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**THE EFFECTS OF TEACHERS' FLOW EXPERIENCES
ON THE COGNITIVE ENGAGEMENT OF STUDENTS**

by

Nian Q. Zhu

**A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Education**

University of San Diego

2001

Dissertation Committee

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ABSTRACT

The purpose of this quantitative study was to investigate the relationship between teachers' flow experiences and student cognitive engagement during class time. Study participants consisted of students and their teachers in grades 6 through 10 from a number of elementary and secondary schools in the Fraser Valley region of British Columbia, Canada. Data were collected through the use of the Experience-Sampling Method, originally developed by Csikszentmihalyi to investigate flow experiences, that allowed teachers and students to fill out sampling forms in response to randomly generated electronic signals transmitted to pagers or wrist watches that the teachers wore. Data were collected from a total of 190 classes, generating 5047 individual observations on students cognitive engagement. Multiple regression analysis was then used to address the following two research questions:

1. Are there differences in the cognitive engagement of students when their teachers are experiencing flow?
2. To what extent are these differences in cognitive engagement influenced by grade level, subject matter, time-of-day, instructional method, and the gender composition of the class and instructor?

Findings from this study suggest that a strong statistical relationship exists between teachers' flow experiences and the cognitive engagement of their students. Specifically, when teachers were experiencing flow, 25 percent more of the students in class were cognitively engaged than when teachers were not experiencing flow. Results from the regression analysis also indicate that grade level, subject matter, and the gender

composition of the class were also significant determinants of the cognitive engagement of students. Taken together, the findings from this study demonstrate the importance of the psychological connection between teachers and their students in the classroom.

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My sincere thanks also go to Dr. B. Hansen, my committee member, who carefully and critically read many versions of my dissertation draft. I wish to emphasize

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Nian Q. Zhu

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CHAPTER I

THE PURPOSE OF THE STUDY

Introduction

The significance of student cognitive engagement, or time-on-task, has long been underestimated in its impact on educational improvement. Inattention to teacher's lectures, disengagement from classroom tasks, and feelings of boredom at school are part of the current rhetoric about the rising tide of mediocrity and the continuous outcry for change in today's public education. Csikszentmihalyi and Larson (1984) reported that, "in a typical 50-minute high school classroom lecture... at least half the time the student is not really thinking about anything even remotely related to the lecture or to the subject matter" (p. 257). Their research findings also indicated that, "of all the places teenagers hang out, the school is the one place they least wish to be. Moreover, when they are in school, the classroom is the one place they most strongly wish to avoid. They far prefer the cafeteria, the library, or the hallways" (Csikszentmihalyi & McCormack, 1986, p. 417). According to a similar study by Shernoff et al. (1999), "with today's students psychologically absent nearly half of the time they are in classrooms, ... student disengagement appears to be as profound and pervasive as ever before" (p. 2).

In a study of boredom in the middle school years, Larson and Richards (1991) warn that, “this boredom lowers the quality of students’ lives in school and probably has a demoralizing effect on teachers as well” (p. 418). Perceiving cognitive engagement as one very important factor in learning, many researchers have suggested that the amount of time a student spends engaged in learning is a significant predictor of achievement (Fisher et al., 1980; Peterson et al., 1982; Rich & McNelis, 1996). The current situation regarding students’ inattention in class leads to many questions. Both the general public and researchers are asking: What are students thinking and doing in class if they are not cognitively engaged in organized activity? How much can today’s teenage students be encouraged to focus on tasks, and involve themselves in organized activities during class? Why are so many students unmotivated to learn and inattentive to school work? And ultimately, what and how can educators find a path to help students engage cognitively in class so as to increase their achievement?

Over decades, studies have indicated that student cognitive engagement is closely affected by such factors as the nature of work (Brophy et al., 1983; Blumenfeld, 1992; Pintrich & Roeser, 1994; Howard, 1996); goal orientation and interests (Meece et al., 1988; Pintrich & Schrauben, 1992; Greene, & Miller, 1996; Harp & Mayer, 1997; Garcia et al., 1998; Husman & Lens, 1999); and levels of challenge and feedback, (Csikszentmihalyi et al., 1993; Butler & Winne, 1995; Shernoff et al., 1999). Although these factors are thought to be most influential on cognitive engagement, there have been also many other factors that are considered both important and relevant by researchers. Following is a list of factors as identified by various researchers: 1) choices and control over school work (Cooper et al., 1979; Ames & Ames, 1985; Plant & Ryan, 1985;

Bandura, 1986; Schraw et al., 1998; Shernoff et al., 1999); 2) self-efficacy (Bandura, 1986, 1993; Schunk, 1991; Lee & Anderson, 1993; Zimmerman, 2000); 3) beliefs about the role of ability versus effort in academic performance (Covington & Omelich, 1985); 4) learned helplessness (Diener & Dweck, 1980; Lee & Anderson, 1993); and 5) teacher's use of strategies such as questioning and critical thinking (Winne, 1979; Gray, 1993; Wentzel, 1997; Altermatt et al., 1998). These factors are incorporated into the literature review in chapter 2.

