epistemological beliefs, are relatively independent beliefs that individuals have about knowledge and the acquisition of knowledge. Schommer (1994) proposed that there were five dimensions of beliefs having a range of possible values. Schommer (1994) termed them as follows: (a) *certainty of knowledge* is the belief that knowledge is absolute versus knowledge is tentative; (b) *structure of knowledge* is the belief that knowledge is organized as isolated bits and pieces versus knowledge is organized as interconnected concepts; (c) *source of knowledge* is the belief that knowledge is handed down by authority versus knowledge is derived from reason; (d) *control of knowledge* acquisition is the belief that the ability to learn is fixed at birth versus the ability to learn can be changed; and (e) *speed of knowledge* acquisition is the belief that knowledge is acquired quickly or not at all versus knowledge is acquired gradually. Schommer (1994) viewed these five beliefs as frequency distributions of each dimension rather than a single point in each dimension.

Both beliefs and knowledge influence students' learning. Though beliefs and knowledge are often intertwined, beliefs are different from knowledge in that beliefs are not universal but rather more personal in nature. Since they are personal and individualistic, they do not have an evaluation standard, while one's knowledge can be measured against a standard criterion.

Preservice teachers' beliefs influence not only their learning but also their teaching (Hollingsworth, 1989; Holt-Reynolds, 1992; Hughes, 1994; Pajares & Miller, 1994; Roth & Roychoudhury, 1994; Schommer, 1994). If they believe that knowledge consists of many isolated units, then they will not try to integrate the new information with their existing knowledge structure, but instead, store the new information as an isolated unit in their memory without being aware of it. They may do this without being aware of their belief system. Though it may serve them well during a given semester, they may not be able to utilize that knowledge in later situations.

Studies that examined the role of existing knowledge in learning have shown a positive relationship between that existing knowledge and achievement (Brophy &Van Sledright, 1995; Henk, Stahl, & Melnick, 1993; Hollingsworth, 1989; Lawson, 1983; Marshall, 1989; Nussabaum & Novick, 1982; Pace, Marshall, Horowitz, Lipson, & Lucido, 1989; Pajares, 1992). Similarly, studies that examined the influence of beliefs on learning showed a relationship, though not necessarily positive, between beliefs and achievement (Lawson, 1983; Schommer, 1990). So the results of these studies provided evidence that existing knowledge and beliefs influence students' learning. Since learning new information is the basis for knowledge integration, which is the incorporation of different units of information into a complex structure, the factors which influence learning should play a role in knowledge integration. Knowledge Integration is conceptualized here as the incorporation of different sources of information and prior knowledge into a complex structure.

The role of goals. In addition to existing knowledge and beliefs, motivation also plays a role in learning (Bandura, 1986; Greene & Miller, 1996; Miller et al., 1996; Pajares & Kranzler, 1993; Pintrich & De Groot, 1990; Pintrich & Garcia, 1991). Individuals who are highly motivated toward learning and achievement tend to choose challenging tasks and are willing to put forth effort in completing these tasks (Dweck, 1986; Pintrich & De Groot, 1990). Motivated learners are willing to try different strategies when they experience unsuccessful results (Bandura, 1986). Different motivational theories explain the different aspects of motivation and their role in learning.

One of these theories is goal theory, which states that students' goals influence their task selection and engagement (Dweck, 1986; Greene & Miller, 1996; Miller et al., 1996). Goals are the purposes or reasons that learners give for engaging in a learning task. Earlier goal theories proposed two different goal orientations which influenced students' learning and achievement (Dweck, 1986; Nicholls, 1984). When students approach learning tasks with high learning/task goal orientation they are focused on developing or improving their skill and knowledge. They are willing to try new tasks and willing to stay on the task even when faced with difficulties.

On the other hand, when students approach learning tasks with high performance/ego goal orientation, they are focused on proving their competence to both themselves and others (Ames & Archer, 1988). When students with high performance goals orientations encounter problems in finishing the task, they become frustrated and are ready to quit. Moreover, since the focus of learning is on showing competence, these students choose tasks in which they are certain of success (Meese, Blumenfeld, & Hoyle, 1988).

Recent research on goals indicates the presence of future goals and social goals along with learning and performance goals (Miller et al., 1996; Urdan & Maehr, 1995; Wentzel, 1981). Both theoretical and empirical evidence indicates that learning and future goals are positively related to achievement (Miller et al., 1996; Greene, De Backer, Ravindran & Krows, 1999). Future goals refer to when the reasons students state for doing a task or taking a course are related to something valued in the future. A high school student may take advanced mathematics classes in order to pursue a degree in Mathematics or Engineering in college. Another one may be taking advanced mathematics classes in order to do well on scholastic aptitude tests and seek admission in a particular university. Similarly, one student may take Latin in order to later learn medical terminology or to pursue a degree in Linguistics.

There are many empirical studies that examined the influence of goals on achievement and learning (Ames & Archer, 1988; Greene et al., (1999); Meese, Blumenfeld, & Hoyle, 1988; Miller et al., 1993; Greene & Miller, 1996; Miller et al., 1996; Pintrich & De Groot, 1990; Wentzel, 1981; Zimmerman & Martinez-Pons, 1990). However, there are very few studies that specifically examined the role of goals and beliefs in learning and knowledge integration (Qian, 1995;

Strike & Posner, 1992). Hence the need for studies examining the combined influence of goals and beliefs in learning and knowledge integration is evident (Pintrich, Marx, & Boyle, 1993; Hofer & Pintrich, 1997).

Summary of theoretical elements. Integrating different knowledge structures into a complex and cohesive knowledge structure is an important step in higher order learning. Knowledge integration helps learners store a vast amount of information into their memory effectively. It also enables learners to draw upon their existing knowledge efficiently to solve a new problem. Hence, knowing more about knowledge integration processes would help teachers and designers of instruction. In order to know more about the knowledge integration process, we must first know what factors influence that process. One such factor, supported by research was cognitive engagement, which was important for learning (Greene & Miller, 1996; Miller et al., 1996; Pintrich & Garcia, 1991).

Similarly, research on beliefs indicates that the learners' beliefs influence their learning (Schommer, 1990). In the same way, research on motivation yields empirical evidence to support the assumption that motivation, especially goals, plays an important role in successful learning (Miller et al., 1996; 1996; Pintrich, & De Groot, 1990). But there are very few studies examining the combined influence of these three factors (cognitive engagement, goals and beliefs) in learning (Qian, 1995: Strike & Posner,1992). Although knowledge integration is an important step in higher level learning, information about the factors that influence knowledge integration is limited. Therefore, the present study was designed to examine the role of beliefs, goals and cognitive engagement in the knowledge integration process of preservice teachers.

Organization of the Dissertation

In the remainder of this chapter I will review the literature that informed the present investigation about different factors that play a role in knowledge integration. A review of the literature indicated that knowledge integration had been examined in text comprehension studies and in studies that examined the transfer of knowledge. Hence, the studies that examined the processes of text comprehension and transfer of knowledge will be reviewed first. Knowledge integration is influenced by the way students process information. Since students' ability to comprehend and integrate is facilitated by employing deep processing techniques (Potts, 1977) and metacognitive strategies, relevant literature on processing techniques and metacognition will be reviewed next. Learners' cognitive and metacognitive processing is influenced by their achievement goals, therefore, literature on goals and its influence on cognitive and metacognitive engagement will be reviewed in the following section.

Since beliefs influence students' cognition and metacognition, literature on epistemological beliefs will be reviewed to illustrate the influence of beliefs on learning. At the end of this chapter, I present an overview of the present study.

The methodology and design of the study will be described in the second chapter. The results are presented in the third chapter. A discussion of the results and my conclusions are presented in the fourth and final chapter.

Review of Literature

Text comprehension and Knowledge Integration

Knowledge integration had been the focus of research in text comprehension for many years (Potts, 1977; Walker & Meyer, 1980; Yekovich, Walker, & Blackman, 1979). Research has shown that when reading a text, individuals try to process the information by integrating the new information with their existing knowledge. If they are familiar with the content of the text, then they are able to connect the new information with their prior knowledge.

Recht and Leslie (1988) investigated students' text comprehension using prior knowledge and reading ability as two factors that could influence comprehension processes. Sixty-four junior high students were divided into four groups based on their reading ability (high/low) and their level of prior knowledge of baseball (high/low). The participants were asked to read an account of a baseball game and later were asked to recall the text by moving toy figures while retelling the story. After they were asked about their school activities (interpolated task) for some time, the students summarized the game and sorted passage sentences for important ideas. The students who had prior knowledge about baseball games scored higher in the given tasks than the students with low prior knowledge. High reading ability did not increase memory for the text if the students had low prior knowledge, but familiarity of the content was found to enhance comprehension of the text.

While the study conducted by Recht and Leslie (1988) indicated that content familiarity of the text enhanced the comprehension and memory of the text passage for the subjects, other researchers reported that the degree of accuracy of the existing knowledge influence text comprehension (Brophy & Van Sledright, 1995; Trumper & Gorsky, 1993). Brophy and Van Sledright (1995) conducted a study with fifth-grade students interviewing them before and after instruction in social studies. Before each unit, ten fifth grade students were interviewed by the researcher to find out the students' preconceptions about the unit. After they had their classroom instruction on that particular unit, the students were again interviewed to find out the extent of the students' conceptual knowledge on that unit.

Brophy and Van Sledright (1995) stated that some students came to class with preconceptions about a concept and the amount and accuracy of those preconceptions that the students had varied among students. Results of this study indicated that the students who had accurate prior information learned more key ideas from instruction and had higher achievement scores than the students who had inaccurate information about history. In other words, the accuracy of the information played a role in their comprehension.

In a similar study, Trumper and Gorsky (1993) examined the relationship between students' prior conceptions about energy and the students' factual knowledge after instruction. Participants were high school students in the ninth, tenth, and eleventh grades. This study was done in two parts. In the first part of the study, Trumper and Gorsky (1993) examined the relationship between students' alternative frameworks on energy and their cognitive levels (preformal or formal). A pretest was given asking the students to write three associations with the word energy and then choose an appropriate definition of energy from five given alternatives. Students were also asked to choose three out of eight pictures relating to energy and explain their reasons for choosing those three pictures.

Students' cognitive levels were measured by observing their performances on twelve tasks requiring formal reasoning. Based on their cognitive task data, they divided the students into levels of formal reasoning and preformal reasoning. Trumper and Gorsky (1993) also stated that students' definition of energy indicated their conception of energy either as anthropocentric, cause, or product. Their results indicated that students at both the preformal operational level and the formal operational level held alternative frameworks different from the physicists' view about energy before their physics instruction.

In the second part of their study, Trumper and Gorsky (1993) investigated the relationship between students' success or failure in learning about energy, their alternative frameworks, their cognitive levels of operations, and their tendency toward open- or closed- mindedness. They selected another sample of 29 students for the second part of the study. Students' preconceptions about energy and their cognitive operational levels were measured as described in the first part of the study.

Students' tendencies toward open- or closed-mindedness were measured by their responses to a questionnaire consisting of twenty items, which asked them to indicate the rate of their agreement to given statements. High positive scores indicated extreme closed-mindedness. Students' success or failure in learning the energy concept was measured by a delayed posttest, which consisted of twelve questions about the energy concept. Students were asked to point out the different forms of energy involved and to describe the processes using the scientific terms they learned during their instruction. Trumper and Gorsky (1993) reported a significant positive relationship between students' prior conceptions and their success in learning about energy.

The studies reviewed above (Brophy & Van Sledright, 1995; Recht & Leslie, 1988; Trumper & Gorsky,1993) examined the comprehension process in learning and indicated that if students were familiar with the content, then they could comprehend and encode the new information. They were able to recall the information effectively. For example, Recht and Leslie (1988) tested the text memory of baseball. Their recall test required the subjects to use their prior knowledge and text information in order to answer the items. Similarly, Brophy and Van Sledright (1995) and Trumper and Gorsky (1993) also reported that students with high and accurate prior knowledge were able to comprehend and encode the new information effectively. Potts (1977) examined similar knowledge integration processes in college students.

Potts (1977) conducted several experiments to examine the integration process by varying the condition of the experiments. In his first experiment, students read statements containing some factual and some fictional information about animals and later were asked to recall the information. The recall test measured the participants' ability to recall the given information and also their ability to incorporate the information they encountered during the experiment with their prior knowledge about the content. Potts (1977) found out that the participants were able to recall the experimental text information successfully, but the integration was not very successful. In his next experiment, the experimental text was introduced as text written as a paragraph and Potts (1977) measured the ability to recall both the text and existing prior knowledge. Potts (1977) found out that meaningful text facilitated the integration of the given information with students' existing knowledge.

In his third experiment, Potts (1977) told the participants that they needed to apply their prior knowledge along with the given information during the test. The results of that experiment indicated that experimenter's instruction facilitated the activation of existing knowledge and integration was also successful. The fourth experiment replicated the results of the third experiment. Potts (1977) concluded that activation of existing knowledge was a necessary step in the knowledge integration process.

The studies reviewed above illustrated that having and activating relevant prior knowledge enhanced the integration process. While researchers in reading education examined the process of knowledge integration as the process of text comprehension (Brophy & Van Sledright, 1995; Potts, 1977; Recht & Leslie, 1988; Trumper & Gorsky, 1993), researchers in the field of educational psychology and technology examined the process of knowledge integration in terms of transfer (Clark & Voogel, 1985).

Transfer and Knowledge Integration. Transfer can be referred to as the ability to apply the knowledge acquired in one situation to a new situation (Clark & Voogel, 1985). It also can be viewed as the integration of theory into practice (Mayer & Wittrock, 1996). Transfer also involves the ability to use declarative knowledge in a procedure (Anderson, 1990). Sometimes the procedure may involve the application of more than one theory or strategy. An individual who wants to fly an airplane learns about the mechanics of the plane and also the different atmospheric conditions that could affect her flying. In order to be a successful pilot, she has to integrate those two pieces of information when she is actually flying the plane.

Similarly, preservice teachers learn different techniques about motivation or classroom management that they could apply in their future classrooms. Research on text comprehension examined the process of integration by measuring learners' ability to integrate different sources of theoretical information (Brophy & Van Sledright, 1995; Potts, 1977; Recht & Leslie, 1988; Trumper & Gorsky, 1993), but research on transfer examined the process of integration by measuring the success of transfer rate among learners. Since transfer was considered a strategy learned by students during the learning process, the purpose of research studies on transfer was to find ways to facilitate the transfer process through instruction (Hattie, Biggs, & Purdie, 1996).

One of the aims of education is to teach for transfer of learning (Clark & Voogel, 1985). In order to promote transfer, the learning environment should be similar to the situation where transfer of knowledge would occur. When instructional interventions to teach transfer were designed, instructors realized that there were two kinds of transfer that needed to be addressed. One kind of transfer is applying the knowledge previously learned in a similar situation. Students learn a mathematical formula in the classroom and apply that formula to solve a problem given as homework. This kind of transfer is called low-road transfer. Another kind of transfer, known as high-road transfer, is one in which an individual has to apply the knowledge learned in one situation to a truly novel situation (Salomon & Perkins, 1989). A student taking classes in architecture who has to design and build the structure will be engaging in high-road transfer as well as a first grader learning to do addition and subtraction in the class room who has to go to a store by herself to buy a candy bar. High-road transfer requires the ability to select appropriate strategies from all strategies learned, before the successful application of those strategies.

A meta-analysis on transfer research was done by Hattie et al. (1996) who reported that studies that focused on teaching low-road transfer using imagery and keyword strategies yielded successful outcomes. Studies that used direct training to use formulas, rules, and procedures were also successful. But when trying to facilitate transfer of training where high-road transfer was required, the results were not encouraging. When instructional interventions were designed to facilitate the two kinds of transfer, researchers and educators realized that success of transfer depends upon not only the design of the intervention, but also upon the cognitive and metacognitive strategies used by the learners (Adey & Shayer, 1993; Cunningham & Thorkildson, 1996; McKeachie, 1987; Phye, 1992; Phye & Sanders, 1992).

In his review of studies on transfer, Phye (1992) concluded that studies focused on encoding reported the processing techniques, like elaboration, as the influencing factors in the transfer process and studies focused on the retrieval process reported that metacognitive activities enhanced transfer. When Phye and Sanders (1992) examined the process of transfer in college students, they measured students' ability to access their prior knowledge along with a motivational variable (e.g., self-confidence), and the effect of feedback on a subsequent transfer task. Phye and Sanders (1992) reported that students' motivation (self-confidence) played a role in the success of transfer. Students who indicated higher self-confidence in their prior knowledge level did better at the transfer task than the students who had low confidence in their knowledge. While Phye's (1992) review of research on transfer informed us that elaboration techniques facilitated the encoding process and metacognitive activities facilitated the retrieval of information, Phye and Sanders' (1992) study indicated the influence of one aspect of motivation (self-confidence).

Summary of research implications. From studies on text comprehension described above, we could conclude that in order to integrate different information into a complex knowledge structure, preservice teachers should be able to comprehend the new information, recall the old information, and connect both sets of information in order to demonstrate their knowledge in classroom situations. So, successful knowledge integration is dependent upon the way students' process the information and store that information. If students employ elaboration techniques, then they will have the information available. But the success of that integration can be seen only by the application of the knowledge.

Similarly, studies on transfer indicated that elaboration helped learners to acquire the information. Acquisition of knowledge can be achieved by employing expository instructional strategies. However, Phye (1992) argued, that availability of knowledge was a necessary condition, but not a sufficient condition for successful transfer. Accessibility of the information is facilitated by learners' use of metacognitive strategies. For successful integration and application of knowledge, learners have to use effective cognitive strategies for processing the information and they need to learn and use metacognition for successful learning and application (Potts, 1977; Phye, 1992). Hence, learners' cognitive engagement and metacognition play a role in comprehension, transfer and integration processes. In the next section, the relevant theoretical information and research on cognitive processes and metacognition and their influence on learning, achievement, and integration will be reviewed.

Cognitive Engagement in Learning and Knowledge Integration

Cognitive process or engagement can be conceptualized as the type and degree of mindful participation on the part of the learner. Students who are actively engaging at a task will show enthusiasm not only at the beginning of the task, but until the successful completion of it (Bandura, 1986). They will try to monitor their own progress, reflect upon their strategies, and be willing to learn or modify their techniques in order to successfully complete the task (Schunk, 1996).

They will take responsibility for their own learning (Zimmerman, 1990). Hence cognitive engagement is a complex process that consists of different aspects (e.g. deep and shallow processing strategies, self-regulation and metacognition). Each one of those aspects plays a role in learning and integration and I will summarize the research on those aspects of cognitive engagement and their influences on learning and knowledge integration in the next section.

Deep and Shallow processing strategies. Although prior knowledge plays a role in learning and integration, just having prior knowledge does not always result in knowledge integration (Craik & Lockhart, 1972; Potts, 1977). Successful knowledge integration is dependent upon successful encoding and retrieval of the information. When students apply deep level processing, they connect the old and new information together. But if students employ shallow methods, encoding and retrieval of the information may not be successful because of the superficial engagement with the new information. Potts' (1977) study, described earlier in this chapter, indicated that elaborate cognitive processing, involving the activation of existing knowledge, played a role in the knowledge integration process.

When students' existing knowledge was activated, they were able to elaborate on that old information and were able to organize the new information by connecting it with existing knowledge (Potts, 1977). Similarly, when the new information was meaningful and easily comprehensible, the students were able to integrate the new information with their existing knowledge structure (Potts, 1977). In other words, students were using deep level processing (Craik & Lockhart, 1972) techniques that helped them to integrate the information. But when students processed the information using shallow processing (Craik & Lockhart, 1972), they had trouble integrating the new information with their existing knowledge.

Many researchers have argued that deep processing is an important factor in learning and achievement and there is empirical evidence to support that argument (e.g., Greene & Miller, 1996; Pintrich & De Groot, 1990; Zimmerman and Martinez- Pons, 1990). I have reviewed some of those studies below.