Student cognitive engagement involves not only students, but also teachers. An examination of the current literature reveals a lack of research on the relationship between the teachers' psychological state and student cognitive engagement. As such, there is a need for studies to examine the link between student cognitive engagement and environmental factors, particularly teacher's psychological states while teaching. If we acknowledge the importance of the teacher's impact on student cognitive engagement, then it makes sense to investigate the prime psychological conditions required to provide optimal learning and achievement.

Flow, as both a theory and concept, investigates psychological states of consciousness that provides the "optimal experience" (Csikszentmihalyi & Csikszentmihalyi, 1988). Due to the fact that it becomes intrinsically rewarding, such an optimal experience is called an *autotelic* experience—enjoying performing a task for its own sake. Therefore, when teachers are in flow during teaching, they empower students to take control of their learning by enlisting students' interest, by helping students establish their goals, and by providing clear feedback to students regarding their performance. One of the characteristics of flow experiences is high concentration.

According to Csikszentmihalyi (1997b), when a teacher is in flow, it is easier for students to be in flow too (p. 33). This underscores not only the relationship between teachers' and students' flow, but also the importance of teachers' psychological states on student cognitive engagement in the classroom.

Statement of the Problem

Too little is understood about the effect of teachers' flow upon student cognitive engagement in the classroom. This research, then, is designed to examine the relationship between teachers' flow experiences and student cognitive engagement in class. There are numerous reasons why students avoid cognitive engagement in class. For example, Lee and Anderson (1993) suggest that feelings of alienation and negative attitudes, unproductive goal orientations concerning excessive ego and social involvement at the expense of task involvement, low self-efficacy and maladaptive causal attributions, conflicting beliefs about the role of ability versus effort in academic performance and learned helplessness are only a few of these reasons (p. 587). Students' inattention and disengagement in class has not only been attributed to low achievement scores on standardized tests, but also to why students often feel unmotivated in school. In order to understand the problem of student disengagement in class, aspects of student motivation and the learning environment itself need to be carefully examined. One effective way to examine the learning environment is through the analysis of important environment factors, most notably, the teachers' psychological state in the classroom. The literature claims that, when teachers are in flow, they tend to empower and motivate students more effectively (Caouette, 1995; Csikszentmihalyi, 1997b; Frase, 1998; Shernoff et al., 1999;

Cothran & Ennis, 2000), resulting in increased achievement. Yet, for teachers to experience flow in the classroom, several factors must come into play.

When examining how the efforts of school administrators can create a positive environment for teachers and student achievement, Frase considers three principal activities that have a positive influence on teachers' frequency of flow and students' achievement: teacher evaluation, professional development, and principal management (1998, p. 2). Teachers are one of the main sources of student motivation and learning. Whether a student is cognitively engaged in class relates to factors such as the teacher's planning, and perhaps more importantly, teacher's psychological states. If a relationship exists between teachers' flow and student cognitive engagement, student engagement levels may rise with increased teachers' flow.

In 1983, the report A Nation at Risk claimed that, the "average achievement of high school students on most standardized tests is now lower than 26 years ago when Sputnik was launched" (p. 8). However, for the past thirty years, public education has faced increasing challenges in teaching. Students come from a wide range of social, cultural, and economical backgrounds, yet, in spite of their differences, one problem common to most teenage students is the difficulty of cognitive engagement in class. In response to this issue, Csikszentmihalyi (1997b) stated, "the problem is that they [students] don't want to get involved, they don't want to learn... the problem is affective, emotional, motivational, and not intellectual, not cognitive" (p. 4). In order to understand these problems, educational leaders at Provincial and Federal levels must look for causes and their solutions. Educational reform will require rethinking how students spend their time in class and at school. As Rubin (1985) suggested, "Motivation (the desire to learn),

involvement (an active interest in what is being taught), and concentration (sustained focus on the task) are of great significance in the classroom. Aside from their command of subject and method, great teachers excel at encouraging these qualities in their students” (p. 8). Not only educators, but educational leaders need to ask, “What are students actually doing in class? What are they thinking about when the teacher is teaching? What are their feelings in the classroom? How much do they pay attention?” If we can answer even some of these questions, then we can help increase student cognitive engagement in the classroom.