Greene and Miller (1996) examined the influences of cognitive engagement, goals, and perceived ability on students' achievement. One hundred and four undergraduate students enrolled in an educational psychology course participated in this study. The "Motivation and Strategy Use Survey" developed by Greene and Miller (1996) contained 54 items used to measure students' goal orientations, perceived ability, and cognitive engagement. Students' midterm exam scores were used as the achievement variable.

Greene and Miller (1996) asked the students to indicate various strategies they would use when doing homework or studying for exams. Greene and Miller (1996) grouped the strategy items into two groups: meaningful cognitive engagement (e.g., when learning the new material, I summarized it in my own words) and shallow cognitive engagement (e.g., I tried to write down exactly what my instructor said during lectures). Results from a path analysis indicated that meaningful cognitive engagement influenced students' achievement positively while shallow cognitive engagement influenced achievement negatively. The path analysis also revealed that meaningful cognitive engagement was influenced by learning goals and perceived ability and shallow cognitive engagement was influenced by performance goals.

Pintrich and De Groot (1990) also investigated the relationship between learning and cognitive engagement. High school students who participated, reported their use of study strategies and self-regulation activities. Pintrich and De Groot (1990) reported that there was a significant positive relationship between students' cognitive strategies and their achievement. When Zimmerman and Martinez- Pons (1990) examined the relationships among students' goals, self-efficacy, strategy use and achievement in gifted and regular students, they found out that gifted students reported more use of meaningful cognitive strategies than regular students and for both groups, students' use of cognitive strategies and their self-efficacy were good predictors for achievement.

Anderman (1992) examined the effect of personal and school-wide goals on deep processing strategies of three groups: (a) at-risk; (b) not at-risk; and (c) special education students. Based on teachers' ratings, students who were identified as at-risk for academic failure were placed in the at-risk group. Students who took at least one special education course were placed in the special education group. Anderman asked the participants (712 sixth- and seventh- grade students) to fill out a survey containing items which measured students' self-efficacy, cognitive strategy use, personal goal orientation, and perceptions of the goals stressed in the school. Anderman's (1992) data analyses revealed that at-risk students used fewer deep strategy techniques and were less learning focused than the not-at risk and special education students. Not-at-risk students were more learning focused than at-risk and special education students. Not-at-risk students perceived the school environment as more learning focused and less ability focused, but at-risk students perceived school environment as less learning focused and more ability focused. Anderman also found out that learning focused scores were the best predictor of deep strategy use for all three groups of students.

In other words, Anderman's study (1992) yielded similar results to the studies reviewed earlier (Greene & Miller, 1996; Zimmerman & Martinez-Pons, 1990) to support the assumption that learning goals and deep strategy use were positively related to one another. Greene and Miller (1996) reported that shallow processing strategies and performance goals were positively related to one another and shallow processing was negatively related to achievement.

It is also evident that deep processing aids the integration process (Potts, 1977). In addition to the processing strategies, students' self-regulation and metacognition also play a role in successful learning (Greene & Miller, 1996; Pintrich & Garcia, 1991; Zimmerman & Martinez-Pons, 1990). In the next section, I have reviewed the literature on self-regulation and metacognition.

<u>Self-regulation and Metacognition</u>. Self-regulation is comprised of three subprocesses (Bandura, 1986; Schunk, 1989): (a) self-observation; (b) self-judgment; and (c) self-reaction. Employing self-regulation strategies enables the learners not only to monitor their learning progress, but also helps them to learn or apply a new or different strategy when experiencing setbacks. Hence students persist with learning tasks until the successful completion of the task, which positively influences their achievement performance.

Research on learning (Greene & Miller, 1996; Pintrich & Garcia, 1991; Obach & Moely, 1993; Zimmerman & Martinez-Pons, 1990) indicated that successful learning was influenced by different factors (e.g., goals, cognitive strategies) and successful learners tend to apply a wide variety of self-regulatory activities. Zimmerman (1990) stated that self-regulated learners were motivationally and metacognitively active participants in their own learning. They were goal oriented individuals who applied a variety of cognitive strategies to achieve success in learning. Empirical evidence for the positive influence of self-regulation in learning has been found in the research literature (Greene & Miller, 1996; Miller et al., 1996; Pintrich & Garcia, 1991; Zimmerman & Martinez-Pons, 1990) and those findings are summarized below.

When Greene and Miller (1996) examined the relationships among goals, cognitive engagement and achievement, they combined deep processing strategy and self-regulation items into a meaningful cognitive engagement variable and found that there was a positive relationship between the reported use of self-regulatory activities and achievement. Pintrich and Garcia (1991) examined the relationships between self-regulation and other motivational factors among college students. Results indicated that highly motivated students also reported the use of many self-regulatory activities. Zimmerman and Martinez-Pons (1990) reported that gifted students tend to apply a variety of self-regulatory activities and more than the regular students. Miller et al. (1996) reported that self-regulation was positively related to students' achievement.

Based on the theoretical and empirical evidences (Greene & Miller, 1996; Pintrich & Garcia, 1991; Zimmerman, 1990) indicating the positive relationship between self-regulation and achievement in learning, one could hypothesize that self-regulation would play a crucial role in knowledge integration because of its positive influence on learning. But information about the relationship between self-regulation and knowledge integration is very limited in the literature as no study specifically examined the association between self-regulation and knowledge integration.

Self-regulation can also be viewed as being the behavioral component of an individuals' metacognition, which refers to the individual's knowledge about his or her own cognition (Flavell, 1987; Garner & Alexander, 1989). Metacognition consists of two separate aspects. One is the metaknowledge about cognitive processes and task demands; the other is acting upon that knowledge, or metacognitive activity. Having metaknowledge is the declarative part and acting upon it or engaging in a metacognitive activity is the procedural part. When reading, individuals try to understand and comprehend what is being read. In order to understand the text, one can read and reread the text, or read and try to summarize the text. When an individual knows that reading it over or summarizing can help the comprehension process, she knows a cognitive strategy. While reading, if a student stops and evaluates her techniques, comprehension, and the purpose of reading, then she is engaging in metacognitive activity.

When an individual engages in a metacognitve activity, she is paying attention to her own cognitive process, reflecting upon the process and evaluating the process. Then, if necessary, she may modify her cognitive activity. Cognition and metacognition are two separate factors related to learning, but they are interrelated. By employing metacognitive knowledge, an individual enriches his/her cognitive development. An artist looking at her paintings and reflecting on her techniques would be able to paint a vivid and exemplary painting. Similarly, a scientist who repeatedly analyzes her work might come up with a new theory. Though cognition and metacognition are interrelated factors which influence learning, the development of cognition and metacognition occur as different processes. Individuals may have a high degree of knowledge of a concept, yet their metacognitive knowledge may be limited.

Research on learning yields evidence to support the assumption that metacognition plays a supporting role in learning (Adey & Shayer, 1993; Fitzpatrick, 1994). Adey and Shayer (1993) investigated the relationship between metacognition and achievement in a middle school setting. Special instructions called "thinking science lessons" were given to the experimental groups once every two weeks for two years. In this class, students were getting the instruction in science along with metacognitive instruction. After two years, their test performance was compared with that of the control group. Adey and Shayer (1993) reported that students who were in the experimental group scored higher on achievement tests than the control group.

Fitzpatrick (1994) examined the relationship of various factors (mathematics knowledge, metacognition, strategy use, attribution, and gender) to problem solving ability in high school mathematics classrooms. One-hundred seniors participated in the study. The instrument used to measure students' metacognition was adapted from two different questionnaires: (a) Students' metacognitive awareness was measured by items selected from the Metacognitive Awareness Assessment questionnaire; and (b) students' metacognitive regulation was measured by the items selected from the Assessment of Individual Mathematical Metacognition. Students' beliefs about mathematics were measured by items adapted from Inventory of Students' mathematical Beliefs and Behavior and for mathematics knowledge, students' PSAT score was used. Fitzpatrick (1994) hypothesized that gender would play a role in students' mathematics performance, metacognition, and attribution. She also hypothesized that mathematics knowledge and gender would be the best predictors for performance. Results of that study indicated that there was a positive relationship between students' metacognitive ability and achievement scores. Gender was not a significant predictor for performance. Mathematics knowledge played a role in performance, but metacognition was the better predictor for performance. Students who had high knowledge in mathematics indicated using more use of specific strategies for solving the given problems than the students with less knowledge in mathematics. Males with high knowledge in mathematics were more likely than high knowledge females to attribute their success to hard work.

Similar results were reported by Abromitis (1994) when she examined the role of metacognition in reading comprehension of elementary school children. Davis (1996) investigated the role of metacognition in science instruction by prompting students to reflect on their progress using self-monitoring and activity focused techniques. Activity prompts aided the students to remember the important steps in the given task and self-monitoring prompts helped them to plan for and reflect upon those steps. Davis (1996) found that activity focused prompts helped the students to finish the task successfully and self-monitoring strategies encouraged them to plan, reflect on their understanding, and justify their choice of action. Davis (1996) concluded that while activity prompts helped students to complete the task, self-monitoring prompts helped students to develop an integrated understanding of the scientific concepts.

From the studies described in this section, it is evident that students' cognitive engagement and metacognitive strategies play an important role in learning (Abromitis, 1994; Adey & Shayer, 1993; Davis, 1996; Fitzpatrick, 1994; Greene & Miller, 1996; Miller et al., 1996; Pintrich & Garcia, 1991; Schunk, 1989; Zimmerman & Martinez-Pons, 1990). But these two factors, cognitive engagement and metacognition are influenced by students' achievement goals (Cunningham & Thorkildsen, 1996; Greene & Miller, 1996; Miller et al., 1996; Nolen & Haladyna, 1990; Middlebrooks, 1996; Obach & Moely, 1993; Pintrich & De Groot, 1990; Zimmerman & Martinez-Pons, 1990). Because of their influence on cognition and metacognition, goals play a role in learning. In the next section, I will summarize the studies that examined the relationships between achievement goals, cognitive engagement and metacognition and how they were related to learning and integration.

Role of Goals in Learning and Knowledge Integration

As noted earlier, goals refer to an individual's purposes or reasons in engaging in a particular task. Initially, motivation theorists conceptualized goal orientations in terms of two goals (Dweck, 1986; Nicholls, 1984). Learning (Dweck, 1986) or task (Nicholls, 1984) oriented individuals seek to increase their competence whereas performance (Dweck, 1986) or ego (Nicholls, 1984) oriented individuals seek to gain acceptance and confirmation of competency from others. The differences in these two goals cause individuals to approach and apply different strategies in their learning process depending upon their goal orientation.

Cognitive engagement and Goals. Ames and Archer (1988) examined the relationships between goals (mastery and performance) and learning strategies of students who were attending a junior high / high school. One hundred seventy six students were randomly selected from one of their classes to participate in the study. They were asked to respond to a questionnaire containing items to measure their perceptions of classroom goal settings, use of effective learning strategies, perceived ability, task choices, attitudes, and causal attributions. Results indicated that students who perceived classroom settings emphasizing a mastery orientation reported using more effective strategies, selecting a variety of tasks, attributing success to effort, and having a positive attitude toward the class. On the other hand, students who perceived the classroom settings emphasizing performance goals reported failure-avoidance techniques and attributed their failures to lack of ability.

When Greene and Miller (1996) examined the relationships among goals, perceived ability and their influence on cognitive engagement and achievement, they found that learning goals and perceived ability were positively related to one another as well as to meaningful cognitive engagement. Greene and Miller also found that performance goals and shallow processing were positively related to each other. As explained in an earlier section, students' achievement was positively related to meaningful cognitive engagement, but was negatively related to shallow cognitive engagement.

Though theorists originally conceptualized only dual goals (Dweck, 1986) recent research on goal orientations indicates the presence of multiple goals influencing the learning process (Maehr, 1984; Wentzel, 1991). Wentzel (1991) argued that social goals, like pleasing the family or teachers, influence students' academic performances and achievement whereas Maehr (1984) proposed the presence of extrinsic goals, and social goals as factors influencing the learning process. Miller et al. (1996) designed a study to examine the relationship among different goals, perceived ability, cognitive engagement (deep and shallow processing strategies), effort, and persistence, and self-regulation activities. Semester grades were used for the achievement variable.

In their study, in addition to learning goals and performance goals, Miller et al. (1996) measured students' future goals and social goals (pleasing the teacher and pleasing the family). Future goals were defined as distant goals, that are dependent on success with the present learning task. Long-term financial rewards, extra-curricular participation, future jobs, and college admissions are a few of the future consequences which might motivate an individual to engage in the present task (Miller et al., 1996).

Two hundred and ninety-seven high school students enrolled in secondary math courses (Geometry, Algebra II, Trigonometry, and Calculus) volunteered to participate in the study. The "Attitude Toward Mathematics Survey " (Miller et al., 1996) was used. It measured students' goals, perceived ability, cognitive engagement effort and persistence.

Results indicated the positive relationships among learning goals, performance goals, and future goals, but not between learning goals and pleasing others (pleasing the teacher and pleasing the family goals). Performance goals, future goals, pleasing the teacher goals, and pleasing the family goals were all positively related to one another. As in the previous study (Greene & Miller,1996), learning goals and perceived ability were positively related to cognitive engagement as well as to effort and persistence. They (Miller et al., 1996) did not find any significant relationship between performance goals and cognitive engagement, nor between effort and persistence. Regression analyses (Miller et al., 1996) indicated that future goals and learning goals were the best predictors of self-regulation and deep cognitive engagement. For effort, learning goals were the best predictor and for persistence, perceived ability and learning goals were the best predictors. For achievement, future goals, perceived ability and effort were the best predictors.

In their second study, Miller et al. (1996) collected data using the same high school classrooms but with a different student sample. The data were collected in two steps. First, students were asked to fill out the goal orientations and perceived ability part of the survey. Then at a later date, they filled out the cognitive engagement, self-regulation, persistence, and effort items on the survey. Again, students' semester grades were used as the achievement variable. Results replicated their first study findings with little variations. Miller et al. (1996) noted that the intercorrelations among the predictor variables (goals and perceived ability) and the criterion variables were a little lower than the first study.

In both studies, future goals played a significant part in the prediction of self-regulation and deep cognitive engagement. Future goals were positively related to effort and achievement (Miller et al., 1996). While the studies on goals described above examined the influence of goals and perceived ability in learning (Greene & Miller, 1996; Miller et al., 1996), Greene, De Backer, Ravindran, and Krows (1999) examined the influence of goals, perceived ability, task values, and task beliefs. Since the purpose of the study was to examine the factors that influence gender differences in mathematics learning and achievement, Greene et al. (1999) also examined the relationship among students' gender identity, belief about mathematics (math is a male domain), and their achievement.

Three hundred and sixty-six high school students who volunteered to participate in the study (Greene et al., 1999) filled out a 92-item questionnaire. Greene et al. (1999) measured participants' goal orientations (learning goals, performance goals, future goals, and pleasing the teacher goals), task values (intrinsic, utility, and attainment), task beliefs (perception of ability, task difficulty, and perception of mathematics as a male domain), and gender identity.

Goals and perception of ability items were adapted from the survey developed by Miller et al. (1996), and task values items were created by the researchers (Greene et al., 1999) by revising the items developed by Wigfield (1994). Task difficulty and perception of math as a male domain items were created by the researchers (Greene et al., 1999).

When Greene et al. (1999) did regression analyses, they found that goals, values, and beliefs influence students' achievement and effort. They (Greene et al., 1999) also reported that goals, especially future goals had a significant influence on effort (Greene et al., 1999).

Since Greene et al. (1999) were interested in examining the factors that influenced gender differences in achievement in mathematics, they conducted regression analyses using gender and mathematics class (required and elective) along with goals, values, and beliefs variables as predictor variables. Results of their study (Greene et al., 1999) indicated that goals influenced achievement for all students more than did the gender variable.

Though researchers in that study examined gender differences in mathematics achievement, the results support the assumption that goals influence students' learning and achievement. The influence of future goals in the prediction of effort and achievement suggests that future research should be aimed at further investigating the influence of future goals in learning and integration.

<u>Self-regulation and Goals</u>. Earlier it was noted that cognitive engagement was conceptualized as a complex process involving different aspects: deep and

shallow processing; self-regulation; and metacognition. In the previous section, studies that examined the influence of goals on learning and achievement were described. In this section, the studies that examined the influence of goals on self-regulation will be summarized.

When Greene and Miller (1996) examined the influence of goals, perceived ability, and cognitive engagement on achievement, they found a positive relationship between meaningful cognitive engagement (deep processing and self-regulation) and learning goals. Similarly, other researchers found that learning goal oriented individuals' reports of self-regulation were positively correlated with self-observation, self-judgment, and self-reaction. But performance goal oriented individuals' reports were negatively correlated with self-observation (Miller, Behrens, Greene, & Newman,1993; Schunk,1996). Zimmerman and Martinez-Pons (1990) also found that students' learning goals were positively related to self-regulation.

Metacognition and Goals. Just as students' cognition is influenced by their motivational goals, students' metacognition is also influenced by goals (Middlebrooks, 1996). Educators and researchers have examined the relationship among cognition, metacognition, and motivation and how those relationships influenced students' learning and achievement. In the following section I have reviewed some of the studies that examined the role of metacognition in learning and achievement.

Middlebrooks (1996) examined the effect of goal orientation on students' metacognitive activities in problem solving. Middlebrooks (1996) reported that individuals with high learning goals indicated not only an awareness of their own prior knowledge, but also an awareness of the extent of their comprehension and the availability of various strategies to successfully complete a task before their attempts to solve the given problem. Middlebrooks (1996) also reported that after solving the problem, learning goal oriented individuals evaluated the effectiveness of their strategies. On the other hand, individuals with performance goal orientations did not report any strategy consideration before engaging in the task or any monitoring of their prior knowledge.

Middlebrooks' findings (1996) indicated that individuals with a performance goal orientation were more concerned with their present performance rather than learning from the context or even trying to bridge their existing knowledge with the new context. In knowledge integration, individuals should be aware of their existing knowledge and its limitations since that awareness influences their ability to process the new information effectively and enrich their cognitive development.

Obach and Moley (1993) also examined the relationship between metacognition and goals by looking at the relationship between students' metacognitive activities and their motivation. Self-report measures to assess study strategy use, attribution beliefs, and goal orientations were administered to fifth-, sixth-, and seventh-grade students. Obach and Moley (1993) reported a positive relationship between metacognitive activities and mastery orientation. Zimmerman (1996) also reported that students who employed self-regulatory activities scored high in motivational factors.

The studies reviewed above indicated that motivation, especially motivational goals, influence students' cognition and metacognition and also play a role in learning and achievement. The focus of those studies was achievement and self-regulation, and the influence of motivation on those factors. However, looking at the evidence obtained from those studies, one could hypothesize that learning goals and future goals may foster the knowledge integration process because of their positive relationship to cognition and metacognition of the students. On the other hand, performance goals may hinder the integration process since they were not positively related to deep processing and self-regulation. If preservice teachers approach their learning tasks with high learning goals, then they may be engaging in meaningful cognitive engagement which would enhance their knowledge integration process. Similarly, if preservice teachers approach the task with high future goal orientations, they may try to integrate their knowledge effectively since they see the utility of the new knowledge.

Since there is empirical evidence for the positive influence of learning goals and future goals in learning, we could hypothesize that learning and future goals would positively influence the knowledge integration process. For example, an individual in medical school may have an aspiration of being a physician. When she takes an introductory physiology class, she learns about basic physiology. If she views the instructional information as useful not only for that class but also for the future, then she will try to comprehend the information and connect it with her existing knowledge. If she had been successful in that process, then she would have less trouble in integrating her knowledge about human anatomy and physiology when studying human anatomy later. Similarly, preservice teachers with future goals may view the information they receive in different education courses as useful for future classrooms and may try to integrate the knowledge effectively.