Importance and Significance of the Research

To date, there has been little research or inquiry into the area of teachers’ flow experiences in relation to student cognitive engagement. As Frase (1998) has noted, “studies that demonstrate linkages between teachers’ flow experiences and students flow experiences and learning should be conducted. As of yet, literature searches reveal no formal studies addressing this question” (p. 16). A review of literature indicates that little research has been conducted on teachers’ in-class psychological state, specifically in relation to flow experiences as an influence indicator for student cognitive engagement and achievement. “Only a few studies have directly analyzed how teaching practices contribute to variations in student engagement (e.g., Meece 1991); scarcely any have examined the multiple dimensions of engagement in the daily subjective experiences of students” (Shernoff et al., 1999, p. 16). Little has changed since Caouette (1995) indicated a lack of research into teachers’ flow experiences. There has been, however, research into creating optimal learning experiences for students. While it is important to

investigate ways of motivating students, it is equally crucial to understand that teachers are the main motivational force in students' learning. Finding the conditions and environment that may allow and support teachers to experience flow is of the utmost importance to improving today's education status quo. Indeed, discovering the conditions that promote teachers' flow and student cognitive engagement are crucial to enhancing student achievement and educational outcomes.

This research may provide a new perspective for teachers, by re-examining and exploring instructional variables within the classroom context. In their empirical study of the effects of classroom activities on student cognitive engagement, Shernoff et al. (1999) pointed out that, "the repetitive, passive, and routinized nature of activities may contribute to the feeling that schooling is something to be endured rather than something that is stimulating or in any way pleasurable" (p. 44). If teachers are to understand strategies to motivate students, then research must be undertaken to discover the elements that motivate students. This research will begin that process. When Shernoff et al. (1999) recommended that "the challenge is to understand how the professional experiences of educators and the experiences of students relate to and affect each other" (p. 49), they clearly expressed the need for further study. The nature and needs of today's students are changing; traditional classroom pedagogy and instructional strategies that once worked may no longer be effective. For example, Goodlad (1983) found that teachers respond to things that their students say only 5% of the time. Subsequently, students' needs and interests are not being attended to. As Csikszentmihalyi (1993) indicates,

Despite our relatively heavy investment in education as a nation, we still do not seem to realize that teaching, which does not consider the students' priorities, is useless. It is wasteful to teach someone who is not interested and so is not motivated. (p. 9)

Glasser also emphasized the importance of teaching useful information to secondary school students when he discusses quality teachers. According to Glasser (1993), whether information is useful can be determined simply by asking, “Can you use it in your life now or in the foreseeable future?” (p. 64). Teachers who ignore student needs fail as effective educators. Although there may be other reasons why students avoid cognitive engagement in class, one of the most common is that, “students often find classroom tasks to be trivial and boring, or difficult and confusing” (Lee and Anderson, 1993, p. 586). In a study of the relationship between teacher statements about classroom tasks and the degree of student engagement on those same tasks, Brophy et al. (1983) reported that, “none of the teachers was ever observed attempting to make students aware that they could derive personal satisfaction or self-actualization value from a task” (p. 548). In a similar study, Spaulding (1992) noted that, “out of 317 presentations, not one teacher commented that a task would help children develop skills that would bring them pleasure or enjoyment... teachers sometimes indicated that students were to expected to like the task or to do well on it...” (p. 59). These findings encourage teachers and administrators to examine their pedagogy. This research project is important in that it will help teachers and administrators examine different ways to motivate students. It is possible to increase achievement and education if teachers are able to motivate their students. In order for students to benefit from instruction and to achieve educational goals through cognitive engagement during class, research must be undertaken to determine the effect that teachers’ flow has on student engagement.

Purpose of the Study

The purpose of this study is to examine the relationship between teachers' flow experiences and student cognitive engagement in class. In other words, are there changes in the cognitive engagement of the class when teachers experience flow? And if so, what is the direction and magnitude of the effect? To answer these questions, data collected through the use of ESM (Experience-Sampling Method) from both students and teachers will be examined and analyzed. A number of other variables that may promote student cognitive engagement will also be considered, including the time-of-day the classes take place; the subject matter such as English, mathematics, science, computers and etc.; teachers' gender; and the grade level being taught. Additionally, this study will also consider a variety of instructional methods including lecturing, group work, individual work, and one-on-one support from teachers during class.

In order to clarify the purpose of the study, the nature of the problems is considered from two different perspectives: the perspective of students and the perspective of teachers. A large percentage of students are described as absent-minded while they are in class (Shernoff et al., 1999). School is perceived as a boring and unstimulating environment. Unfortunately, this can be a common feeling among students, and may have something to do with the educators themselves. For many generations and across many cultures, people have been taught and therefore habitually believe that learning is a process of tasting bitterness. An illustration of this exists in a cross cultural proverb which suggests that, "the root of knowledge is bitter, but the fruit of knowledge is sweet". Speaking on the same topic, Csikszentmihalyi (1997b) pointed out that the acquisition of knowledge could be a tremendously exciting and an enjoyable process. The reason that

we carve those words on schools is that schools themselves make knowledge bitter, not because knowledge itself is such (p. 4). What do we expect children to think if we lead them to believe that learning is not an enjoyable process? Let's take a look at what teachers face in their day-to-day work. According to statistics reported by Schneider and Houston (1993), about 350,000 children are born each year to mothers addicted to cocaine during pregnancy. Those who survive birth become children with strikingly short attention spans, poor coordination, and other such disfunctions. When these children reach school age and sit in classrooms, it becomes so difficult for them to focus and equally hard for teachers to teach. Over time, many teachers are burnt out due to the lack of resources and support for a large number of needy students. Because teaching has become an increasingly difficult profession due to the added pressure of special needs child and because, according to a report based on a national survey, "the status of educators is low both within and outside the profession... low self esteem among teachers is a common theme" (Schneider and Houston, 1993, p. 78), research must be done to establish ways for teachers to be aware of their flow. Some studies indicate that despite the difficulties teachers today face, many of them still find much enjoyment and a sense of reward in their daily jobs, even when they work with children with learning disabilities (e.g., Newcomer, 1980; Mandel & Marcus, 1995; Caouette, 1995). These teachers often report having experienced flow or optimal experience in their teaching. Whereas it remains unknown as to what exactly makes them different from those who rarely experience flow, one thing is clear: the teachers with flow experiences possess what is called *autotelic* personality and regard their jobs as *autotelic* jobs. More about *autotelic* personality and *autotelic* jobs will be discussed in the next chapter.

Delimitation and Limitation of the Study

The present study focuses on investigating the relationship between teachers' flow experiences and student cognitive engagement in class, through the analysis of teachers' psychological states in class. Although six types of variables were used in the analysis, it must be emphasized that other variables not included in this study may also play a role in influencing student cognitive engagement during class. These variables may include, but are not limited to, race, students' socioeconomic status, and even the physical plant of the school. Based on the literature review and the location of this research project, however, only those "most likely" variables are selected. This selection can be taken as the limitation of this study, as the study does not examine an exhaustive list of variables that may impact on student cognitive engagement.

Furthermore, it must be emphasized that this study will not attempt to discover how teachers obtain or enjoy flow experiences during their teaching, but rather to what extent a relationship exists between student cognitive engagement and teachers' flow experiences. In addition, it is not intention of this study to claim that the cause of student engagement is teachers' flow experiences, even though a strong relationship may be found between the two. As Huck and Cormier (1996) pointed out that "a correlation coefficient does not speak to the issue of cause-and-effect" (p. 69). This is not only due to the research method used in this study, but also because more research will be needed before any such claim can be laid.

The limitations of this study are identified and briefly explained as follows:

This study is limited to the number of variables (one dependent and six independent variables) to be investigated. As mentioned above, other potential variables, have not

been included. In addition, the study is also limited to quantitative analysis. Interviews of teachers and their students regarding the investigated variables are not considered.

Finally, the study is limited in that a certain percentage of the ESFs may not be completed, as participants may become bored or frustrated by the frequency (three times a day) and length (five consecutive days) of the study. To help solve this problem, the number of participants in the study were increased so that incomplete surveys could be discarded. Besides, this study is limited to the teachers and the students of sixteen elementary and secondary schools from one school district in the province of British Columbia.

The Research Question and Hypotheses

The present research intends to investigate the following two research questions:

1. Are there differences in the cognitive engagement of students when their teachers are experiencing flow?
2. To what extent do these differences in cognitive engagement vary by grade level, subject matter, time-of-day, instructional method, and the gender composition of the class and instructor?