It seems that the literature on learning supports the assumption that learners' use of deep processing strategies and metacognition play a role in learning and knowledge integration (Adey & Shayer, 1993; Cunningham & Thorkildson, 1996; McKeachie, 1987; Potts, 1977), and that motivational goals play a vital role in cognition and metacognition (Ames &Archer, 1988; Dweck, 1986; Greene & Miller, 1996; Maehr, 1991; Middlebrooks 1996; Miller et al., 1993, 1996; Nolen, 1987, 1990; Nolen & Haladyna, 1990; Obach & Moley, 1993; Pintrich & De Groot, 1990; Schunk, 1996; Wentzel, 1991; Zimmerman, 1996; Zimmerman & Martinez-Pons, 1990). Yet, in addition to motivational goals, people's epistemological beliefs influence their cognition and metacognition. In the next section, I have reviewed literature on epistemological beliefs and their influence on the learning process.

Epistemological Beliefs, Learning, and Knowledge integration

While research on motivation yielded empirical evidence to support the positive influence of learning goals and future goals on learning (e.g., Ames & Archer, 1988; Greene et al., 1999), the research on epistemological beliefs has provided evidence to the influence of epistemological beliefs on learning (Dweck, 1986; Hofer & Pintrich, 1997; Kardash & Scholes, 1996; Schommer, 1994). Schommer (1994) conceptualized epistemology as a set of relatively independent beliefs about the certainty, source, structure, speed, and control of knowledge acquisition. One individual may believe that knowledge is absolute (certainty) whereas another individual may believe that knowledge is tentative (relative). Similarly, one may believe that knowledge is acquired by reasoning as opposed to being handed down by authority (source). Another dimension of the belief system is that one individual may view knowledge as isolated pieces of information while another may view it as interconnected concepts (structure). Schommer (1994) also stated that some individuals may think that learning is quick, while others may say learning occurs gradually (speed). The fifth dimension in Schommer's (1994) belief system is whether the ability to learn is fixed at birth or if it can be changed (control).

In her study, Schommer (1990) administered her epistemological beliefs questionnaire to undergraduate students. In addition to answering the epistemological beliefs questionnaire, participants also answered a student characteristic survey and took a vocabulary test. Factor analysis of the belief system instrument yielded only four factors which Schommer (1994) listed as fixed ability, simple knowledge, certain knowledge, and quick learning. When she examined the relationship of epistemological beliefs with the student characteristic survey, Schommer found that older students believed the ability to learn could be changed whereas younger students indicated fixed ability belief.

In the second part of that study, Schommer (1990) examined the relationship between individuals' epistemological beliefs and their comprehension ability using some of the participants from the first experiment. One group of students who participated in the second part of the study received a text passage in psychology in which integration of factual information was required in order to form a conclusion. The other text materials were on nutrition and contained some controversial information about vitamins. It was given to the second group. Students were asked to read the text passages at home. Later they were asked to write a conclusion for the passage they read. Students were also asked to report their confidence in comprehension of the text passage and were given a multiple choice test on that passage. The students' conclusion on text passages were examined by Schommer in two ways. One was whether the conclusion contained a simple or complex solution, and the other aspect was whether the conclusion indicated the participants' degree of agreement to the certainty of the given information.

Data analyses revealed the following findings. Students who believed in quick learning wrote an oversimplified conclusion. When complex information was given, students with quick learning belief had trouble integrating all the information and monitoring their comprehension processes. Schommer (1990) also found that students who strongly believed in the certainty of knowledge tended to distort the information to fit their views. Schommer (1990) reported that students' educational levels and home environments influenced their beliefs. The higher the educational level, the more likely they would believe in tentative knowledge.

Another study conducted by Schommer, Crouse, and Rhodes (1992) examined the role of simple knowledge belief on text comprehension. The epistemological questionnaire was the same one that was used in the previous study (Schommer,1990) and a text passage on statistics was used for measuring comprehension and metacognitive activities. One group was instructed to read the material to determine whether it was intelligible for a beginner in statistics. The other group was instructed to read the material so that they would be able to teach another student. Afterwards, all participants reported the study strategies they used when reading the material. As in the previous study, all participants took a multiple choice test on the text material and reported their confidence in their comprehension. Schommer et al. (1992) concluded that beliefs in simple knowledge negatively influenced students' comprehension and metacomprehension. A path analysis of the data (Schommer et al., 1992) indicated that the students' beliefs in simple knowledge influenced their reported choices of study strategies as well as their test performance.

Kardash and Scholes (1996) examined the effects of epistemological beliefs, along with individuals' pre-existing beliefs and need for cognition, on the interpretation of controversial issues. Kardash and Scholes (1996) measured participants' epistemological beliefs using Schommer's (1990) epistemological questionnaire and measured participants' existing beliefs and knowledge about HIV and AIDS. Participants also reported their cognitive strategies used for comprehension and read a text passage containing two view points about the transmission of AIDS through the HIV virus. After reading the text, they rated the text materials on interest, familiarity, and intelligibility. They were also asked to write a conclusion for the text based on the information provided in the text.

Results indicated that participants' epistemological beliefs about certainty of knowledge influenced their evaluation of the information given. That is, the less they believed that knowledge was certain, the less they believed that the HIV virus caused AIDS.

Similarly, the more they reported about the effective use of cognitive strategies for evaluating any information, the more likely they were to write a tentative conclusion based on all the text information. Kardash and Scholes (1996) concurred with Schommer (1990) that individuals' epistemological beliefs about the certainty of knowledge influence their ability to evaluate the information critically. Most likely, students would distort the information to fit their existing epistemological beliefs. The assumption that individuals' beliefs about a specific issue also influence their comprehension and interpretation of all the available information was also supported by the results of this study. Another inference noted by Kardash and Scholes (1996) was that individuals' use of cognitive strategies also influenced their ability to assimilate and integrate all the information. When the information is conflicting with what one knows and believes, some people might ignore or simplify the information to fit with their existing beliefs and knowledge.

Another study was conducted by Bendixen, Schraw, and Dunkle (1998) to examine the relationships of epistemological beliefs in moral reasoning. Bendixen et al. (1998) hypothesized that an individual's epistemic beliefs would have a greater impact on her or his moral reasoning than any other factors (such as age, gender, education, and logical reasoning ability). Bendixen et al. (1998)

constructed a 32-item questionnaire, which was a modified version of Schommer's 63-item epistemological questionnaire for measuring the participants' epistemological beliefs. Logical reasoning ability was measured by a 12-item syllogistic reasoning test constructed for their study, and moral reasoning was measured by a short form of the Defining Issues Test, (Rest 1979, as cited in Bendixen et al. (1998).

Bendixen et al. (1998) reported that epistemic beliefs related to moral reasoning. They concluded that higher levels of moral reasoning were associated with more sophisticated epistemic beliefs. Bendixen et al.(1998) also found out that simple knowledge, certain knowledge, belief in authority, and quick learning each explained a significant amount of variance. Bendixen et al. stated that people who accepted authority without question were not inclined to use their own reasoning ability to weigh all the information. In other words, people who were less inclined to accept authority would be more active in constructing their own standards for moral reasoning.

Another way that epistemic beliefs might influence the individual's reasoning was through her belief in simple knowledge. When an individual believes in simple knowledge she looks for simple solutions. Sometimes in real life situations, we need to look for complex solutions for moral problems. In those situations, people's epistemic beliefs may play a role. Thirdly, the belief in quick learning might affect the individual's moral reasoning by hindering their effort to pursue a solution if finding a solution involved time and effort. If a person believes that a solution can not be achieved, or it should be achieved quickly, she may give up trying to find one when encountering failures or unsuccessful attempts.

There is empirical evidence to indicate that beliefs played a crucial role in cognition (Kardash & Scholes, 1996; Schommer, 1990). That role could affect the knowledge integration process. Preservice teachers are introduced to many theories in their teacher preparation courses. The information about how they integrate those theories and what factors influence that integration is still limited.

The role played by epistemological beliefs could be crucial in the knowledge integration process. If preservice teachers believe that knowledge is simple and view it as isolated units of information, then they might process the information as separate units of knowledge rather than trying to integrate different theoretical information. Similarly, if preservice teachers believe in quick learning or that the ability to learn is an innate trait, they would not try to employ different strategies when faced with unsuccessful results. Thus epistemological beliefs may limit their learning and that may, in turn, limit their future students' learning.

Though there is substantial evidence to support the assumption that epistemological beliefs play a vital role in cognition and metacognition (Bendixen et al., 1998; Kardash & Scholes, 1996; Schommer, 1990, 1992) we are still at the exploration stage when it comes to the relationship of epistemological beliefs and motivation (Hofer & Pintrich, 1997; Qian, 1995; Strike & Posner, 1992). There were very few studies that examined the relationship between epistemological beliefs and motivation (Qian, 1995; Strike & Posner, 1992).

When Strike and Posner (1992) examined the relationship among students' epistemological views, learning attitude (motivation variables), and physics learning, they found out that there was a positive relationship between epistemological views and physics learning. Strike and Posner (1992) reported that students' epistemological views and learning attitudes affected physics learning while students' competence in physics affected their epistemological views.

But when Strike and Posner (1992) conducted their study with high school students, the initial analyses were not statistically significant. One explanation that Strike and Posner offered was that high school students had just started to form their epistemological beliefs and it was too early to detect any particular pattern between epistemological beliefs and learning. But they also noted that as physics knowledge increased, students seemed to be indicating their beliefs in the uncertainty of knowledge. Results of learning attitude measures (perception of competence, mastery goals, and deep processing strategies) indicated that mastery goals fostered high achievement in physics.

In another study that examined the role of epistemological beliefs and motivational goals in learning from a science text, Qian (1995) examined the relationship between epistemological beliefs and motivational goals. Qian (1995) asked ninety-five high school students enrolled in an inner-city school to fill out a survey which contained a 32- item epistemological questionnaire (adapted from Schommer's 63-item epistemological questionnaire, 1990) and an 11- item goal orientation questionnaire (adapted from Pintrich, Smith, Garcia, & McKeachie, 1991). Qian (1995) used multiple regression to examine the relationship between students' epistemological beliefs and motivational goals. The three epistemological beliefs (quick learning, simple-certain knowledge, and innate ability) were used as the three predictors variables and the goal orientation score was used as dependent variable. The results indicated a moderate relationship between the three epistemological beliefs and the two (intrinsic and extrinsic) motivational goals, and the regression model explained 12% of the variance. Qian (1995) conducted a canonical correlation with three beliefs and goal orientations as one set of variables and conceptual understanding and application reasoning tests scores as the second set of variables and found that innate ability, simple-certain knowledge beliefs, and performance goals were more important predictors than quick learning for conceptual learning change.

Although Qian (1995) and Strike and Posner (1992) examined the relationship between motivation and epistemological beliefs, there were limitations in those studies that compelled me to design the present study. Qian (1995) examined two goals (intrinsic/learning and extrinsic/performance goals) but the relationship of future goals with beliefs was not explored, though, recent research on goals indicates not only the presence of future goals, but also its positive influence on achievement (Miller et al., 1996; Greene et al., 1999). Strike and Posner (1992) examined the relationship between learning goals and epistemological beliefs along with deep processing and self-efficacy. Again, the relationship between future goals and epistemological beliefs was not examined. One aim of this present study is to examine the relationship between goals (learning, performance, and future goals) and epistemological beliefs (innate ability, certain knowledge, simple knowledge, quick learning, and omniscient authority).

Summary of Previous Literature and Implications for the Present Study

Knowledge integration is essential in complex learning. Though knowledge integration was explored in terms of text comprehension and transfer, the information about the process of knowledge integration or the factors that could play a crucial role in knowledge integration is limited. Potts (1977) reported that activation of prior knowledge was necessary in knowledge integration. His study (Potts, 1977) focused only on cognition. But later research on cognition and motivation (Dweck, 1986; Pintrich & De Groot, 1990) informed us how those two factors were related and how they influenced learning. Similarly, research on beliefs (Kardash & Scholes, 1996; Schommer, 1990) yielded evidence to support the assumption of the influence of beliefs on learning. Still the information we have is sketchy. On one hand, research on motivation indicates that learners' motivation plays an influential role in learning. On the other hand, research on beliefs indicates that beliefs play an important role in learning.

Are these two factors (beliefs and motivation) related to each other? Do they compliment one another? Do goals mediate or mitigate the effect of beliefs? These questions are yet to be answered. By examining the combined influence, we can attempt to answer those questions. Research on goals yielded a vast amount of information, yet most of the studies examined learning goals and performance goals (Pintrich & De Groot, 1990; Urdan & Maehr, 1996; Qian, 995;

Strike & Posner, 1992; Zimmerman & Martinez-Pons, 1990), but not future goals. Though recent research indicated the presence of future goals and its influence on learning (Greene et al., 1999; Miller et al, 1996), there is not a single study which examined the relationships among future goals and epistemological beliefs. Hence the present study will focus on the relationship of the three goals, beliefs, cognitive engagement, and knowledge integration.

Knowledge integration is an important goal in education since the integration of knowledge enables learners to acquire and store information as cohesive and comprehensive units, and also helps them to utilize all the information available. Review of literature on integration indicated that deep processing and self-regulation influence learning and knowledge integration. These two factors (deep processing and self-regulation) are influenced by goals and beliefs. Though the research literature yields a vast amount of information about goals and beliefs, we have very limited information about the relationships among goals and beliefs. The information about the relationships among goals, beliefs, and the knowledge integration process is still at an exploration stage.

Integration of different sources of information into a complex knowledge structure is a necessary step in complex learning, and the factors that influence the process of knowledge integration can be examined by focusing on any subject. For the present study, I chose preservice teachers as the sample and a unit on motivation as the subject matter for the following reasons. Preservice teachers enter a teacher education program with their own schemata about learning, motivation, and the role of a teacher in classroom instruction (Curda, Curda, &

Miller, 1995; Hollingsworth, 1989; Nolen & Nicholls, 1993; Pajares, 1992; Raymond, 1997). Their existing schemata will play a role in encoding the new information they receive in their education classes. Motivation is a complex concept and students' motivation in the classroom influences their learning considerably. The teacher plays an important role in creating a positive environment for learning (Ames, 1990).

The research literature indicates that teachers' beliefs about motivation influenced their classroom teaching and also influenced their students' motivation and learning (Ames, 1992; Ames & Archer, 1988; Midgeley, Feldlaufer, & Eccles, 1989). There is empirical evidence supporting the assumption that preservice teachers have pre-existing schemata about motivation when they enroll in educational psychology classes (Curda, Curda, & Miller, 1995). Though there are studies that have examined preservice teachers' beliefs (Hollingsworth, 1989; Raymond, 1997), there does not appear to be studies that have examined preservice teachers' epistemological beliefs and the relationships between beliefs and learning. There is research that shows epistemological beliefs influence cognition and self-regulation (Pajares, 1992; Posner, Strike, Hewson, & Gertzog, 1982; Schommer, 1990), yet there is limited information available about the relationships among cognitive processing, beliefs, and the knowledge integration process.

Preservice teachers have definite schemata about teaching and learning since they have been students for thirteen or more years. Based on their experiences in different classrooms, they may have well-developed schemata about teaching and learning. Before taking a course in motivation, they have developed their own schemata about motivation. But their prior knowledge may be based only on their own experiences as students. Hence, their information may be limited or incomplete. Preservice teachers are introduced to different theories and techniques in different teacher education classes, and they need to integrate that information with their existing knowledge about teaching and learning. Successful integration will equip them with the ability to utilize the knowledge they gained in different teacher preparation courses. If they do integrate the new knowledge with their existing knowledge, then they are fully utilizing their teacher education preparation. That will be an advantage for them in their professional growth. But how cognition, motivation, and beliefs are all related to the knowledge integration process is still largely unknown.

Pilot Study 1

A pilot study was conducted in order to select instruments that would measure preservice teachers' prior conceptions about motivation, goal orientations, beliefs, cognitive engagement, and knowledge integration (Ravindran, 1998a). Ninety-six preservice teachers who were taking an educational psychology course participated in the study. I used the Approaches to Learning Survey (Greene & Miller, 1996; Miller et al. 1996) to measure goals, deep processing, shallow processing, and self-regulation. There were 6 items measuring learning goals, 11 items for performance goals, and 7 items for future goals. There were 8 items measuring deep processing, 10 items for shallow processing, and 8 items for self-regulation. It was a Likert type scale and the participants got a score based on their responses to each item. Those scores were then used in data analysis as learning goal score, performance goal score, and future goal score.

For measuring knowledge of motivation, I developed one instrument consisting of 26 items which measured the preservice teachers' preconceptions about motivation. The format was based on Harter's (1980) intrinsic motivational scale. The responses were scored as low or high on motivational conceptions (Ames, 1990). From the responses to those items, it was evident that preservice teachers do come to the education classes with their own schema about motivation. Since the analysis of my pilot data indicated that there was not much variability in those scores, I decided not to use that measure in my present study.

I constructed another instrument which contained three classroom instructional scenarios followed by three questions. It was intended to measure preservice teachers' knowledge integration of motivation. The participants were asked to read the scenarios and answer the questions about classroom motivation that followed the scenarios. Preservice teachers' responses to those questions were scored using the following guidelines. If the students' analyzed the scenario instructions in general without using any cognition or motivation terminology from the course, those responses were given one point. If the responses contained the terminology they learned in their course, two points were given for each response. If the analysis of the lesson contained a rationale for their description using cognition and motivation terminology from the course, three points were given. Scores ranged from 0 to 12.

I used Schommer's epistemological questionnaire to measure the participants' beliefs about knowledge acquisition (Schommer, 1990). There were twelve subscales in her questionnaire. The seeking a single answer variable was measured by 11 items. The avoid integration variable was measured by 8 items, and the avoid ambiguity variable had 5 items. Belief about the certainty of knowledge was measured by 5 items, and beliefs about authority was measured by 10 items under two subscales (depend on authority and don't criticize authority). Belief about innate ability was measured by 4 items and the belief about the nature of learning was measured by 13 items under three subscales. Beliefs about effort and work were measured by 6 items.

The participants were asked to indicate their degree of agreement to the given statement using a five-point scale (1=strongly disagree; 5=strongly agree). If an individual scored high in one subscale, it would mean that she or he had naive beliefs about that dimension of epistemological beliefs. If a person scored high in innate ability, then it would mean that she or he believed that ability is fixed at birth. Depending upon the wording of the questions, some of the items had reverse scoring. Schommer did a factor analysis and collapsed those twelve subscales into four factors which she identified as innate ability, simple knowledge, quick learning, and certain knowledge.

Results showed that the Cronbach alpha values for the goals subscales were .88 for learning goals, .90 for performance goals, and .96 for future goals (Ravindran, 1998a). From the responses to those items on preconceptions about motivation, it was evident that preservice teachers do come to education classes with their own schema about motivation. The Cronbach alpha coefficient for that instrument was .76. The analysis of the knowledge integration measure showed that the measure was not related to any other variables. Therefore, I concluded that I needed a more sensitive measure to determine the level of their knowledge integration. I decided to use part of the exam questions on motivation and the related application papers as my two measures of knowledge integration.

Following Schommer's scoring system (Schommer, 1990), I did a factor analysis of the epistemological items and reliability analysis and discovered that the Cronbach alpha values for the epistemological factors (innate ability, simple knowledge, quick learning, and certain knowledge) were very low (.3 and .4). Because of the low reliability of the instrument, I decided to look for another instrument to measure epistemological beliefs. I decided to use the instrument developed by Bendixen et al., (1998) and did another pilot study (see Appendix A) to evaluate its psychometric properties. Those data are summarized in the next chapter.

Overview of the Present Study

The purpose of the present study was to examine the relationships among goals (learning goal, performance goal, and future goal), epistemological beliefs (authority, innate ability, simple knowledge, certain knowledge, and quick learning), cognitive engagement strategies (meaningful and shallow), and knowledge integration. The present study examined two sets of independent variables: goals and epistemological beliefs; and two sets of dependent variables: meaningful and shallow cognitive engagement (deep processing and self-regulation will be combined as meaningful cognitive engagement) and knowledge integration. Since the content for this study is motivation, the context for the study was a teacher preparation class where preservice teachers are learning about motivation to learn. I examined three goals (learning goals, performance goals, and future goals) and five epistemological beliefs (innate ability, certain knowledge, simple knowledge, quick learning, and omniscient authority). Two cognitive engagement variables were treated as dependent variables in analyses that examined the extent to which goals and epistemological beliefs would predict cognitive engagement. Then, they were treated as independent variables in the prediction of knowledge integration. There were two knowledge integration measures that were based on exam answers and application papers from a unit on motivation. I addressed three research questions that emerged from the literature on knowledge integration, cognitive engagement, goals, and epistemological beliefs.