To address these questions, multiple regression analysis will be used to first estimate and then evaluate a series of five alternate models. This will then allow the researchers to test the null or “no effect” hypotheses associated with the various independent variables used in the series of models. For example, the null hypothesis for the first research question can be stated as:

H₀: There is no statistically significant relationship between teachers flow experiences and the cognitive engagement of their students.

While the null hypothesis for the second research question can be written as:

H₀: For all the other types of variables used in this study (grade level, subject matter, time-of-day, gender, and instructional method), no statistically significant relationship exists between them and the cognitive engagement of students.

Summary of the Purpose of the Study

This chapter serves to define the problem of the present study by providing some background information that substantiates the problems and the need for research in this area. As various studies have shown (Brophy, et al., 1983; Marshall & Weinstein, 1986; Talbert, et al., 1993; Winne, 1979; Cooper, et al., 1979; deCharms, 1976; Shernoff et al., 1999), one of the most important environmental factors affecting students involves teachers' psychological states in class. Thus, it makes sense to investigate the effects of teachers' psychological states on the cognitive engagement of the students.

The chapter also states the purpose of the study with an emphasis on the significance of the research outcomes. Although the study may have several outcomes, it has one major purpose: To examine the relationship between teachers' flow experiences and student cognitive engagement. As described earlier, the lack of literature and research on the relationship between student cognitive engagement and teachers' flow experiences warrants and justifies the necessity, value, and significance of the present study in terms of both educational psychology and leadership. The significance of the study described within the body of this chapter illustrates this statement. In addition, statements of

hypotheses are presented together with the research questions. The following chapter will deal with a review of relevant literature as it relates to both flow as part of intrinsic motivation, and current research on topics related to student cognitive engagement.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The literature review is a combination of reviews and critiques of flow research in education, as well as topics related to student cognitive engagement in the classroom context. Since both the study of flow and research in cognitive engagement are in the domain of intrinsic motivation, a review of motivation theories is also necessary. The purpose of the review is to provide a background of existing literature on the relationship between teachers' flow and student cognitive engagement in class. To complete this review of related literature, four sections need to be explored. Firstly, there must be some review of the interrelationship among intrinsic motivation, flow, and cognitive engagement. Then, research of studies of intrinsic motivation is reviewed. This touches upon areas of motivation research in work and job satisfaction as well as intrinsic motivation studies in education. The third section relates to the review of flow theory in general, including specific discussions about the definition, concept, and characteristics of flow. Finally, a review of empirical research in the study of student cognitive engagement in educational settings is presented. This literature review covers the areas of current theories and research on cognitive engagement, relevance of cognitive

engagement and flow, as well as the factors that affect cognitive engagement, e.g., time-of-day, teachers' gender, grade difference, subject preference, and instructional method.

Intrinsic Motivation, Flow, and Cognitive Engagement

In the late nineteenth century, philosophical psychology was replaced by experimental psychology. Ivan Pavlov (1849-1936) and John Watson (1878-1958) are two forerunners of experimental psychology. Although it is difficult to pinpoint the origin of human motivational studies, research in educational psychology indicates a progressive development since the late 1950s with significant changes and improvements in empirical research and evidence. The research moved from subtopics such as reinforcement, curiosity, and locus of control, which were largely based on Pavlov's stimulus-response or conditioned reflex theory in the 1930s, to the theory of intrinsic motivation inspired by deCharms in the 1960s. It should be noted, however, that other scholars before deCharms helped pave the way for the study of intrinsic motivation. For example, White (1959) and his "intrinsic need" proposal demonstrates that such need is an innate characteristic of human beings. Piaget (1952), in his evolutionary argument, claims that human beings naturally tend to practice newly developing "schemes". Believing that external factors such as rewards and grades do not support genuine learning, most contemporary educational researchers such as deCharms et al. (1976), Lepper and Greene (1978), Deci and Ryan (1985), and Schunk and Meece (1992) have focused more and more on the study of intrinsic motivation. Flow theory is one example

of a perspective that embraces intrinsic motivation to examine the psychology of internalized human organism.

Considerable theoretical and empirical work exists on the issues of intrinsic motivation, flow, and cognitive engagement. What remains to be established is a framework that investigates the relationships among the three issues. Since there is a close relationship between motivation and cognitive engagement, one can hardly study cognitive engagement without examining aspects of human motivation. Both flow, or interchangeably optimal experience, and cognitive engagement are within the research frame of intrinsic motivation. Both also share certain characteristics such as concentration, self-regulatory strategies, and feedback. Defining cognitive engagement, Turner et al. (1998) indicate that “cognitive engagement describes students’ reported use of metacognitive and self-regulatory strategies (Blumenfeld, Puro, & Mergendoller, 1992; Greene & Miller, 1996; Lee & Anderson, 1993; Meece, Blumenfeld, & Hoyle, 1988; Miller, Greene, Montalvo, Ravindran, & Nichols, 1996)” (p. 730).