Research Questions and Predictions

Research Question 1: What are the relationships among preservice teachers' achievement goals (learning goal, performance goal, and future goal), epistemological beliefs (innate ability, certain knowledge, simple knowledge, quick learning, and omniscient authority), meaningful cognitive engagement (deep processing and self-regulation), shallow processing, and knowledge integration?

The first research question concerns the relationships among preservice teachers' goals, epistemological beliefs, cognitive engagement, and knowledge integration. Based on my pilot data and the research literature, I predicted that goals and beliefs would be related, but that different patterns would be found depending on the goal. In general, I predicted negative correlations between epistemological beliefs and both learning and future goals and positive correlations between performance goals and epistemological beliefs.

I also had several more specific predictions. An individual with high learning goals is trying to improve her knowledge. Because of that goal characteristic, I expected to see a negative relationship between learning goal and epistemological beliefs about quick learning. Similarly, if one believes that learning is quick or not at all, then she \he may not engage in elaboration or putting effort in organizing her or his knowledge structure. Hence I expected to see a negative relationship between meaningful cognitive engagement and quick learning belief. I expected to see a positive relationship between performance goal and epistemological beliefs about innate ability because Dweck (1986) stated that individuals who believed in innate ability tend to exhibit performance goals. Based on the literature on future goal, I expected to see a negative relationship between future goal and epistemological beliefs about simple knowledge. Based on my pilot data, I expected to see a negative relationship between future goal and quick learning.

Research Question 2: What combination of achievement goals (learning goal, performance goal, and future goal), and epistemological beliefs (innate ability, certain knowledge, simple knowledge, quick learning, and omniscient authority) is the best predictor of cognitive engagement variables (meaningful cognitive engagement and shallow processing)?

The second research question concerns the extent to which goals and beliefs predict the two cognitive engagement variables. Based on the literature on goals (Greene &Miller, 1996; Miller et al., 1996), I expected that the combination of achievement goals to be the best predictors for cognitive engagement. Based on my pilot data, I expected that epistemological beliefs would also play an important part in the prediction equation. I expected that simple knowledge belief would have a positive influence on shallow cognitive engagement.

Research Question 3: What combination of achievement goals (learning goal, performance goal, and future goal), epistemological beliefs (innate ability, certain knowledge, simple knowledge, quick learning, and omniscient authority), and cognitive engagement (meaningful cognitive engagement and shallow processing) variables is the best predictor of knowledge integration?

The third research question concerns which combination of goals, epistemological beliefs, and cognitive engagement variables will be the best predictors for the preservice teachers' knowledge integration scores. My prediction was that both learning goals and future goals would play a prominent role in predicting the knowledge integration scores. While I expected a positive relationship from these two goals (learning and future goals), I expected to see a negative relationship from simple knowledge belief. I also predicted that meaningful cognitive engagement will have a positive relationship and shallow cognitive engagement will have a negative relationship on knowledge integration.

CHAPTER II

Method

Design

This was a correlational study that examined the relationships among goals (learning goal, performance goal, and future goal), epistemological beliefs (innate, certain, quick, simple, and authority), cognitive engagement (meaningful cognitive engagement and shallow processing), and knowledge integration measures. Three goals and five epistemological beliefs were the independent variables and the two cognitive engagement variables were the dependent variables in the first set of regression analyses. Then three goals, five beliefs, and two cognitive engagement variables were the independent variables and two knowledge integration measures (two scores based on an exam and a paper from the course) were the dependent variables in the second set of regression analyses.

Sample and Context

One hundred and one preservice teachers who were taking an educational psychology course volunteered to participate in this study. According to Tabachnick and Fidell (1983, pp. 91-92) the minimum number of cases should be at least five times greater than the number of independent variables for a regression analysis. In this study, there were eight (three goals and five beliefs) independent variables in the first set of regression analyses and ten (three goals, five beliefs and two cognitive engagement) independent variables in the second set of regression analyses. Hence the sample size met the minimum requirement.

There were twenty-seven males and seventy females who participated in the study. Four participants did not report their gender. The sample consisted of sophomores (4), juniors (54), seniors (38), and graduate students (4) seeking teacher certification. One participant did not indicate a category. Forty-three preservice teachers were elementary education majors and thirteen were science education majors. The remaining participants reported the following majors: early childhood (8); language (12); mathematics (4); social studies (7); special education (3); music education (8); and three did not specify their majors.

The context for this study was an educational psychology course in which preservice teachers learn about cognition, motivation, classroom management, and measurement in education. In the motivation unit, they learn about multiple concepts of motivation (e.g., self-efficacy, achievement goals, and attribution) and their influence on students' cognition. When learning about motivation, they are introduced to Maehr's (1984) view of motivation as personal investment. According to Maehr, all students are motivated, but not all students are motivated to do the tasks that classroom teachers assign. Maehr (1984) stated that students develop their own meaning of any learning situation based on three factors: action possibilities, self-efficacy, and goals. Action possibilities can be described as knowledge of available course of actions and beliefs about the consequences of those actions. Self-efficacy is the perception of one's ability to engage successfully in a task. Goals are the reasons that motivate students to engage in a task. Maehr (1984) also stated that these three factors (action possibilities, self-efficacy, and goals) are influenced by students' past experiences, socio-cultural context, and the teaching -learning situation (classroom structures including the teacher's instructional methods). These are the concepts that students are expected to integrate into their existing schemata for motivation.

Since the purpose of my study was to examine the relationships among achievement goals, epistemological beliefs, cognitive engagement, and knowledge integration, I chose the motivation unit for this study, because in this class preservice teachers are not just learning different concepts of motivation, but are expected to apply them on exams and in papers. This educational psychology class tends to be learning goal oriented and students' self-efficacy in this class is generally very high (Greene & Miller, 1996).

Instruments

An 84-item survey (see Appendix B) was used to measure goals (learning goal, performance goal, and future goal), epistemological beliefs (innate ability, simple knowledge, certain knowledge, omniscient authority, and quick learning), and cognitive engagement (meaningful cognitive engagement and shallow processing). The two knowledge integration measures (described in detail below) were obtained through rescoring two assessment items from the course. All survey items were on a six-point Likert- type scale. The first part of the survey listed the various reasons that students might give to do the class work and the students were asked to indicate their level of agreement to the statements. The second part of the survey contained statements describing the different techniques that students may use in order to process the information and monitor their own learning. The third part had statements about epistemological beliefs and students were again asked to indicate their level of agreement to the statements. Each part of the survey is described in detail below along with how scores were computed for each subscale.

Goals. The first part of the survey measured preservice teachers' goals. A goal is defined as an individual's purpose for engaging in a task. Learning goals are concerned with wanting to improve or learn a skill or knowledge. Performance goals are concerned with getting approval from others or demonstrating competence at that task. Future goals are concerned with engaging in a task in order to achieve a distant goal that involves knowledge gained from the current task.

The three goals (learning goals, performance goals, and future goals) were measured for this study using the Approaches to Learning Survey (Greene & Miller, 1996; Miller et al., 1996). Though Miller et al. (1996) examined four goals (learning goal, performance goal, future goal, and pleasing the teacher goal) I chose to omit the pleasing the teacher goal. Miller et al. (1996) found strong evidence to the positive relationship between learning goals and cognitive engagement and the same positive influence of future goals on cognitive engagement. They (Miller et al., 1996) also stated that although pleasing the teacher goal was related to self-regulation in their first study, it did not have a strong positive relationship to other cognitive engagement variables. They noted in their discussion section that the pleasing the teacher goal might be a strategy used by students in order to achieve other goals (performance and future). So in this study, I decided to measure only learning goals, performance goals, and future goals. Sample items for the goals subscales are shown in Table 1 (see page 67).

There were 5 items for learning goals, 5 items for performance goals, and 4 items for future goals. The participants were asked to mark their choices on a six-point Likert type scale ranging from strongly disagree to strongly agree for each item. Item scores were summed for each subscale category and each participant received a mean score for each goal. Those mean scores were used in the analyses.

Cronbach alpha reliability coefficients for the goals subscales in my second pilot study (See Appendix A) were .90 for learning goal, .87 for performance goal, and .75 for future goal. These Cronbach values were consistent with the values reported by Miller et al.(1996).

Cognitive Engagement. The next part of the survey asked the participants to report the specific study strategies they usually use when learning course materials and new concepts. The items were adapted from the Approaches to Learning Survey (Greene & Miller, 1996). There were 8 items for deep processing strategies, 8 items for self-regulation techniques, and 10 items for shallow processing strategies. The participants were asked to mark their choices on a six-point Likert type scale ranging from strongly disagree to strongly agree for each item. Following Greene and Miller (1996), I combined deep processing and self-regulation items into one variable called meaningful cognitive engagement and kept shallow processing as a separate variable. Item scores were summed for each subscale category and each participant received a mean score for each cognitive engagement variable which was used in the analyses. Sample items for two cognitive engagement subscales are shown in 7(see page 64).

Cronbach alpha reliability coefficients for the two cognitive engagement variables in my second pilot study (Appendix A) were .87 for meaningful cognitive engagement (deep processing and self-regulation) and .71 for shallow processing, and these Cronbach values were consistent with those reported by Miller et al. (1996).

Epistemological Beliefs. For the epistemological measure, I used the instrument developed by Bendixen et al. (1998) since that instrument yielded higher reliability coefficients than Schommer's (1990) instrument in my pilot studies (Ravindran 1998a, & 1998b). There were 32 items in the survey that were based on the criteria described by Schommer (1990) for five epistemological factors (certain knowledge, innate ability, quick learning, simple knowledge, and omniscient authority). The participants were asked to indicate their degree of agreement on a 6 point scale (1= strongly disagree; 6= strongly agree) to the given statements.

If an individual scored high in one factor it would mean that she or he holds a naive belief about that dimension of epistemological beliefs. If an individual scores high in certain knowledge, then she believes that knowledge is certain, and if an individual scores low, then she believes that knowledge is tentative. Similarly, if an individual scores high in innate ability, then it would mean she or he believes that the ability to learn is fixed while a low score would mean that she or he believes that the ability to learn is incremental. Schommer

(1994) proposed that epistemological beliefs scores should be viewed as frequency distribution rather than as a single point along each dimension. After entering the raw scores, I first did a factor analysis for 32 epistemological items to find out the factor loading of each item. Using a loading of 0.30 or higher on that factor, I grouped the items on each of the five factors. Factor loading of the items was used to determine which items went into each subscale. Five beliefs scale scores were computed by summing up item scores for each subscale category. Each participant received a mean score for each belief and those mean scores were used in the analyses.

Cronbach alpha reliability coefficients for epistemological beliefs in my second pilot study (see Appendix A) were .85 for innate ability, .72 for certain knowledge and omniscient authority, .79 for simple knowledge, and .70 for quick learning. These Cronbach values were consistent with the values reported by Bendixen et al. (1998) in their study (.87 for innate ability, .76 for certain knowledge and omniscient authority, .67 for simple knowledge, and .74 quick learning). Sample items are shown in 7(see page 65) and the whole instrument is included as Appendix B.

Table 1

Sample items

All the following items on the survey used a Likert-type scale.

Goals items

Learning goal
I do the work in this class because I want to understand the concepts.
I do the work in this class because I like to acquire new knowledge.

Performance goal
I do the work in this class because I like to perform better than other students.
I do the work in this class because I like others to think I'm smart.

Future goal
I do the work in this class because good grades lead to other things that I want (e.g., money, graduation, good job, certification).
I do the work in this class because being a good teacher in the future is important.

Cognitive engagement items

Deep strategy
While studying course material I compare and contrast different concepts.
I evaluate usefulness of the ideas presented in course materials.

Self-regulation
I find it difficult to organize my study time effectively (reverse scoring)
I make sure I understand material that I study.

Shallow strategy
I write out lists of new terms and definitions.
I underline main ideas as I read for course assignments.

Epistemological items

Innate Ability factor
Some people are born with special gifts and talents.
Some people will never be smart no matter how hard they work.

Simple Knowledge factor
Too many theories just complicate things.
Instructors should focus on facts instead of theories.

Certain Knowledge factor
Truth means different things to different people (reverse scoring)

Omniscient authority factor
Children should be allowed to question their parents' authority. (reverse scoring)

Quick learning factor
If you don't learn something quickly, you won't ever learn it.

Knowledge Integration measures

For knowledge integration measures, I obtained from the course instructors one section of the motivation exam and one of the application papers. Each of these measures and the scoring method will be described below.

Knowledge Integration based on performance on exam items. On the exam, the preservice teachers were asked to identify the motivational problem in three scenarios and to prescribe two solutions to solve the diagnosed motivational problem. The participants' answers were examined to see whether they identified the problem in terms of motivation and whether they used more than one motivational concept to describe the diagnosis. Similarly, the prescriptions were examined to see whether they contained appropriate solutions for the given diagnosis and whether they integrated more than one motivational concepts in their prescriptions. The exact scoring for exam answers was done following the guidelines given in Table 2 (see page 67). Examples of answers can be seen in Appendix C.

Table 2

Score	Criteria for Scoring Motivation Exam Answers Criteria
	Diagnosis Part
4	The participant integrated more than one motivational concept (self-efficacy, multiple goals, and attribution) learned in the class in the diagnosis and provided a theoretically accurate explanation for the diagnosis.
3	The participant diagnosed the problem correctly, used more than one motivational concept to describe it, and provided rationale for the diagnosis, but did not integrate the two concepts in the answer.
2	The participant diagnosed the problem correctly, used the theoretical concepts to describe it, and explained the rationale for the diagnosis.
1	The participant diagnosed the problem correctly and referred to the problem using the theoretical concepts learned in the class but did not provide any explanation.
0	The participant did not provide any reasonable diagnosis, or provided a reasonable diagnosis that did not fit with the given task (i.e., not about concepts learned in the class).
	Prescriptions Part
4	The prescription was consistent with the given diagnosis and integrated multiple concepts of motivation along with the rationale.
3	The prescription was consistent with the diagnosis that contained more than one motivational concept and the rationale for that prescription was also included. But the multiple concepts were unconnected.
2	The prescription was consistent with the given diagnosis and rationale was given for the given prescription.
1	The prescription was consistent with the given diagnostic part, but no explanation for that prescription was given.
0	The prescription did not match the given diagnosis.

Note: " Reasonable" means diagnosis tied to the course conceptions of motivation taught in the course.

Using the scoring guideline outlined above, all the answers were scored by two people. I paid a graduate student colleague, who is also developing expertise in the area of motivation to learn, to help me with the scoring. Initial inter-rater reliability rate was 71% total agreement, 24% differences by one point and 5% differences by two points. Disagreements were resolved by consensus. A score was given for the diagnosis and prescription sections of each of the three scenarios. Then those scores from the three scenarios were summed to obtain a total score for each participant. That total score was used in the analyses as knowledge integration exam measure.

Knowledge Integration based on performance on an application paper. I also used one of the application papers assigned in the class for another knowledge integration measure. Prior to the motivation unit, students were asked to write a lesson plan using their knowledge of cognition. Following the motivation unit, students were asked to analyze and critique their plan using their knowledge of motivation. According to the instructions given to students, the application paper should reflect an integration of student knowledge of cognition and motivation. I scored their lesson plans based on their use of concepts applied to cognition and motivation. There are four aspects of the paper: the description of the classroom environment; introduction of the lesson; activities; and assessment. These were examined using the guidelines described in Table 3. (p.69-71)

Table 3

Level	Criteria for Scoring Application Papers Aspects
	Classroom Environment
4	Description of the classroom environment that fosters meaningful cognitive engagement (deep processing and self-regulation) and multiple concepts of motivation discussed in the class (learning goals, future goals, self-efficacy, and cooperative learning). An explanation was included by integrating more than one motivational concept and cognitive principles.
3	Description of the classroom environment that fosters meaningful cognitive engagement (deep processing and self-regulation) and/or multiple concepts of motivation discussed in the class (learning goals, future goals, self-efficacy, and cooperative learning). The explanation was included but multiple concepts were unconnected.
2	Description of the classroom environment that fosters at least one meaningful cognitive engagement (deep processing and self-regulation) and/or one concept of motivation discussed in the class (learning goals, future goals, self-efficacy and cooperative learning) with an explanation.
1	Description of the classroom environment that fosters at least one meaningful cognitive engagement (deep processing and self-regulation) and/or one concept motivation discussed in the class (learning goals, future goals, self-efficacy, and cooperative learning) with no explanation.
0	No description of the classroom environment, or description of the classroom that did not indicate the fostering of meaningful cognitive engagement (deep processing and self-regulation) and/or one concept of motivation discussed in the class (learning goals, future goals, self-efficacy, and cooperative learning)
	Introduction of the lesson:
4	Descriptions of introduction contained more than one concept of motivation and cognitive principles discussed in the class and the explanation indicated an integration of those multiple concepts.
3	Descriptions of introduction contained more than one concept of motivation and cognitive principles discussed in the class and an explanation was included, but multiple concepts were unconnected.

2 Descriptions of introduction contained at least one concept of motivation discussed in the class and an explanation was included.

1 Descriptions of introduction was based on motivation or cognition, but no explanation was given.

0 Description of introduction did not mention any motivational concepts discussed in the class.

Activities/ Analysis

4 Description of activities that contained more than one concept of motivation and cognitive principles discussed in the class, and the explanation indicated an integration of those multiple concepts. **OR** Analysis of the lesson that included multiple concepts of motivation, cognitive aspects of the lesson, and pros and cons of those aspects.

3 Description of activities that contained more than one concept of motivation and cognitive principles discussed in the class and an explanation was included, but the concepts were unconnected. **OR** Analysis of the lesson that included multiple concepts of motivation, cognitive aspects of the lesson, and pros and cons of those aspects. But the analysis of different aspects were not connected.

2 Description of activities that contained at least one concept of motivation discussed in the class and an explanation was included. **OR** Analysis of the lesson that critiqued at least one aspect of motivation.

1 Description of activities that contained at least one concept of motivation discussed in the class but no explanation was included. **OR** Analysis of the lesson that critiqued at least one aspect of motivation discussed in the class.

0 Description of activities did not mention any motivational concepts discussed in the class.

Assessment:

4 Description of evaluation procedures or techniques that contained more than one concept of motivation and cognitive principles discussed in the class. An explanation indicated an integration of those multiple concepts.

3 Description of evaluation procedures or techniques that contained more than one concept of motivation and cognitive principles discussed in the class and an explanation was included, but the concepts were unconnected.

2 Description of evaluation procedures and techniques that contained at least one concept of motivation discussed in the class and an explanation was included.

1 Description of evaluation procedures and techniques that contained at least one concept of motivation discussed in the class but no explanation was included.

0 Description of evaluation procedures or techniques did not include any motivational concepts discussed in the class, or no description of evaluation procedures.

In each aspect of the description (environment, introduction, activities/analysis, and assessment), the participants could provide descriptions using multiple or single motivation concepts. Each aspect of the lesson was scored according to the guidelines given above in Table 3. Some participants did not have any description for one or more of the four aspects. So they did not get any points.

Using the scoring criteria described above, the papers were scored by the same two people who scored the motivation exam answers. The initial inter-rater reliability rate was 63% total agreement, 29% differences by one point and 8% differences by two points. Disagreements were resolved by consensus. Each aspect (classroom environment, introduction, activity/analysis, and assessment) was scored, and all the scores were summed to obtain a total score for each participant. That total score was used in the analyses as the knowledge integration paper measure.

Procedures

Preservice teachers who volunteered to participate in the study filled out the surveys in their educational psychology classes. Consent forms and demographic information about their majors, gender, and their future teaching grade level were also collected during that time. The survey was given to the participants before they started their motivation unit. One part of their motivation unit exam and one of their application papers were collected and copied for data analyses at the end of the semester.

CHAPTER III
RESULTS

This chapter is organized in the following manner. First I present the results of the factor and reliability analyses conducted to evaluate the survey. Then I present the descriptive statistics for each variable. Finally I present the information about the correlation and regression analyses conducted to examine the three research questions.

Factor Analyses

Principal Axis factor extraction with varimax rotation was conducted on the goal and cognitive engagement subscales. A rotated factor solution indicated there were six factors with eigenvalues ranging from 1.4 to 8.1 and explained 50% of the total sample variation. Both learning and performance goal items loaded on the two separate factors as expected based on theoretical and empirical predictions (Dweck, 1986; Greene & Miller, 1996; Miller et al., 1996). Two out of four future goal items loaded on one factor, but the other two items cross loaded on three factors. There were 11 out of 16 items that loaded on the meaningful cognitive engagement factor and 5 items cross loaded on two or more factors. The two future goals items and five meaningful cognitive engagement items that were loading on two or more factors were omitted in the subsequent analyses. Eight shallow processing items loaded on shallow cognitive engagement factor but two items loaded on a single factor separately and were also omitted in the subsequent analyses. Table 4 (see page 75-76) lists the factor loading for the goal and cognitive engagement items.

A separate factor analysis was conducted on the epistemological belief part of the survey using Principal Axis factor extraction with varimax rotation. A rotated factor solution yielded five factors with eigenvalues ranging from .99 to 5.3 and explained 37% of the total sample variation. Table 5 (see page 77) lists the factor loading for the epistemological items.

Using the factor loading values, I grouped the items as ten subscales (learning goals, performance goals, future goals, meaningful cognitive engagement, shallow cognitive engagement, innate, certain, simple, quick, and authority) and used the scale scores for the subsequent analyses. A factor loading value of .30 or higher was used as the criterion for the items to be included in that factor (Bendixen et al., 1998; Tabachnick & Fidell, 1996).

Table 4

Approaches to Learning Survey Factor Structure and Loading (Varimax Rotation)

Learning Goals (Eigenvalue= 4.3)

I do the work in this class because I want to understand the concepts.(.73)
I do the work in this class because I like learning new material or ideas.(.76)
I do the work in this class because I like the challenge of learning new things.(.66)
I do the work in this class because I like to understand what I am learning.(.62)
I do the work in this class because I like to acquire new knowledge.(.88)

Performance Goal (Eigenvalue= 1.9)

I do the work in this class because I like to perform better than other students.(.50)
I do the work in this class because I don't want others to think I'm not smart.(.71)
I do the work in this class because I like to look capable to my peers and friends.(.79)
I do the work in this class because I like others to think I'm smart. (.84)
I do the work in this class because I don't want to look foolish or stupid to my peers or to my instructor. (.80)

Future Goal (Eigenvalue= 1.4)

I do the work in this class because good grades lead to other things that I want (e.g., money, graduation, good job, certification). (.87)
I do the work in this class because my grades have important consequences for my future (e.g., money, graduation, good job, certification). (.82)

Meaningful cognitive engagement (Deep processing strategy and self-regulation) (Eigenvalue= 8.1)

Deep Strategy

When learning new material, I summarize it in my own words. (.56)
I put together ideas or concepts and draw conclusions which are not directly stated in course materials. (.74)
While studying course material I compare and contrast different concepts. (.56)
I mentally combine different pieces of information from course materials into some order that makes sense to me. (.68)
I learn new material by mentally associating new ideas with similar ideas that I already know. (.35)
I mentally combine different pieces of information from course material together. (.59)
I evaluate the usefulness of the ideas presented in course materials. (.54)
While learning new concepts, I try to think of practical applications. (.66)

Self-regulation

Before a quiz or exam, I plan out how I will study the material. (.45)
It is easy for me to establish learning goals for this class. (.59)
I make sure I understand material that I study. (.58)

Shallow cognitive engagement (Eigenvalue = 2.6)

In order for me to understand what technical terms mean, I memorize the text-book definitions. (.56)
I mainly read the course materials to get the information needed for the tests.(48)
I try and write down exactly what my instructor says during lectures. (.44)
I recopy my notes from class to help learn the material. (.42)
When doing the reading for class I try to figure out what part of the reading will be on the test. (.55)
I write out lists of new terms and definitions. (.69)
I copy down details exactly as they are stated in my readings. (.70)
I copy down main ideas exactly as they are stated in my readings or by my instructor. (.66)

Table 5

Epistemological Beliefs Factor Structure and Loading (Varimax Rotation)

Innate Ability (Eigenvalue = 5.3)

Students who learn quickly are the most successful. (.43)
Really smart students don't have to work as hard to do well in school. (.54)
People can't do much about how smart they are. (.47)
How well you do in school depends on how smart you are. (.55)
Some people just have a knack for learning and others don't. (.53)
Smart people are born that way. (.69)
Some people are born with special gifts and talents. (.46)

Quick Learning (Eigenvalue = 2.5)

Some people will never be smart no matter how hard they work. (.37)
If you don't learn something quickly, you won't ever learn it. (74)
If two people are arguing about something, at least one of them must be wrong. (.38)
If you haven't understood a chapter the first time through, going back over it won't help. (.70)
Working on a problem with no quick solution is a waste of time. (.47)

Certain Knowledge (Eigenvalue = 1.6)

Truth means different things to different people. (.32) *
Children should be allowed to question their parents' authority. (.49) *
Science is easy to understand because it contains so many facts. (.37)
The moral rules I live by apply to everyone. (.60)
What is true today will be true tomorrow. (.61)
When someone in authority tells me what to do, I usually do it. (.46)
People who question authority are trouble makers. (.52)

Simple Knowledge (Eigenvalue = 1.25)

It bothers me when instructors don't tell students the answers to complicated problems. (.43)
Parents should teach their children all there is to know about life. (.46)
If a person tries too hard to understand a problem, they will most likely end up being confused. (.43)
Too many theories just complicate things. (.60)
The best ideas are often the most simple. (.62)
Instructors should focus on facts instead of theories. (.52)

Things are simpler than most professors would have you believe. (.31)

Omniscient Authority (Eigenvalue = .99)

People should always obey the law. (.62)
Absolute moral truth does not exist. (.36) *
I like teachers who present several competing theories and let their students decide which is best. (.33) *
The more you know about a topic, the more there is to know. (.43) *
You can study something for years and still not really understand it. (.40) *
Sometimes there are no right answers to life's big problems. (.33) *

Note: * indicates reverse scoring of the item.

Subscale Reliabilities

Cronbach alpha reliability coefficients were computed for each of the subscales. The reliability coefficients for the goal and cognitive engagement variables ranged from .83 to .90, which were comparable to the values reported by Miller et al. (1996). The alpha coefficients of the five epistemological beliefs ranged from .54 to .78. Although the Cronbach alpha value for omniscient authority belief was relatively low (.54), it was still in the acceptable range (Popham, 1990). Table 6 (see page 83) lists the reliability coefficients for all the subscales.

Validity Check for Knowledge Integration Measures

Preservice teachers' final exam grades were obtained as a validation check for the knowledge integration scores. Correlational analyses were conducted for the final exam grades with the two knowledge integration measures. The correlation coefficient between final grades and knowledge integration exam scores was $r(98) = .47$, $p = .000$ and the correlation coefficient between final grades and knowledge integration paper scores was $r(93) = .23$, $p = .028$. These measures provide some evidence that the two new scores are related to learning the course content.

Descriptive Statistics

Table 6 (see page 81) illustrates the means, standard deviations and ranges for all the subscales. The mean for performance goals (3.6) was lower than that for learning goals (4.9) and for future goals (5.39). The descriptive statistics indicated that preservice teachers in this sample had high learning and future goals since the means for learning goals and future goals were 4.90 and 5.39, respectively. The frequency distribution of future goals indicated that 58% of the participants scored 6, the highest scores possible, and 21% participants scored 5. That means that this subscale had a highly skewed distribution. Although learning goal scores had a restricted range between 3 and 6, there was no clustering of scores like there was for future goals. Performance goal scores had a normal frequency distribution. The frequency distributions for meaningful cognitive engagement and shallow cognitive engagement were also normal. Between the two cognitive engagement subscales, meaningful cognitive engagement has a higher mean (4.41) than shallow cognitive engagement (3.57).

For the belief subscales, low scores indicate that the individuals hold a sophisticated view about that belief and high scores indicate that the individuals hold a naive view about that belief. The means ranged from 1.84 (quick learning belief) to 3.83 (simple knowledge belief). Sixty-nine percent of the participants scored between 1 and 2 on the quick belief subscale. That means that most of the participants did not view learning as a quick process. Eighty-six percent of the participants scored above 3 on simple knowledge subscale indicating that many of the preservice teachers in this sample seem to view knowledge as isolated units of information rather than as complex and integrated structures.

Table 6

Means, Standard Deviations, Ranges, Total Possible Scores, and Cronbach Alpha Reliabilities for the Subscales

Variable	Mean Std.Dev.	N	Range TPS	Alpha
LG	4.90 0.75	101	3.00-6.00 6.00	.88
PG	3.60 1.02	101	2.25-6.00 6.00	.88
FUG	5.39 0.87	101	2.50-6.00 6.00	.90
MCogEng	4.41 0.73	99	2.55-6.00 6.00	.86
Shallow	3.57 1.09	100	1.12-5.75 6.00	.83
Authority	3.03 0.77	101	1.00-5.33 6.00	.54
Certain	2.95 0.82	100	1.14-5.14 6.00	.66
Innate	3.12 0.91	100	1.00-6.00 6.00	.78
Quick	1.84 0.70	101	1.00-4.80 6.00	.67
Simple	3.83 0.85	99	1.00-5.85 6.00	.74
Knowint Exam	9.55 3.99	101	1-21 24	-
Knowint Paper	5.83 2.26	101	0-12 20	-

Note: MCognEng =Meaningful Cognitive engagement (Deep processing + Self-regulation); LG = Learning goals; PG = Performance goals; FUG= Future goals; Knowint exam= Knowledge Integration motivation exam; Knowint paper= Knowledge Integration application paper; TPS = Total Possible Scores

Research Question 1:

What are the relationships among preservice teachers' achievement goals (learning, performance, and future goal), epistemological beliefs (innate ability, certain knowledge, simple knowledge, quick learning, and omniscient authority), cognitive engagement (meaningful cognitive engagement (deep processing and self-regulation) and shallow processing), and knowledge integration?

Subscale intercorrelations were computed to address this question using the Pearson Product Moments Correlation method. Due to the exploratory nature of the study, alpha level was set at .05 as the criterion for a statistically significant relationship between the variables. Table 7 (see page 85) illustrates all the subscales intercorrelations.

The following findings were consistent with predictions made for this question. It was predicted that the relationship between learning goals and epistemological beliefs would be different than the relationship between performance goals and beliefs or future goals and beliefs. The relationships between learning goals and the five epistemological beliefs were not statistically significant. As shown in Table 7 (page 83), performance goals were positively related to innate ability belief (.27) and simple knowledge belief(.35). Another finding that was consistent with the prediction was the negative relationship between future goals and quick learning belief (-.22, See Table 7, page 83).

Table 7

Intercorrelations of Goals, Cognitive Engagement, Epistemological Beliefs, and Knowledge Integration measures

Variable	LG	PG	FuG	MCogEng	Shallow	Innate	Quick	Certain	Simple	Authority	Knowint exam	Knowint paper
LG												
PG	.27**											
FuG	.16	.27**										
Mcogeng	.43**	.25*	.09									
Shallow	.22*	.47**	.21*	.07								
Innate	-.05	.27**	-.04	.03	.34**							
Quick	.05	.07	-.23*	-.05	.21*	.49**						
Certain	.09	.12	.02	.09	.30*	.24*	.32**					
Simple	.03	.35**	.08	.10	.46**	.51**	.37**	.22*				
Authority	-.06	.01	-.05	-.29**	.14	.03	.10	.33**	-.01			
Knowint exam	-.04	-.16	.14	.11	-.22*	-.08	-.11	.05	-.10	-.14		
Knowint paper	.07	-.09	.01	.01	.08	.01	-.15	.06	-.14	.05	.27**	-

Note: MCogEng= Meaningful Cognitive Engagement (self-regulation and deep processing); LG- Learning goals; PG= Performance goals; Fug- Future goals; Innate= Innate ability belief; Quick = Quick learning belief; Certain = Certain knowledge belief; Simple = Simple knowledge belief; Authority- Omniscient Authority belief; Knowint Exam= Knowledge Integration Exam Measure; Knowint Paper= Knowledge Integration Paper Measure; * $p < .05$; ** $p < .01$;

The following findings were not consistent with the predictions. A negative relationship was predicted between learning goals and quick learning, but as shown in Table 7 (page 83), there was no significant negative relationship between learning goals and quick learning (.05). Similarly, a negative relationship was predicted between future goals and simple knowledge, but the data did not support that prediction. Although the prediction about a negative relationship between meaningful cognitive engagement and quick learning was not supported by the data, as seen in Table 7 (page 83), results indicated a significant negative relationship between meaningful cognitive engagement and authority (-.29).

Though no predictions were made for shallow cognitive engagement and beliefs, as shown in Table 7 (page 83), significant positive relationships were found between shallow cognitive engagement and four of the epistemological beliefs (innate ability .34, quick learning .21, certain knowledge .30, simple knowledge .46). Results also indicated a significant negative relationship between shallow cognitive engagement and the knowledge integration exam measure (-.22, Refer
to Table 7, page 85). As seen in Table 7 (page 83), the knowledge integration paper measure was positively related to the knowledge integration exam measure (.27), but not correlated with any of the other variables.

Research Question 2:

What combination of achievement goals (learning, performance, and future goal), and epistemological beliefs (innate ability, certain knowledge, simple knowledge, quick learning, and omniscient authority) are the best predictors of cognitive engagement (meaningful cognitive engagement and shallow processing) variables?

Multicollinearity

Multiple regression analyses were conducted to address the second research question. When two or more of the explanatory variables are highly correlated, the problem of multicollinearity may arise and it may affect the regression analysis. In order to determine the degree of multicollinearity that may influence the regression analyses, tolerance indices and condition indices along with the variance proportions were examined. Tolerance coefficients of .61 to .90 indicated that the level of tolerances were high and multicollinearity problems may not arise in the regression analyses. The condition indices for the variables ranged from 1.0 to 35.72. The high condition index would have been a problem if the variance proportions of two or more variables were higher than .50 (Belsely, Kuh & Welsch, 1980), but an examination of variance proportions and condition indices revealed that that was not a problem. In addition to the condition indices, variance inflation factors (VIF) were also obtained for multicollinearity diagnostics and they were ranged from 1.1 to 1.7 for all the variables. Stevens (1996) stated that if VIF values were higher than 10 then there was a reason for concern about multicollinearity. These diagnostics indicated that the regression analyses would not be negatively affected by multicollinearity.

Multiple Regression Analysis

Using SAS r-square selection, multiple regression analyses were conducted to test all possible subsets of variables. SAS r-square selection procedure starts with a one variable model and systematically runs all possible combinations until all the variables were included in the equation.

In the first set of regression analyses, meaningful cognitive engagement was regressed on the three goals (learning, performance and future), and five epistemological beliefs (authority, certain, innate, simple, and quick). The best fitting model among all the models was determined by examining three values.

First, I examined the r-square value for each model. Secondly, I examined Mallows' Criterion known as C(p) statistic (Daniel & Wood, 1996). Mallows (1973) proposed this criterion for selecting the best model where several alternate equations were considered. C(p) values can be obtained by measuring total squared error, and Mallows (1973) stated that by choosing the model where C(p) is equal or nearly equal to p (p is the number of regressors in the equation and intercept), we can minimize the error of selecting an underfitting or overfitting model. Thirdly, I examined the value of beta coefficients for each variable in the equation.

Based on the three criteria, the best model selected for predicting meaningful cognitive engagement contained learning goals and two epistemological beliefs (authority, and certain knowledge). These three variables accounted for 28% of the variance in meaningful cognitive engagement ($F(3,94)$ =

12.00 MSe = .40). As can be seen from Table 8 (see page 92), learning goals and certain knowledge belief had positive beta weights and authority belief had a negative beta weight. Though only a small r-square change was found by including certain knowledge variable in the equation, I chose this model because by the addition of certain knowledge in the equation, the C(p) value is nearly equal to the number of regressors in the equation. The prediction that both beliefs and goals would play an important part in the prediction of cognitive engagement was supported by these results. Variables in the equation with their beta weights, r-square, r-square change values and C(p) value are listed in Table 8 (see page 90).

In the second set of regression analyses, shallow cognitive engagement was regressed on the three goals and five beliefs. The same procedure described earlier was used to select the best fitting model. Consistent with what I predicted, the three best predictors for shallow cognitive engagement were simple knowledge belief, performance goal, and certain knowledge belief. These three variables accounted for 37% of the variance in shallow cognitive engagement ($F(3,93) = 18.19$. MSe = .77). Though certain knowledge had a low beta weight (.16), the C(p) value with certain knowledge variable in the equation was equal to the number of regressors in the equation. Hence this model was selected as the best one. Beta weights, r-square value and C(p) value for the variables in the equation are listed in Table 8 (see page 90).

Research Question 3:

What combination of achievement goals (learning goals, performance goals, and future goals) epistemological beliefs (authority, innate ability, certain knowledge, simple knowledge, and quick learning) and cognitive engagement (meaningful cognitive engagement and shallow cognitive engagement) variables are the best predictors of knowledge integration?

Multiple regression analyses were conducted to address this question using SAS r-square selection which tested all possible subsets of variables. This procedure starts with a one variable model and systematically runs all possible combinations until all the variables were included in the equation. Multi-collinearity diagnostics described in the previous section indicated that the regression analyses would not be negatively affected by collinearity problem.

In the first set of regression analyses, the knowledge integration exam measure was regressed on the three goals (learning performance, and future goals), five epistemological beliefs (authority, innate, certain, simple and quick), and two cognitive engagement variables (meaningful cognitive engagement and shallow cognitive engagement).

Based on r-square value, C(p) value and beta coefficients, the best model for predicting the knowledge integration exam measure contained only the shallow cognitive engagement, which accounted for 5% of the variance in knowledge integration ($F(1,98) = 5.22$. $MSe = .82$. The beta weight, C(p) value and r-square value were listed in Table 8 (see page 90).

In the next set of regression analyses, the knowledge integration paper measure was regressed on the three goals (learning performance, and future goals), five epistemological beliefs (authority, innate, certain, simple and quick), and two cognitive engagement variables (meaningful cognitive engagement and shallow cognitive engagement). None of the predictor variables could account for the variance in the knowledge integration paper measure. With all the ten independent variables in the equation, r-square value was .09 and adjusted r-square was -.02 (($F(10,77) = 0.83$. $MSe = 5.25$).

Table 8

Regression Weights for Variables Entering The Equation

Dependent variable Independent variable	R-Square change	B	SE B	β	C(p)
Meaningful Cognitive Engagement					3.7
Learning goal	.18	.39	.09	.40***	
Authority	.07	-.30	.09	-.32**	
Certain	.03	.17	.09	.18	
(Intercept)		3.0	.52		
R-Square	.28				
Shallow Cognitive Engagement					4.0
Performance Goal	.23	.30	.08	.34***	
Simple	.12	43	.12	.33***	
Certain	.02	.21	.11	.16	
(Intercept)		.16	.50		
R-Square	.37				
Knowledge Integration Exam Measure					1.9
Shallow	.05	-.80	.35	-.26*	
(Intercept)		12.3	1.3		

Note: *** p< .001; ** p<.01; * p< .05;

Chapter IV

Discussion

In this chapter, the main results of the study will be summarized and then discussed in light of theory and previous research. The implications and directions for future research and practice will also be discussed.

Summary of Main Findings

The important contribution of the present study is the empirical evidence it lends to the theoretical assumptions about beliefs and goals. Both beliefs and goals played a vital role in the prediction of students' cognitive engagement. In previous research on cognitive engagement, researchers examined the role of either goals or one belief (Greene & Miller, 1996; Miller et al., 1996; Kardash & Scholes, 1996; Schommer, 1992), but the present study found out that there were unique combinations of goals and beliefs that predicted meaningful and shallow cognitive engagement. The results of the present study also informs us that each belief has a distinct relationship with students' cognitive engagement.