Flow investigates psychological states of consciousness and “optimal experience” (Csikszentmihalyi & Csikszentmihalyi, 1988). Such optimal experiences become intrinsically rewarding, therefore, they are called *autotelic* experiences—people enjoy performing a task for its own sake. Therefore, when teachers are in flow during teaching, they tend to empower students to take control of their learning by enlisting students’ interest, helping students set up their goals, and providing clear feedback to the students’ performance. According to Csikszentmihalyi (1997b), when a teacher is in flow, it is easier for students to be in flow too; whereas it is harder for students to be in flow if the teacher in the classroom is not in flow (p. 33). This statement underscores the importance

of teachers' psychological states in classroom, although Csikszentmihalyi did not provide empirical evidence to support this theory.

It is important to point out that, although cognitive engagement is not equivalent to flow, when someone is in flow, he or she must be highly “cognitively” engaged. In other words, when students are in flow, they are automatically cognitively engaged in class. However, while a student is cognitively engaged, he is not necessarily in flow. This is simply because of the simultaneous occurrence of other basic characteristics that flow usually accompanies.

Motivation Research in Work Place and Job Satisfaction

Research of motivation in the work place has always been a focus of interest for psychologists. In education, motivation concerns both educators and students. Motivation for educators is largely reflected by job satisfaction, whereas for students, learning goals and achievement take precedence. The works of some of the most prominent motivational theorists such as Maslow, McGregor, Herzberg, Vroom, Hackman and Oldham have not only made significant contributions to the organizational development of business and industry, but have also strongly influenced theories of educational research and practice.

Although categorized at five different levels, the concept of “hierarchy of needs” proposed by Maslow (1943, 1954) emphasizes the innate need of human beings for self-actualization and for the full development of their potentialities. Maslow's theoretical framework, which claims that higher needs do not emerge until lower-level needs are met, has not been challenged. McGregor (1957) explains that, “these are the needs for

realizing one's own potentialities, for continued self-development, for being creative in the broadest sense of that term" (p. 178). It is worth mentioning McGregor's Theory X and Theory Y in which the Theory Y approach is based on the assumption that people are intrinsically motivated to do a good job. In fact, this Theory Y strongly influenced the management of industry in the second half of the twentieth century. Influenced by Maslow's concept of motivation, Herzberg formulated his motivation-hygiene theory about job factors that motivate employees. Concentrating on the psychological person in terms of how the job affected basic needs, Herzberg (1959) asserts that factors such as policy, supervision, working conditions, wages and others are hygiene factors that could cause job dissatisfaction. On the other hand, factors such as responsibility, recognition, achievement, the work itself, and advancement are motivator factors that create positive job performance. Both Maslow's and Herzberg's motivation theories have been replicated in education with students, teachers, and administrators. Sergiovanni (1967, 1996), Frase (1989), Frase and Conley (1994), and Schmoker and Wilson (1993) all have explored the motivational factors affecting satisfaction and dissatisfaction of teachers in work places.

Discussing various approaches to the study of the nature of motivation in work, Vroom (1964) considers both the psychological and physiological aspects of human beings by exploring questions of arousal or energizing of the organism: "Why is the organism active at all? What conditions instigate action, determine its duration or persistence and finally its cessation?...Under what conditions will an organism choose one response or another or move in one direction or another?" (p. 8). Focusing primarily in the field of industrial motivation to predict people's work-related behaviors, Vroom

holds that there is no simple relationship between job satisfaction and job performance. This is simply because, as Vroom proposes, “the association between job satisfaction and job performance in a given situation is also affected by any variables which are uncontrolled” (p. 182). Vroom views motivation as the product of expectancy and valence. His expectancy theory formulated for the work environment is one of the most widely accepted approaches to motivation.