For meaningful cognitive engagement, learning goals, omniscient authority and certain knowledge beliefs were the best predictors. Based on theoretical and empirical evidence, it was expected that learning goals would account for significant variance in meaningful cognitive engagement (Dweck, 1986; Miller et al., 1996), but how the combination of goals and beliefs would predict meaningful cognitive engagement was exploratory. The results indicated that the combination of learning goals and two beliefs contributed to the prediction of meaningful cognitive engagement. Since meaningful cognitive engagement was positively related to learning goals and negatively related to authority belief in the present data, it was not surprising to see these two variables in the regression equation with beta weights of opposite signs. The role of certain knowledge belief is less clear, but could be explained by the positive relationship between certain knowledge and authority belief, and a resulting suppressor effect. When the shared variance of certain and authority was partialled out, what was left was a positive relationship between certain knowledge belief and meaningful cognitive engagement.

For shallow cognitive engagement, performance goals, simple knowledge and certain knowledge beliefs were the best predictors. The presence of performance goals, simple knowledge, and certain knowledge beliefs was consistent with the theory and empirical evidence found in earlier studies (Dweck, 1986; Greene & Miller, 1996; Kardash & Scholes, 1996; Schommer, 1992). But the merit of the present finding is that it informed us about the combined contribution of performance goals and the two beliefs in the prediction of shallow cognitive engagement.

Shallow cognitive engagement was the sole predictor of the knowledge integration exam measure and the absence of meaningful cognitive engagement in the prediction equations for both knowledge integration measures was a surprise. The negative relationship of shallow cognitive engagement with the knowledge integration exam measure was consistent with both theory and earlier research (Greene & Miller, 1996; Pintrich & De Groot, 1990). While shallow cognitive engagement was the sole predictor of the knowledge integration exam scores, none of the variables could predict the knowledge integration paper scores. The correlation matrix for all the variables (see Table 7, page 83) indicated that the knowledge integration paper scores were not related to any of the independent variables, although they were positively related to the knowledge integration exam scores. The positive correlation between two knowledge integration measures and their positive relationships with the final exam grades indicated that the two knowledge integration measures were indeed reflecting the acquisition of the content knowledge. Yet, regression analyses did not yield any equation to account for the variance in knowledge integration paper measures.

Based on the theory on knowledge integration, it was hypothesized that the application paper would reflect preservice teachers' integration process, since they were expected to integrate their knowledge on cognition and motivation in their lesson plans. But the results did not support that assumption. One plausible explanation could be that task demand of the application paper might have been a factor for the present finding. The paper may not be capturing the minute processes of integration, since the task may not be structured so as to elicit the intended knowledge integration.

Although the knowledge integration exam measure was predicted by shallow cognitive engagement (Schommer, 1992), neither meaningful cognitive engagement nor the goals or beliefs entered in the prediction equation which was inconsistent with the theory (Greene & Miller, 1996; Pintrich & De Groot, 1990; Zimmerman & Martiniz-Pons, 1990). Both the knowledge integration exam measure and the knowledge integration paper measure required students to integrate the information; however, the knowledge integration paper measure required a higher level of integration. Hence, it was hypothesized that meaningful cognitive engagement would play a crucial role in knowledge integration measures. Yet, the role of meaningful cognitive engagement in the knowledge integration process is not clear and that could be viewed as a limitation of the study. One explanation could be that the cognitive strategies included on the cognitive engagement instrument may not be sensitive to knowledge integration or they are not the cognitive strategies students use to integrate knowledge. We may need to construct items specifically for the purpose of examining the relationship between knowledge integration and meaningful cognitive engagement. It should be noted that Miller et al. (1996) did not find predicted relationships between their deep and self-regulation strategy variables and their achievement variable.

Another notable, yet problematic, finding was that future goals did not enter into any of the regression equations. Although the absence of future goals in the prediction of cognitive engagement and knowledge integration measures was contrary to what I predicted, future goals did show a negative correlation with the quick learning belief. Future goals are the reasons that students give for doing a task in order to attain their intended future aspirations. Hence students who approach a task with future goal orientation are building their skill or knowledge base in order to reach their distant goal and should be willing to put forth effort at the task. On the other hand, naive belief about quick learning meant that students believed that learning was quick and effortless (Schommer, 1990). Earlier research on goals indicated that future goals were positively related to effort (Greene et al., 1999; Miller et al., 1996). Hence the finding of a negative relationship between future goal and quick learning in the present study was consistent with the theory and research. But the absence of future goals in the prediction of cognitive engagement and knowledge integration was inconsistent with theory and earlier research (Greene et al., 1999; Miller et al., 1996).

The examination of descriptive data yielded some insight into this puzzling result. Though there were four items in the original future goals subscale, factor analysis of the survey indicated that only two items loaded on a separate factor. The other two items loaded on three different factors with factor loadings of .30 or above. One of those factors was learning goals. The two items which loaded on three factors were excluded from the analyses and only two items were used in the analyses of the present study. So one explanation for the discrepancy between the earlier research and the present study could be the difference in the number of items and the factor analysis results. Secondly, the frequency distribution of future goals scores indicated a negatively skewed distribution and restricted range. Hence the combination of skewness and restricted range could have affected the present findings by diminishing the relationships between that variable to others. Future studies may focus on measuring future goals with more items and then examine the relationships with cognitive engagement or knowledge integration.

Previous Research and the Present Findings on the Predictive Power of Beliefs

In general, epistemological beliefs performed as expected, but the role of specific beliefs in the prediction of the two types of cognitive engagements measures was a unique finding of the present study. There was one previous study that examined the relationship among goals, four epistemological beliefs (quick learning, simple-certain knowledge and innate ability), and conceptual learning (Qian, 1995). Qian (1995) grouped simple knowledge and certain knowledge belief items together and learning and performance goals scores into one goal orientation score in his analyses. The results of Qian's (1995) study indicated that innate ability, simple-certain knowledge beliefs, and goal orientation were the best predictors for conceptual change in learning. But in his study, Qian (1995) did not examine authority belief and goal orientation was treated as one variable. If he had examined the authority belief, then he might have had similar results to those of the present study.

In other studies which examined the role of beliefs in learning, the focus was on only one of the epistemological beliefs. For example, Kardash and Scholes (1996) examined the relationship between certain knowledge and need for cognition and reported a negative relationship between certain knowledge and need for cognition. In the present study, certain knowledge belief played a role in the prediction of both meaningful and shallow cognitive engagement, yet the relationship was not a negative one. While Kardash and Scholes (1996) did not report any correlation between certain knowledge and authority beliefs, certain knowledge belief had a positive correlation with authority belief in the present study, and no other belief variable was correlated with authority.

Schommer et al. (1992) examined the relationship between simple knowledge belief and comprehension and found that simple knowledge was negatively related to comprehension. Schommer et al. (1992) also reported that simple knowledge belief was linked to test preparation strategies. Students who believed that knowledge was simple and isolated units of information reported using shallow strategies for test preparation. The finding of simple knowledge in the prediction equation for shallow cognitive engagement is consistent with both the theory and research (Schommer, 1990, Schommer et al., 1992). Schommer et al. (1992) did not examine the certain knowledge belief in her study, though had she looked at the certain knowledge belief, then she might have had the similar result to the present study. Moreover, certain knowledge was positively related to shallow cognitive engagement and simple knowledge belief. Hence the presence of certain knowledge in the prediction equation of shallow cognitive engagement in the present study was not surprising.

Bendixen et al.(1998) examined the relationship between beliefs and moral reasoning and reported that four beliefs (simple knowledge, certain knowledge, authority, and quick learning) were significant predictors of moral reasoning. But Bendixen conducted hierarchical regression analyses where they (Bendixen et al., 1998) determined the order of the variables and beliefs variables entered as one block. In the present study, SAS r-square selection was used so that we could see the role of each belief separately and in combination of all the other variables. Hence the analyses indicated the best belief variable for the prediction.

Furthermore, in the present study, three motivational goals were treated as three separate variables along with all five beliefs. Results of the present study indicated that authority belief predicted meaningful cognitive engagement with a negative relationship while learning goals influenced meaningful cognitive engagement positively. The results of the present study indicated the unique combination of goals and beliefs that played a role in predicting meaningful and shallow cognitive engagement. The beta weights of learning goals and authority belief were both large, indicating that both learning goals and authority beliefs are likely to play a crucial role in students' meaningful cognitive engagement. The finding about authority belief predicting cognitive engagement with a negative relationship is consistent with theoretical predictions. If preservice teachers come to the classroom with the belief that knowledge was handed down from instructors, they are not going to employ critical analysis of different theories taught or try to build their own theory about teaching by integrating different sources of information.

As noted earlier, this finding about the authority belief with a negative relationship with meaningful cognitive engagement was consistent with the evidence found by Bendixen et al. (1998). But the predictive ability of certain knowledge belief for meaningful cognitive engagement was not expected. Regression analysis indicated a positive beta weight for the certain knowledge variable. By examining the correlation analyses, the presence of certain knowledge belief in the prediction equation for meaningful cognitive engagement can best be explained by the likely suppressor effect described earlier.

Previous Research and the Present Findings on the Predictive power of Goals

Both learning goals and performance goals performed as expected in the findings of the present study, but the performance of future goals was not consistent with the theory and previous research (Miller et al., 1996; Greene et al., (1999)). In the literature on motivation, there is ample evidence of the positive influence of learning goals on meaningful cognitive engagement (Greene & Miller, 1996; Miller et al., 1996). Therefore, the predictive ability of learning goals for meaningful cognitive engagement in this study is consistent with the results of previous research. Similarly, the predictive ability of performance goals for shallow cognitive engagement is also consistent with the evidence in literature (Greene & Miller, 1996; Miller et al., 1996). But the combined predictive ability of beliefs and goals for cognitive engagement we see in this study is additional information.

As noted earlier, performance goals, simple knowledge and certain knowledge beliefs were the best predictors for shallow cognitive engagement and this finding is consistent with the earlier studies on goals and beliefs (Greene & Miller, 1996; Kardash & Scholes, 1996; Middlebrooks, 1996; Miller et al., 1996; Schommer et al., 1992). Yet, the merit of this finding is that it informed us the best combination of goals and beliefs in the prediction of both types of cognitive engagement.

But this finding was not consistent with Qian (1995) who reported that the innate ability belief also played an important role in the prediction of conceptual learning. Although four epistemological beliefs (innate ability, simple knowledge, quick learning and certain knowledge) were correlated with shallow cognitive engagement, the best model for prediction contained simple and certain knowledge beliefs in addition to performance goals. Since empirical evidence provided by research on beliefs (Kardash & Scholes, 1996; Schommer et al., 1992) supported the assumption that simple and certain knowledge would influence shallow cognitive engagement, the finding of this study is consistent with theory and earlier research. One explanation for the absence of innate ability in the best model in this study could be that performance goals usurped the predictive power of the innate ability variable. In other words, there is a lot of conceptual overlap between performance goals and the innate ability belief.

Hofer and Pintrich (1997) argued that beliefs about ability might dictate students' motivational goals and viewing that as an epistemological belief might be problematic. Dweck (1986) posited that students who hold the entity view of ability tend to indicate a high performance goal orientation. Hence, the presence of performance goals in the prediction equation might have diminished the predictive ability of innate ability whereas in Qian's study (1995) the goal variable was not two separate variables.

Previous Research and the Present Findings on Knowledge Integration Measures

The finding of shallow cognitive engagement as a predictor of knowledge integration exam scores is consistent with the theory and previous research on cognitive engagement and achievement (Greene & Miller, 1996; Pintrich & De Groot, 1990; Miller et al., 1996) But there was no previous study that examined the relationship of the knowledge integration with the three sets of variables (goals, beliefs, and cognitive engagement), hence, the finding of the present study about the predictive ability of shallow cognitive engagement for one of the knowledge integration measures is informative. Knowledge integration is the incorporation of different units of information into a complex and cohesive structure and it requires deep and elaborate processing. If students engage in shallow cognitive engagement, then they are not trying to organize the information into a complex structure. That may limit their integration process. From the results of the present study and earlier research, we can speculate that students who believe that knowledge is simple and certain are not going to put forth effort in elaborating and organizing information to be learned. Instead they may be engaging in shallow strategies to process the information. That may lead to poor integration. The importance of the finding about the predictive ability of shallow engagement for knowledge integration is that it informs us of the detrimental effects of shallow cognitive engagement on knowledge integration.

Implications for Future Research and Practice

Although there were some limitations to the present study, the findings suggest some strong implications for both research and practice. The results of the present study informed us concerning the relationship of goals and beliefs. Educators have been speculating about the possible relationships among beliefs and goals (Hofer & Pintrich, 1997; Schommer et al., 1992; Qian, 1995) and their role in students' cognition. The present study validates the speculation and suggests the need for further studies of this kind. For example, in the present study, learning goals did not have any relationship with any of the epistemological beliefs. Yet it teamed up with authority and certain knowledge beliefs to predict meaningful cognitive engagement. Hence one avenue of future research would be to explore the intricacies of learning goals and the epistemological beliefs. Although it had been suggested that beliefs might dictate students' goals and strategies (Schommer et al., 1992), the causal relationship needs further research. In this study there was a positive relationship between performance goals and two epistemological beliefs (innate ability and simple knowledge). Dweck (1986) argued that students who believed that ability to learn was innate had also exhibited performance goals. Yet the causal path has not yet been explored. This study confirms the positive relationship, but the causal relationship was not examined. Therefore that issue can be another avenue for future research. Similarly, the negative relationship between future goals and quick learning can be explored further. A study may be designed to explore the causal role or relationship between those two variables.

Schommer (1990) examined the relationships among beliefs and students' characteristics and home background variables (students' age, gender, year in school, verbal ability, parents' highest education, parents' occupation, and parenting style) and reported that students' home background variables predicted their epistemological beliefs. But in her study authority belief was not included. Hence, how authority belief is developed and what factors influence that belief is still not clear. Still, the results of the present study indicate that authority belief was one of the best predictors for meaningful cognitive engagement. Authority belief predicts meaningful cognitive engagement with a negative relationship. Hence, one area of future research could be in investigating how individuals develop the authority belief and what factors contribute to the development. Qualitative measures like personal interviews may be useful to explore that issue.

In the present study, both learning goals and authority belief played an important role in predicting meaningful cognitive engagement, which raises a few questions. For example, what will happen if most of the students entered the classroom with naive authority belief and the classroom fostered learning goal orientation? Does fostering learning goals compensate for the naive authority belief? Can we change the naive belief to a higher level of sophistication by intervention? Or, do students' beliefs overshadow the motivational goals? Future research should focus on examining these issues.

Although beliefs are considered to be highly resistant to change, Schommer (1990) reported that the more classes students had completed in higher education, the more likely they were to hold a sophisticated view about the certainty of knowledge. Similarly, in her study (1990), the students' ages influenced the innate ability belief. Older students believed that the ability to learn was an acquired trait. Hence it is possible that naive beliefs about the nature of knowledge can be changed, if students have exposure to a variety of courses in different areas. Future research shall attempt to provide empirical evidence to support that assumption. Future researchers might design a longitudinal study to find out whether student's beliefs changed from naive to more sophisticated from year to year.

Another venue for research would be on how to better measure knowledge integration. In this study the knowledge integration exam scores were negatively related to shallow cognitive engagement, but the knowledge integration paper scores were not related to any of the predictor variables. Since it could be a methodological problem, future research may focus on finding a more sensitive measure for knowledge integration.

In addition to the research implications, the findings of the present study have practical implications for educators. The important findings in the present study are the negative relationship of shallow cognitive engagement with knowledge integration exam scores, and shallow cognitive engagement's positive relationships with performance goals, simple knowledge, certain knowledge, innate ability and quick learning beliefs. Though these findings are consistent with theory and research, they are not good news for educators because they suggest that there are a lot of factors that can impede learning. Regression analyses revealed that performance goals, certain knowledge and simple knowledge beliefs were the best predictors for shallow cognitive engagement. Hence having high performance goals, and naive beliefs about certain and simple knowledge may encourage shallow cognitive engagement. From the present study and previous studies (Greene & Miller, 1996; Miller et al., 1996; Pintrich & De Groot, 1990), we found out that shallow cognitive engagement was negatively associated with achievement. Therefore, performance goals should be discouraged and naive beliefs should be challenged.

One of the aims of education is to help learners integrate different sources of information into a complex structure that can be used in future situations. The finding of a negative relationship of shallow cognitive engagement to knowledge integration suggests that, although we may not know what factors facilitate the knowledge integration process, we do have evidence of the factors which can be detrimental to the integration process. From earlier research on cognitive engagement and learning, researchers told practitioners that they should foster meaningful cognitive engagement in the classroom in order to facilitate learning. While that still is sound advice, the results of the present study indicate that encouraging meaningful cognitive engagement is not enough, the practitioners have to also discourage shallow cognitive engagement if they want their students to be successful in the knowledge integration process. Teachers should ensure that students know more ways to approach learning than just shallow strategies.

The results of the present study also indicate that learning goals were not related to any of the epistemological beliefs. Hence fostering high learning goals in the classroom may minimize some of the detrimental effects of naive epistemological beliefs. Future research should examine this possibility. Moreover, there is ample theoretical and empirical evidence in the literature that high learning goals influence meaningful cognitive engagement (Greene & Miller, 1996; Miller et al., 1996; Zimmerman & Martinez- Pons, 1990). Furthermore, there is empirical evidence that students changed their naive epistemological beliefs to sophisticated beliefs when they acquired knowledge in specific content area (Strike & Posner, 1992). Therefore, by fostering learning goals we may help learners to develop expertise in a specific domain, which, in turn, may help them to change their naive beliefs.

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Appendix A

Pilot Study 2

Second Pilot Study

Based on the results of the first pilot study, I decided to do another pilot study in order to identify a more appropriate epistemological measure and more sensitive knowledge integration measures.

Sample and Procedures

Sixty-four preservice teachers who enrolled in an educational psychology course participated in the second pilot study. The participants were asked to fill out a survey before the motivation unit. After the exam on motivation, copies of their exams were obtained. Then at the end of the course, copies of one of their application papers were collected for scoring. I have described each part of the instrument used in the second pilot in the following section.

Epistemological Beliefs.

To measure the preservice teachers' epistemological beliefs, I used an instrument developed by Bendixen, Schraw, & Dunkle for their study (1998). There were 32 items in that survey which were based on the criteria described by Schommer (1990) for five epistemological factors (certain knowledge, innate ability, quick learning, simple knowledge and omniscient authority). The participants were asked to indicate their degree of agreement on a 6 point scale (1= strongly disagree; 6= strongly agree) to the given statements. Bendixen et al (1998) did a factor analysis to collapse those 32 items into five factors and reported Cronbach values for the factors as .76 for certain knowledge, .87 for innate ability, .74 for quick learning, .67 for simple knowledge, .76 for omniscient authority.

If an individual scored high in one factor it would mean that she or he holds a naive belief about that dimension of epistemological belief. If an individual scores high in certain knowledge, then she or he believes that knowledge is certain and if an individual scores low, then she believes that knowledge is tentative. Similarly, if an individual scores high in innate ability, then it would mean she or he believes that ability to learn is fixed and low score would mean that she or he believes that ability to learn is incremental. I decided to use the epistemological survey developed by Bendixen et al. in my second pilot study because of its high reliability, length and clarity. Although, Bendixen et al. had five factors in their epistemological survey, analysis of my pilot data yielded four factors with high reliability coefficients. In my pilot data, certain knowledge and omniscient authority loaded as a single factor. Cronbach values for the factors were .70 for quick learning, .72 for certain knowledge\omniscient authority, .79 for simple knowledge, and .85 for innate ability (Ravindran, 1998b)

Knowledge Integration Measures.

Since my first pilot data analysis indicated that I needed more sensitive knowledge measures than the ones used in that study, I decided to use part of the exam on motivation and one of the application measures in order to identify better measures for the present study.

Knowledge Integration based on performance on exam items. On the exam, the preservice teachers were asked to identify the motivational problem in three scenarios and to prescribe two solutions to solve the diagnosed motivational problem. The scoring for exam answers was done following the guidelines given below.

Each point or argument made by the participant was scored 1,2 or 3, depending on the amount of elaboration. If the participant provided a reasonable diagnosis, but the diagnosis was not connected to the theoretical concepts learned in class, that answer was scored 1. If the participant diagnosed the problem correctly and referred to the problem using the theoretical concepts learned in the class, then that answer was scored 2. If the participant diagnosed the problem correctly, used the theoretical concepts to describe it, and explained the rationale for her diagnosis, then that answer was scored 3. The prescription part of the answers was scored in the same way. Since the participants could provide multiple arguments for either the diagnosis prompt or the prescription prompt, each of the those arguments was scored using the above method. I have given one example of the questions asked and the diagnostic part of the answers with corresponding scores below.

Question:

Ms. Bunson was trying to figure out why her student Brenda got a D-on her lab report. From the report, it looked like she knew very little about the topic or the experiment it was based on. Ms.Bunson was confused because she remembered that the day of the experiment Brenda was the group member who could explain the findings to the other group members. She wondered whether this was one of those performance goals with uncertain self-efficacy situations.

How would you diagnose Brenda's problem related to motivation beyond what is stated?

Sample answers and scores:

Besides being a performance goal, I think it had something to do with social solidarity. Brenda stepped over her own boundaries when she explained the experiment to her group. She may have felt smart then, but was looked down upon by her peers. In order to show and prove to her friends that she too was not as smart, she goofed-off on the test to look good for her peers. I agree that it is uncertain self-efficacy because Brenda seems to know that she is capable of being smart, she just does not know what to about her intelligence around her peers. (score= 3) Diagnosis and explanation are consistent.

Brenda has social solidarity goals. She knows the material in front of her peers, but does not care for her success. (score= 2) Explanation not consistent with diagnosis.

Brenda has a problem seeing how the class will help her in the future (why is it important) (score= 2) Possible diagnosis, but not enough elaboration.

Brenda could have been under a lot of stress which could have attributed to her bad performance. (score=1) Possible diagnosis, but not connected to the motivational concepts learned in the class.

Using the scoring guideline outlined above, I will obtain a score for both the diagnosis and prescription sections of each of the three scenarios. Then I will add up those scores from the three scenarios to obtain a total score for each participant. I am currently working with another person (Dr. Greene) on scoring in order to obtain a reliable scoring protocol for the study. Initial scoring indicated that scoring criteria might not be capturing the variability. Hence scoring system was revised and used in the next study.

Knowledge Integration based on performance on an application paper. I also used one of the application papers assigned in the class for another knowledge integration measure. The students were asked to write a lesson plan using their knowledge of cognition and motivation. I scored their lesson plans based on their use of concepts applied to cognition and motivation. There are four aspects of the paper (The description of the classroom environment, introduction of the lesson, activities and assessment) which were examined using the guidelines described in Table 1. Initial scoring of the papers indicated that scoring criteria might not be capturing the degree of knowledge integration. Scoring system was revised and used in the next study.

Table 1

Criteria for Scoring Application Papers

Level	Aspects
	Classroom Environment
	Description of the classroom which fosters learning / future utility goal and also promotes self-efficacy and self-regulation using the theoretical concepts learned in the class and explanation .
3	Example: I would like the general climate of my classroom to be comfortable enough for students to feel confident and free to inquire and ask questions. I would desire my students to be willing to participate in classroom discussions and activities and to put forth their best effort. I would like to foster an "I can" attitude and hopefully encourage high self-efficacy and learning goals in my classroom. I also hope to engage the students in declarative, procedural and metacognitive knowledge to enhance the learning experience.

Description of the classroom which fosters learning / future utility goal and also promotes self-efficacy and self-regulation using the theoretical concepts learned in the class but with little or no elaboration.

2 Examples: In general, it is the hope that the class will foster a sense of curiosity, in the students about the world around them and give them tools to find answers to their curiosity.

I would like to foster a learning community type of atmosphere in my classroom that supports choice and autonomy for the children. .

1 Description of the classroom which fosters learning / future utility goal and also promotes self-efficacy and self-regulation without reference to the theoretical concepts learned in the class.

Example: The students need to understand that they are important part of the classroom and that each one of them special.

Introduction of the lesson:

Descriptions of introduction is based on motivation and cognitive principles discussed in terms of motivation.

Example:

3 the topic will be introduced by asking questions about the students idea of poetry. Their schemata will be activated by the question and their use of prior knowledge or relationships with poetry. The advance organizer of brainstorming will also help activate their schemata. The introduction addresses self-efficacy by providing an open floor for any ideas. The question that is asked is not simply, " what is the definition of poetry?" It asks for the students' idea of poetry which will foster high self-efficacy because students will be more confident in offering their ideas than stating a definition. Presenting these ideas will lead into the development of learning goals in which the students aim to know the correct idea and eventually the definition.

Descriptions of introduction is based on motivation and cognitive principles discussed in terms of motivation, but with little or no elaboration.

Example:

2 First I would introduce poetry by asking questions about the students' ideas about poetry. This would help them to activate the schema they have.

Descriptions of introduction is based on motivation and cognitive principles discussed in terms of motivation, but without any reference to theoretical concepts learned in the class.

Example:

1 Begin with a review of other poetic devices previously discussed.

Activities/ Analysis

Description of activities and/or analysis with activities which foster self-efficacy, learning goal, future utility goal, self-regulation, cooperative learning, and deep processing.

Examples:

3 In the exploration phase of the investigation, the students have a hands-on, concrete learning experiences with the phenomenon that they will eventually learn abstractly. In this phase relevant schemata pertaining to pressures are activated......... Again through experiences and observations and through participatory discussions, the students are able to assimilate the new information into existing schemata in order to make the concepts more complete.

The device that helps foster continued motivation the best is the use of groups. This cooperative learning style encourages discussion among group members to arrive at a result.......... this task is designed to make them think cognitively...... showing them how to organize various piece of information ....

3 I know that if I say something that encourages them to look good for others or for them to compare them to others that I will probably impart a performance goal onto their motivation. I do not want this.

Description of activities and/or analysis with activities that foster self-efficacy, learning goal, future utility goal, self-regulation, cooperative learning, and deep processing, but very little or no elaboration .

Example:

2 The students will complete an Acrostic poem and a Shape poem to foster cognitive engagement with the new material. The brainstorming can be done as a class, in cooperative groups, or individually.

Description of activities and/or analysis with activities that foster self-efficacy, learning goal, future utility goal, self-regulation, cooperative earning, and deep processing, but without any reference to the theoretical concepts learned in the class.

Example:

1 As for as activities, a handout will be given with different steps to an experiment and the students will label each part with a step of the scientific method.

0 Analysis or critiquing the aspects that are not consistent with motivational principles.

Assessment:

Evaluation procedures or techniques that emphasize learning goal , future goal, but less emphasis on the performance goal. Or use of multiple mode or alternative mode of evaluation procedures.

Examples:

3 I would read over their responses and look for creativity and logical progression, knowing that I will probably not find that in all of them. Although I would rely on partly on the worksheet for evaluation, I would also rely on my observations of their interaction with others or their engagement with the experiment (for those who work independently). In

this way, I hope to assess not only what they wrote down, but their total involvement with the lesson.

2 Evaluation method that employs more than one mode of assessment techniques, but no elaboration or explanation given as the reasons for using those techniques.

Example:

Students will end this unit by completing a word search containing vocabulary words from the three different countries. Then, discuss that word comes from that country. This will help the teacher to evaluate the students' grasp on the information.

1 Any mention of assessment for the lesson was given a point.

Example;

A test will be given to determine the effectiveness of the lesson.

In each aspect of the description (environment, introduction, activities, and assessment), the participants could provide description of more than one motivational issue and each description will be scored according to the guideline. Some participants did not have any description for one or the other of the four aspects. Then they did not get any point in that aspect. At the end, I will add up all the points to obtain a total score. In conjunction with Dr.Greene, I am still working on how to apply the scoring rubric to achieve reliable scoring.

Goals. As I did in my first pilot study, I used Approaches to Learning Survey developed by Greene and Miller(1996) and by Miller, Greene, Montalvo, Ravindran, and Nichols(1996) to measure goal orientations, cognitive engagement. The description of that survey is given below.

The first part of the survey measures preservice teachers' goal orientations. A goal is defined as an individual's purpose for engaging in a task. Learning goals are concerned with wanting to improve or learn a skill or knowledge. Performance goals are concerned with getting approval from others or in order to prove themselves competent at that task. Future consequence goals are concerned with engaging in a task in order to achieve a distant goal that involves knowledge gained from current task.

There were 5 items for learning goals, 4 items for future goals, and 5 items for performance goals. The participants were asked to mark their choices on a six-point Likert type scale for each item. Cronbach values for goals were .90 for learning goals, .75 for future utility goals, and .87 for performance goals (Ravindran & Greene, 1998b). These Cronbach values were consistent with the values (.82 for learning goal, .69 for future goal, and .87 for performance goal) reported by Miller et al (1996). Each participant received a score for each goal based on their responses to each item and those scores were used in the analysis as learning goal scores, future consequence goal scores, and performance goal. Sample items are shown in Table 2.

Table 2

Sample items

All the following items on the survey used Likert-type scale.
Goals items

Learning goal
I do the work in this class because I want to understand the concepts.
I do the work in this class because I like to acquire new knowledge.

Performance goal
I do the work in this class because I like to perform better than other students.
I do the work in this class because I like others to think I'm smart.

Future consequence goal
I do the work in this class because good grades lead to other things that I want (e.g., money, graduation, good job, certification)
I do the work in this class because being a good teacher in the future is important.
Cognitive engagement items

Deep strategy
While studying course material I compare and contrast different concepts.
I evaluate usefulness of the ideas presented in course materials.

Self-regulation
I make sure I understand material that I study.
I find it difficult to organize my study time effectively (reverse scoring)

Shallow strategy
I write out lists of new terms and definitions
I underline main ideas as I read for course assignments.
Epistemological items

Innate Ability factor
Some people are born with special gifts and talents
some people will never be smart no matter how hard they work

Simple Knowledge factor
Too many theories just complicate things.
Instructors should focus on facts instead of theories.

Certain Knowledge factor\ Omniscient authority factor
Truth means different things to different people (reverse scoring)
Children should be allowed to question their parents' authority. (reverse scoring)

Quick learning factor
If you don't learn something quickly, you won't ever learn it.

Cognitive Engagement.

The next part of the survey asked the participants to report the use of specific strategies they usually use when learning course materials and new concepts. There were eight items to measure the use of deep processing strategies and ten items in shallow processing strategies. There were eight items, which measured the participants' self-regulation techniques. Cronbach values for three variables were .85 for deep processing, .71 for shallow processing, and .77 for self-regulation (Ravindran, 1998b). Each participant received a score for deep processing, shallow processing and self-regulation. Following Greene and Miller (1996), I combined deep processing and self-regulation into one variable as meaningful cognitive engagement (Cronbach alpha .87) and shallow processing as a separate variable. I used two engagement scores in my analysis. The full instrument is included in Appendix section.

Results of pilot study

Data were analyzed to see whether there were relationships among the three goals and the epistemological beliefs. Based on the previous research done on beliefs (Kardash & Scholes, 1996; Qian, 1995; Schommer., 1990,1992) I decided to use the factor scores for the analysis. When simple correlation analyses were done, they indicated that the quick learning factor was negatively related to learning goal, future utility goal, and cognitive engagement (-.46 learning goal, -.30 future utility goal, and -.31 cognitive engagement). But future utility goal was positively related to innate ability and simple knowledge factors (.28 and .26 respectively).

Appendix B

Survey on Goals, Cognitive Engagement and Beliefs

Directions: Before you begin to answer the questionnaire please answer this information sheet by circling the appropriate letter for the following questions.

1. GENDER: a. male b. female

2. Major: Please indicate your major by circling the appropriate letter. If your major is not listed below, then write your major in the space marked other.
   a. Early Childhood Education
   b. Elementary Education
   c. English
   d. Foreign languages
   e. Math Education
   f. Music Education
   g. Science education
   h. Social studies Education
   i. Special education
   k. Other.

3. Education: Please indicate your grade level by circling the appropriate letter.
   a. Sophomore
   b. Junior
   c. Senior
   d. Graduate Student

4. Please indicate the grade level that you are planning to teach.
   a. Early Childhood
   b. Elementary
   c. Middle school \ Junior High
   d. High School
   e. K-12
   f. Other

Survey on Cognition and Motivation

Part 1--Directions: The following statements represent reasons that students might have for doing school work. Read each statement and indicate whether you agree that it is one of your reasons for doing the work in this class. Use the 6-point scale below and fill in the number of your response on the answer sheet provided.

Strongly Disagree = 1 ____________________ Strongly Agree = 6

1. I do the work in this class because I want to understand the concepts. 1 2 3 4 5 6

2. I do the work in this class because I like to perform better than other students. 1 2 3 4 5 6

3. I do the work in this class because I like learning new material or ideas. 1 2 3 4 5 6

4. I do the work in this class because I want the instructor to be happy with me 1 2 3 4 5 6

5. I do the work in this class because I want to be a good teacher in the future. 1 2 3 4 5 6

6. I do the work in this class because I don't want others to think I'm not smart. 1 2 3 4 5 6

7. I do the work in this class because I like the challenge of learning new things. 1 2 3 4 5 6

8. I do the work in this class because good grades lead to other things that I want (e.g., money, graduation, good job, certification). 1 2 3 4 5 6

9. I do the work in this class because I like to look capable to my peers and friends. 1 2 3 4 5 6

10. I do the work in this class because being a good teacher in the future is important to me. 1 2 3 4 5 6

11. I do the work in this class because I like to understand what I am learning. 1 2 3 4 5 6

Strongly Disagree = 1 ______________________ Strongly Agree = 6

12. I do the work in this class because I don't want the instructor to be unhappy with me. 1 2 3 4 5 6

13. I do the work in this class because I like to acquire new knowledge. 1 2 3 4 5 6

14. I do the work in this class because I like others to think I'm smart. 1 2 3 4 5 6

15. I do the work in this class because I don't want to look foolish or stupid to my peers or to my instructor. 1 2 3 4 5 6

16. I do the work in this class because that is what the instructor expects me to do. 1 2 3 4 5 6

17. I do the work in this class because my grades have important consequences for my future (e.g., money, graduation, good job, certification). 1 2 3 4 5 6

18. I do the work in this class because I want to please the instructor. 1 2 3 4 5 6

Part 2--Directions: Read each statement carefully. Respond to the statements along the following 6-point scale.

Strongly Disagree = 1 ______________________ StronglyAgree = 6

19. Compared with other students in this class I don't know very much about the subject. 1 2 3 4 5 6

20. I understand the ideas being taught in this course. 1 2 3 4 5 6

21. I am doing well in this class compared to others. 1 2 3 4 5 6

22. Compared with other students in this class I think I am doing well. 1 2 3 4 5 6

23. My knowledge and skills are better than those of other students in this class. 1 2 3 4 5 6

Strongly Disagree = 1 ______________________ Strongly Agree = 6

24. I can do the work in this class. 1 2 3 4 5 6

25. In a next course in this area I would probably have difficulty understanding the material. 1 2 3 4 5 6

26. I have limited understanding of the concepts in this class. 1 2 3 4 5 6

Part 3--Directions: The statements below deal with specific study strategies that you may use for this class. Read each statement carefully. Fill in the number of your response on the answer sheet provided.

Strongly Disagree = 1 ______________________ StronglyAgree = 6

27. When learning new material, I summarize it in my own words. 1 2 3 4 5 6

28. If I have trouble understanding course material I go over it again until I understand it. 1 2 3 4 5 6

29. As I progress through the course I have a clear idea of what I am trying to accomplish. 1 2 3 4 5 6

30. I underline details as I read for course assignments. 1 2 3 4 5 6

31. I put together ideas or concepts and draw conclusions which are not directly stated in course materials. 1 2 3 4 5 6

32. I ask questions when I don't understand something in my readings or something said during lecture. 1 2 3 4 5 6

33. Before a quiz or exam, I plan out how I will study the material. 1 2 3 4 5 6

34. It is easy for me to establish learning goals for this class. 1 2 3 4 5 6

35. While studying course material I compare and contrast different concepts. 1 2 3 4 5 6

36. I underline main ideas as I read for course assignments. 1 2 3 4 5 6

Strongly Disagree = 1 ______________________ Strongly Agree = 6

37.	In order for me to understand what technical terms mean, I memorize the text-book definitions.	1 2 3 4 5 6
38.	I mentally combine different pieces of information from course materials into some order that makes sense to me.	1 2 3 4 5 6
39.	I mainly read the course materials to get the information needed for the tests.	1 2 3 4 5 6
40.	When I study I take note of what material I have or have not understood.	1 2 3 4 5 6
41.	I find it difficult to organize my study time effectively.	1 2 3 4 5 6
42.	I try and write down exactly what my instructor says during lectures.	1 2 3 4 5 6
43.	I recopy my notes from class to help learn the material.	1 2 3 4 5 6
44.	I learn new material by mentally associating new ideas with similar ideas that I already know.	1 2 3 4 5 6
45.	When doing the reading for class I try to figure out what part of the reading will be on the test.	1 2 3 4 5 6
46.	I write out lists of new terms and definitions.	1 2 3 4 5 6
47.	I copy down details exactly as they are stated in my readings.	1 2 3 4 5 6
48.	I mentally combine different pieces of information from course material together	1 2 3 4 5 6
49.	I make sure I understand material that I study.	1 2 3 4 5 6
50.	I copy down main ideas exactly as they are stated in my readings or by my instructor.	1 2 3 4 5 6
51.	I evaluate usefulness of the ideas presented in course materials.	1 2 3 4 5 6
52.	While learning new concepts, I try to think of practical applications.	1 2 3 4 5 6

Epistemological Beliefs survey

Directions: Please read the following statements and then mark your degree of agreement by circling appropriate number.

Strongly Disagree = 1 ______________________ Strongly Agree = 6

53.	It bothers me when instructors don't tell students the answers to complicated problems.	1 2 3 4 5 6
54.	Truth means different things to different people.	1 2 3 4 5 6
55.	Students who learn things quickly are the most successful .	1 2 3 4 5 6
56.	People should always obey the law.	1 2 3 4 5 6
57.	Some people will never be smart no matter how hard they work.	1 2 3 4 5 6
58.	Absolute moral truth does not exist.	1 2 3 4 5 6
59.	Parents should teach their children all there is to know about life.	1 2 3 4 5 6
60.	Really smart students don't have to work as hard to do well in school.	1 2 3 4 5 6
61.	If a person tries too hard to understand a problem, they will most likely end up being confused.	1 2 3 4 5 6
62.	Too many theories just complicate things.	1 2 3 4 5 6
63.	The best ideas are often the most simple.	1 2 3 4 5 6
64.	People can't do too much about how smart they are.	1 2 3 4 5 6
65.	Instructors should focus on facts instead of theories.	1 2 3 4 5 6
66.	I like teachers who present several competing theories and let their students decide which is best.	1 2 3 4 5 6
67.	How well you do well in school depends on how smart you are .	1 2 3 4 5 6

Strongly Disagree = 1 ______________________ Strongly Agree = 6

68. If you don't learn something quickly, you won't ever learn it.		1 2 3 4 5 6
69. Some people just have a knack for learning and others don't.		1 2 3 4 5 6
70. Things are simpler than most professors would have you believe.		1 2 3 4 5 6
71. If two people are arguing about something, at least one of them must be wrong.		1 2 3 4 5 6
72. Children should be allowed to question their parents' authority.		1 2 3 4 5 6
73. If you haven't understood a chapter the first time through, going back over it won't help.		1 2 3 4 5 6
74. Science is easy to understand because it contains so many facts.		1 2 3 4 5 6
75. The moral rules I live by apply to everyone.		1 2 3 4 5 6
76. The more you know about a topic, the more there is to know.		1 2 3 4 5 6
77. What is true today will be true tomorrow.		1 2 3 4 5 6
78. Smart people are born that way.		1 2 3 4 5 6
79. When someone in authority tells me what to do, I usually do it.		1 2 3 4 5 6
80. People who question authority are trouble makers.		1 2 3 4 5 6
81. Working on a problem with no quick solution is a waste of time.		1 2 3 4 5 6
82. You can study something for years and still not really understand it.		1 2 3 4 5 6
83. Sometimes there are no right answers to life's big problems.		1 2 3 4 5 6
84. Some people are born with special gifts and talents.		1 2 3 4 5 6

Knowledge Integration Measure 1

Motivation exam questions

1. Ms. Bunson was trying to figure out why her student Brenda got a D-on her lab report. From the report, it looked like she knew very little about the topic or the experiment it was based on. Ms. Bunson was confused because she remembered that the day of the experiment Brenda was the group member who could explain the findings to the other group members.
   How would you diagnose Brenda's problem related to motivation ?
   What are two approaches you would recommend to Ms. Bunson for encouraging more positive motivation in Brenda?