In line with Maslow’s (1954) need fulfillment theory, Herzberg’s theory of motivator factors (1959), Vroom’s theory of expectancy (1964), and McGregor’s managerial theories X and Y (1967), Hackman and Oldham (1980) propose the Job Characteristics Model in their Work Redesign. The essential idea about the work redesign is about increasing both the quality of the employees’ work experience and their performance. The theory frame consists of three basic psychological states that are critically connected with the desired work outcomes. The first is called “experienced meaningfulness of the work” (p. 83), which directly points to the importance and worthiness one experiences with the job. The second state is about experienced responsibility, which connects with accountability on the job. Here, autonomy is emphasized and regarded as the primary job characteristic that helps create a sense of responsibility. The last state is concerned with the knowledge of the actual work result, which is a matter of continuous feedback directly from the job. Hackman and Oldham (1980) suggest that jobs with high motivating potential create conditions that reinforce employees with high performance levels (p. 82). The characteristics of a job have a direct influence on employees’ motivation for performance and job satisfaction. The more positively a person experiences the three psychological states in their job, the better the

job outcomes will be with higher intrinsic work motivation, job satisfaction, and work effectiveness. As the work redesign theory dominated the movement for increasing both the quality of the employee's work experience and their performance during the late 1970s and early 1980s, the Job Characteristics Model approach emerged as part of the future design of work. In this regard, Hackman and Oldham propose two routes. Route one is about fitting jobs to people whereas route two fits people to jobs. Fitting jobs to people has an emphasis on enriched work and personal growth; and fitting people to jobs "attempts to maximize technological and engineering efficiency" (p. 260). Replicated in education by Frase (1989), Hackman and Oldham's work context (teaching environments such as school policies, work conditions, supervisory practices) and content factors (such as professional growth, recognition, achievement) are seen as crucial, and the existence of "both must be in good health for success to occur" (p. 21).

Intrinsic Motivation Research in Education

The importance and centrality of the study of intrinsic motivation in education and educational psychology has generated momentum in both quantitative and qualitative research since the 1960's. Ames and Ames (1984) state that, "only in the past 20 years, however, has the systematic study of motivational processes in education settings received significant and sustained attention by researchers in psychology and education" (p. xi). This "sustained attention" has a strong focus on intrinsic motivation. deCharms, Deci, and Ryan were a few of the pioneering scholars during this period. Such a focus signifies a departure from the previous fixation on human drives in the field of human motivation and behavior, such as Freud's (1925) two-drive theory—sex and aggression,

and Hull's (1943) four-drive theory—hunger, thirst, sex, and avoidance of pain. The review of current theories on intrinsic motivation, establishes a crucial link to better understanding intrinsic motivation and cognitive engagement in relation to such factors as students' self perception, control beliefs, goal orientation, task value. For example, research findings (Pintrich & Schrauben, 1992) suggest that students with an intrinsic orientation to learning and mastery of the course content are more willing to invest cognitively in tasks.

In search of students' intrinsic motivation in the classroom, deCharms (1976, 1984) developed the notion of personal causation based on his Origin-Pawn theory. deCharms (1976) defines an Origin as a person who originates his own behavior while a Pawn as someone who is pushed or influenced by others. There are students who believe they can control their actions, and other students who believe others control their behavior. In the words of deCharms (1968), "Man strives to be a causal agent, to be the primary locus of causation for, or the Origin of, his behavior; he strives for personal causation" (p. 269). Based on his empirical research, students should set their own goals and have control over their learning in order to be Origins. deCharms emphasized the importance of helping teachers to be Origins first and foremost. He (1976) plainly states that "to treat teachers as Origins and hence help develop their motivation... in dealing with students" (p. 40). This notion has a profound influence on the movement of educational reform that recognizes the importance of teachers in the process of supporting students to learn and achieve.

Like deCharms, Deci (1975) is interested in the notion of autonomy and self-determination. He develops his cognitive evaluation theory which claims that rewards can

decrease intrinsic motivation. Deci and Ryan (1985) also discussed perceptions of control in terms of students' belief in self-determination. They argue that human beings tend to feel self-determining. People are motivated when they perceive themselves as the locus of causality, in other words, the cause of their own behavior. In this situation, people are intrinsically motivated to perform a task for the value of the task itself. Deci and Ryan (1985) also believed that "the feeling or perception that the performance of an activity is by one's own choice, rather than externally imposed should...have a positive effect on one's intrinsic motivation" (p. 317). As in education, students' motivation to learn and their level of concentration is at its height when students perceive themselves as competent and in control. It is under this condition that students feel enjoyment and personal satisfaction. Intrinsic motivation shares some characteristics with flow theory, which was studied by Csikszentmihalyi almost at the same period. Through many studies and experiments, Deci and Ryan find that when a reward is presented to a person who performs an intrinsically satisfying task, the person's intrinsic motivation shifts to the extrinsic. Furthermore, his motivation to perform the task decreases when the reward is taken away. Both Deci and Ryan (1987) and Lepper (1988) indicate that choice and control are critical to enhance intrinsic motivation in classroom tasks. They argue that teachers' use of rewards and communications is primarily informational or controlling, and the classroom climate is largely a derivative of these teachers' behavior. In terms of the importance of students' perceptions of their own competence and control, "numerous theories of human motivation point to students' perceptions of competence and control as being major influences of their motivated behavior and task-related engagement" (Spaulding, 1992, p. 28).