2. James was feeling bad about a D-on a biology report, but he felt even worse when Ms. Bunson told him she was very disappointed in his grade and hoped he would try harder next time. James thought that this was strong evidence for his lack of ability because he really worked hard on it.
   How would you diagnose James's problem related to motivation? Be sure to include what Ms. Bunson did that hurt his motivation.
   What are two approaches Ms. Bunson should now take to encourage more positive motivation in James?

3. Janelle received an F on her project in social studies. She doesn't feel too bad because she attributed her failure to external circumstances. Mr. Atlas noted that Janelle's F on her unit project was consistent with her overall performance in class. She just doesn't seem to try. He is worried because she seems to have friends who also don't care about school, learning, or their futures.
   How would you diagnose Janelle's problem related to motivation?
   What are two approaches Mr. Atlas should now take to encourage more positive motivation in Janelle?

Knowledge Integration Measure 2

Instructions for Application paper

Describe, in a short paper, how you would use the ideas from the cognitive approach to learning (unit 1) and the Maehr model of motivation (unit 2) to plan for instruction. Think through and describe a lesson from your future teacher area. You can either think about a day's lesson within a larger unit or the larger unit.

Include all of the following:

1. First describe the setting for this hypothetical lesson a bit, e.g., nature of unit and grade level. Describe the general climate you will try to foster in your classroom.
2. Describe the type(s) of knowledge you have as the goal(s) for the lesson --declarative, procedural, metacognitive.
3. Describe the instructional steps (outline a lesson plan) including the relevant cognitive and motivational principles that we have discussed in class and/or that you learned from the text. Include points A. to D. below in your lesson description.

    A. How would you introduce the topic? How would you activate their schemata? How does the introduction address self-efficacy and goals?
    B. What else would you, the teacher, do (e.g., demonstrate, discuss, etc.)
    How would you encourage ongoing motivation?
    C. What activities would students complete (they need some type of cognitive engagement with the new material)
    D. How would you determine if they learned or if they lesson was effective?

Don't forget that the point is for you to use the principles from units 1 and 2 to plan a lesson--- so use the language from this course (terminology) to describe your plan

Table 1
Key for Items from the Survey Approaches to Goals, Cognitive Engagement, and Epistemological Beliefs
Goals and Cognitive Engagement
Learning Goals
Items: 1, 3, 7, 11, 13
Performance Goals
Items: 2, 6, 9, 14, 15
Future Goals
Items: 8, 17
Meaningful Cogitive Engagement
Items: 27, 31, 33, 34, 35, 38, 44, 48, 49, 51, 52
Shallow Cognitive Egagement
Items: 37, 39, 42, 43, 45, 46, 47, 50
Epistemological Beliefs
Innate Ability
Items: 55, 60, 64, 67, 69, 78, 84
Certain Knowledge
Items: 54*, 72*, 74, 75, 77, 79, 80
Quick Learning
Items: 57, 68, 71, 73, 81
Simple Knowledge
Items: 53, 59, 61, 62, 63, 65, 70
Omniscient Authority
Items: 56, 58*, 66*, 76*, 82*, 83*
Note: *= Reverse Scoring.

Appendix C

Example Answers from the knowledge integration paper measure

Score	<u>Criteria for Scoring Motivation Exam Answers</u> Criteria
	Diagnosis Part
4	The participant integrated more than one motivational concept (self-efficacy, multiple goals, and attribution) learned in the class in the diagnosis and provided a theoretically accurate explanation for the diagnosis. Example: Since James felt he worked hard (internal, unstable) and still failed, he could be on the path to learned helplessness. Ms. Bunson added to the problem by lowering the feelings James had about his abilities (internal,stable).
3	The participant diagnosed the problem correctly, used more than one motivational concepts to describe it, and provided rationale for the diagnosis, but did not integrate the two concepts in the answer. Example: Brenda may have social solidarity and /or performance goals. This means she may not want to perform too well in front of her peers so she might not put in effort for fear of failure.
2	The participant diagnosed the problem correctly, used the theoretical concepts to describe it, and explained the rationale for the diagnosis. Example: Performance goal. She was afraid to look incompetent so she didn't use any effort as an excuse.
1	The participant diagnosed the problem correctly and referred to the problem using the theoretical concepts learned in the class but did not provide any explanation. Example: Performance goal.
0	The participant did not provide any reasonable diagnosis, or provided a reasonable diagnosis that did not fit with the given task (i.e., not about concepts learned in the class). Examples: She is motivated not to do well in school since her immediate goals are being met (did not provide a diagnosis). Brenda did poorly on her report due to negative external circumstances. Something could have happened to Brenda such as illness,

death in her family, etc., (provided a diagnosis, but it was not connected with the theoretical concepts learned in class).

Prescriptions Part

4 The prescription was consistent with the given diagnosis and integrated multiple concepts of motivation along with the rationale.

Example: Her friends don't try or do well so she could have negative social solidarity goals to not seem like a 'dork' in front of her peers, and therefore doesn't try to do well. (diagnosis part = 2).
Mr. Atlas should encourage meaningful learning and point out to Janelle how social studies can be applied in her future. He needs to point to her that she can learn by trying new strategies and make her responsible for her learning. He could also try to do group work and place Janelle in a group of students who care about learning and would like to help her- especially keep her away from those peers who don't care - may be even make up a new seating chart. (Prescription part- consistent with diagnosis, integrated multiple concepts of motivation, and a rationale was included).

3 The prescription was consistent with the diagnosis that contained more than one motivational concept and the rationale for that prescription was also included. But the multiple concepts were unconnected.

Example: Brenda may have social solidarity and /or performance goals. This means she may not want to perform too well in front of her peers, or she might not put in effort in fear of failure. (diagnosis part= two concepts with explanation, but unconnected)

Ms. Bunson should stress that Brenda has abilities since she has demonstrated them in lab. Ms. Bunson needs to encourage effort, even if it originally leads to some extrinsic goal. Ms. Bunson should probably do this in a private manner since public mention might be detrimental if this is a social solidarity problem. (prescription was consistent with diagnosis, explanation was included, multiple concepts of motivation, but two concepts were unconnected).

2 The prescription was consistent with the given diagnosis and rationale was given for the given prescription.

Example: Brenda may have low self-efficacy, because although she may understood during the experiment it seems like she does not have enough confidence in her written report (diagnosis part).
The teacher should present Brenda with a new open approach to writing her lab report. Ex: tell Brenda to write her report as if she were teaching

her other group members. (prescription was consistent with the diagnosis and explanation was given).

1 The prescription was consistent with the given diagnostic part, but no explanation for that prescription was given.

Example: Her peers may think uncool to do well so she put little effort in to the report. (diagnosis part).
Explain importance of doing well for future (college\career). (prescription was consistent with the diagnosis, but no explanation was given).

0 The prescription did not match the given diagnosis.

Example: Janelle probably has social solidarity goals and approaches school in the same manner as her group of friends. (diagnosis part =1; reasonable diagnosis, no explanation).

Although this may be difficult, Mr. Atlas needs to find something Janelle is interested in and somehow link it to his class. Somehow Mr.Atlas must encourage Janelle to use her abilities that she believes she has. If Janelle thinks her failure is something external, perhaps he can involve her with one of her noticeable abilities. (prescription did not match the given diagnosis).

Note: " Reasonable" means diagnosis tied to the course conceptions of motivation taught in the course.

Level	Criteria for Scoring Application Papers Aspects and Examples
	Classroom Environment
4	Description of the classroom environment that fosters meaningful cognitive engagement (deep processing and self-regulation) and multiple concepts of motivation discussed in the class (learning goals, future goals, self-efficacy, and cooperative learning). An explanation was included by integrating more than one motivational concept and cognitive principles. Example: None.
3	Description of the classroom environment that fosters meaningful cognitive engagement (deep processing and self-regulation) and/or multiple concepts of motivation discussed in the class (learning goals, future goals, self-efficacy, and cooperative learning). The explanation was included but multiple concepts were unconnected. Example: Within the classroom I hope to foster a relaxed situation where the students feel free to express their ideas. Students should feel comfortable brainstorming and allow themselves to make mistakes which they can learn from. One ongoing requirement for the class will be student journals. The journals will constitute a major portion of their grade. Within their journals they will keep track of daily assignments and concepts. This should teach them the organization and note taking skills which they will need in college, as well as give them practice in putting their ideas on paper.
2	Description of the classroom environment that fosters at least one meaningful cognitive engagement (deep processing and self-regulation) and/or one concept of motivation discussed in the class (learning goals, future goals, self-efficacy and cooperative learning) with an explanation. Example: Since this is their first time to be exposed to graphing, they have no past experience to work with, so I would use forms of persuasion (i.e. "It's not very hard"; "Just take it one step at a time"; "Everyone CAN DO THIS") to help build high, positive self-efficacy. Through strong encouragement in my classroom, I plan to promote a comfortable, respectful, I can do anything, there are no limits, and I will succeed-type environment. No one loses in my class.

1 Description of the classroom environment that fosters at least one meaningful cognitive engagement (deep processing and self-regulation) and/or one concept motivation discussed in the class (learning goals, future goals, self-efficacy, and cooperative learning) with no explanation.

Example: I will try to establish a light atmosphere yet still remain in control. I want to make the students feel responsible for their own learning, yet maintain authority. The climate most comfortable for me and I hope my students as well will be one of intellectual challenge and fun too.

0 No description of the classroom environment, or description of the classroom that did not indicate the fostering of meaningful cognitive engagement (deep processing and self-regulation) and/or one concept of motivation discussed in the class (learning goals, future goals, self-efficacy, and cooperative learning)

Example: The students need to understand that they are an important part of the classroom and that each one of them is special.

Introduction of the lesson:

4 Descriptions of introduction contained more than one concept of motivation and cognitive principles discussed in the class and the explanation indicated an integration of those multiple concepts.

Example: I would introduce the topic and at the same time activate the students' schemata by use of an informal discussion about space to assess what the children already knew about the subject. We would make two columns on the chalk board. One would be for what we already know about space and the other would be for what we want to learn about it or may be for what we want to learn more about. This is a good way to get the children intrinsically interested in the material. Getting them excited about learning will spur most of them on to activate learning goals for themselves. I would tell them that learning about space is exciting and fun. I would tell them that in coming weeks we will do a lot of interesting group and class projects as we explore space, perform presentations on learned information, watch videos about far away places in our solar system and last but certainly not least visit the Omniplex in Oklahoma City to do more fun, hands-on learning. This type of introduction would establish a foundation for learning goals and though a few children's negative self-efficacy ideas would be present when they hear about future presentations (public speaking) most would be just fine with it. Some future goals could be established here also if I were to find out more about some children who wanted to be scientists in the future. I could also bring in relevant magazine and newspaper clippings that show the importance of the information that we would be learning that would be used in the children's present or future lives.

3 Descriptions of introduction contained more than one concept of motivation and cognitive principles discussed in the class and an explanation was included, but multiple concepts were unconnected.

Example: To introduce fractions I would begin by activating prior schemata and by engaging their motivation by recalling a past experience. In order to do this I would begin by asking the class if anyone has any siblings. Then I would ask one of those students if his/her mom or dad had ever given the two of them something like an apple or candy bar and told them to split it in half and share. This should get them thinking about pieces or parts of a whole object. The discussion would continue by demonstrating how these pieces can be represented by fraction. We would then discuss other possible real-world fraction applications and form a list.

2 Descriptions of introduction contained at least one concept of motivation discussed in the class and an explanation was included.

Example: In introducing the topic I will first foster a discussion about parts of speech and describe each part of speech and provide them with an example of each. I will ask children to tell me what they think parts of speech are and why we use them in our writing. For example, noun-bird, verb-run, adverb- quietly, and so on. After the students give me their definitions of what they think part of speech are I will encourage them to make a column, one side titled parts of speech and the other titled examples. This will help the students activate their current schema. By creating two columns the students can make connections between the different parts of speech and each function.

1 Descriptions of introduction was based on motivation or cognition, but no explanation was given.

Example: Explain to the students what origami is and show them the final outcome of figures that I will have already made.

0 Description of introduction did not mention any motivational concepts discussed in the class.

Example: I would begin the lesson handing out the class outline.

Activities/ Analysis

4 Description of activities that contained more than one concept of motivation and cognitive principles discussed in the class, and the explanation indicated an integration of those multiple concepts. **OR** Analysis of the lesson that included multiple concepts of motivation, cognitive aspects of the lesson, and pros and cons of those aspects.

Activity Example: Once the class understood this, I would assign a small group assignment. It would consist of real world problems as well as classic book problems. Allowing the students to work together provides them with other sources of information and multiple links in their memory, which will lead to more possible points for schema to be reactivated later in recollection. It also builds solidarity as a group. Group work can also increase motivation, and foster positive, high self-efficacy. Group work also provides another "teacher." A student who understands the material can assist those who are still unsure of themselves and the assignment. Many times another student can explain an assignment or concept to another student better than the teacher. This allows more avenue for success. One student is successful in mastering the skill and assisting a fellow student and the student may then understand the concept and be successful. This would boost both students' self-efficacy and make them more confident in a similar lessons to come.

Analysis example: None.

3 Description of activities that contained more than one concept of motivation and cognitive principles discussed in the class and an explanation was included, but the concepts were unconnected. **OR** Analysis of the lesson that included multiple concepts of motivation, cognitive aspects of the lesson, and pros and cons of those aspects. But the analysis of different aspects were not connected.

Activity example: Following the discussion, the students would practice electrons on electron distribution diagrams. This would be done with small candies such as M& Ms or skittles that they place facing up or down the diagram to represent electron's spin orientation. This hands-on experience will sustain their attention and add a quite bit of elaboration to their schemas so the lesson will not son be forgotten. This gives them practice to reinforce their declarative knowledge and become experts in the procedure of predicting the placement of electrons.

Analysis example: In my future lesson plans I would try to incorporate what I have learned about motivation and cognition. I have especially benefited from what I have learned about goals. Students need to be more encouraged to have learning goals by being given assignments that are interesting to them as well as educational. To encourage self-efficacy as a teacher I plan to pay attention to each one and learn their names and encourage them for trying. I want to reward students for class participation and encourage their off the wall ideas about certain subjects so that they will know that they can think and are intelligent.

2 Description of activities that contained at least one concept of motivation discussed in the class and an explanation was included. **OR** Analysis of the lesson that critiqued at least one aspect of motivation.

Activity example: The students would be expected to move on to the lesson activity. I would make the first combination with the help of the students. They would then be given a few minutes to work on the problem by themselves while I walk around and observe them. each student would be expected to put a different combination sequence on the board and tell how they got it. The students would be given a worksheet to do for homework.
Analysis example: This lesson is full of ways to build a student up. It gives them opportunities to show they can do it but it also helps them when they struggle by building in a number of ways that the information is presented. If they did not understand it the first time, perhaps they will understand it the second time or third. Also, it uses many of the senses. They hear the story, they can draw or color which is using tactile senses, and they can see the timelines completed to make an abstract concept more concrete. This lesson also uses a variety of teaching styles to reach students with different learning styles and interests as well as different motivational goals. Those that like to hear directions will benefit from the introduction whereas the students that are more visual will like the timeline activity. The students that are intrinsically motivated will do well (obviously). and the students that are more extrinsically motivated will have a concrete project to show for their hard work at the end. However, if that is not to enough, a wise teacher can always build more motivation into the plan. For example, a behavior chart could be introduced and can be used throughout the day and not just during the lesson. Also, students could be allowed, if the weather permits, to find crickets or other creatures outside and keep them in the classroom fro a day or two. This could lead nicely into a science lesson.

1 Description of activities that contained at least one concept of motivation discussed in the class but no explanation was included. **OR** Analysis of the lesson that critiqued at least one aspect of motivation discussed in the class.
Activity example: Group the students together randomly and assign each group to a country, making sure to include: Britain, France, U.S., Italy, Germany, and Japan. Students can decide to be certain national leaders for the group process, but the point is to role play each main political

leader, not to create their own production of revisionist history through generalizations.

Analysis example: My main objective was to make the lesson easy to understand so that they could use the knowledge in the future. I didn't go real depth as I would if I was teaching a geography major, just enough to introduce them to maps. I figured by making the lessons or assignment easy it would raise the students' self-efficacy in dealing with maps. So many children I see are baffled by maps and find them difficult to interpret .I was hopefully able to demonstrate that maps are not difficult to use and encourage the steadiest to use them more in the future.

0 Description of activities did not mention any motivational concepts discussed in the class.

Example: The only activities needed of the students would be their questions and notes.

Assessment:

4 Description of evaluation procedures or techniques that contained more than one concept of motivation and cognitive principles discussed in the class. An explanation indicated an integration of those multiple concepts.

Example: To determine if the students had learned how to read and use maps, I would have them draw up their own maps of their own of what ever they wanted. Their maps would have include distinct borders and a key that was consistent with the contents of the map they were to draw. Since the exercise is learning goal oriented, if the students in my class were able to complete their own map and it was clearly legible and effective in helping to understand something about the place they were mapping it would be undoubtedly raise their self-efficacy about their ability to read maps. I believe that using the advanced organizers as well as doing the previous exercises would work as schema activators and dramatically increase their ability to use and understand maps and their importance in the classroom.

3 Description of evaluation procedures or techniques that contained more than one concept of motivation and cognitive principles discussed in the class and an explanation was included, but the concepts were unconnected.

Example: I will evaluate how the students are doing and if they learned the lesson by taking up their papers and also by walking around to each pair and listening and observing each student. I will also ask each group what they thought of the activity in order to get an idea if the lesson was effective or not. Hopefully, by allowing the students to work in groups, the students will have a higher self-efficacy towards the material because there is no pressure of being on the spot or in front of the class. Also by attempting to instill future utility goals within the students, it will create a motivation to learn how to calculate total, subtotal, and tip because it will be necessary to know these skills throughout their entire lives.

2 Description of evaluation procedures and techniques that contained at least one concept of motivation discussed in the class and an explanation was included.

Example: To determine the students' level of comprehension, I would observe them as they completed their assignments and answer any questions. I would allow them to have relevant conversations about the material and help each other with the assignment to incorporate some of the benefits of group learning. For the students who seem to be relying too heavily on their peers, I would briefly ask them to justify their solutions to determine if they learned the material. By making observations concerning how well the students enjoy the assignment, how quickly they become distracted, how motivated they are to learn this and how accurately they represent this learning on their diagrams, I will be able to discern the students' level of comprehension and the overall effectiveness of the lesson.

1 Description of evaluation procedures and techniques that contained at least one concept of motivation discussed in the class but no explanation was included.

Example: After the students have had a chance to work with fractions and develop their understanding of them I would give the students an individual assignment much like the group assignment. If the individual assignment showed that only a few actually mastered the skill, then I would provide more work with fractions, probably with some type of object manipulation activity.

0 Description of evaluation procedures or techniques did not include any motivational concepts discussed in the class, or no description of evaluation procedures.

Example: I will then summarize the lesson and have the class tell me what they learned. This would assure me that the students learned what was intended by the lesson.