In addition to the studies by deCharms (1976) and Deci and Ryan (1985), Lepper and Greene's (1978) landmark work on intrinsic motivation, The Hidden Costs of Reward, "demonstrated that the imposition of external rewards for the performance of an intrinsically satisfying activity can, in certain situations, have a detrimental effect on a student's continued intrinsic motivation for the activity" (Raffini, 1993, p.72). Their proposition challenges Thorndike's "Law of Effect" and Skinner's behaviorism—if you reward a good behavior, that behavior is likely to reoccur. Different from most researchers, Lepper and Greene link the study of intrinsic motivation with students' cognitive engagement processes. According to Lepper and Greene (1978), students' task engagement via extrinsic rewards does not last long, because "when reward is involved, termination typically occurs when the desired product is achieved—usually the receipt of the offered reward" (p. 70). This is exactly one of the "hidden costs" which has been proven to be detrimental to intrinsic motivation in learning. Unlike Csikszentmihalyi whose flow theory emphasizes no reward other than the experience itself, Lepper and Greene maintain that rewards do not always undermine intrinsic motivation if they are used contingent on the quality of a student's performance or to provide information about competence. Nevertheless, Lepper and Greene do not over-emphasize the role of rewards in their stand. They indicate that the notion of rewards generally enhances performance, but rewards cannot stand without student intrinsic motivation. More powerful research on intrinsic motivation, e.g., flow theory, reveals that people work and perform tasks for their own sake. This will be discussed in detail in the next section.

Bandura's self-efficacy theory deals with students' perceptions and beliefs in their ability to exercise control over their lives. The definition of self-efficacy refers to

individuals' beliefs about their performance capabilities in a particular domain. Bandura (1981) places emphasis on self-perceptions of efficacy as cognitive mediators of action. His concept of "proximal goals" suggests that, by breaking down difficult tasks and setting short-term and achievable goals, students should increase their perception of self-competence and motivation. The positive feedback of their competence will likely enhance their sense of self-efficacy. He states (1989) that "it is partly on the basis of self-beliefs of efficacy that people choose what challenges to undertake, how much effort to expend in the endeavor, and how long to persevere in the face of difficulties" (p. 1180). Bandura's self-efficacy theory, echoed by Schunk (1991) and some other theories of self-perceptions of ability (e.g., Covington, 1992), supports that students' self-perceptions of ability are positively related to their level of cognitive engagement in a certain task. In general terms, Bandura's self-efficacy theory can also be traced to the principles of intrinsic motivation disclosed by deCharms, Ryan, and Deci and their theory of choice and self-determination. Bandura's (1986) social cognitive theory, on the other hand, emphasizes the reciprocal relations between motivation and cognition, especially in the classroom setting.

Closely related to Bandura's self-efficacy theory and Dweck's conception of performance versus learning goals (Dweck & Leggett, 1988) is Nicholls's theory of task involvement versus ego involvement. Nicholls (1984) believes that when students are task involved, they focus on personal mastery of materials. In this situation, "greater understanding or acquisition of new skills is considered an end in itself" (Graham & Golan, 1991, p. 187). When students are ego involved, however, they focus on themselves by comparing their own performance with that of others. Many researchers

(Jagacinski & Nicholls, 1987; Butler, 1987; Stipek & Kowalski, 1989; Graham & Golan, 1991) show that task-involved students work harder and experience more positive feelings in learning than ego-involved students. Although the theory of task-involved versus ego-involved has different aspects of focus, it falls into intrinsic motivation; as does the theory of competence (White, 1959), self-efficacy (Bandura, 1982), self-determination (deCharms, 1968; Deci, 1975), and flow theory (Csikszentmihalyi, 1975, 1978, 1990).

Flow Theory and Experience-Sampling Method

The theory of flow by Csikszentmihalyi, arisen from an inquiry into human happiness and play, established its base in the field of psychology in the early 1970s, and became more popular and widely studied in the late 1980s. The term “flow experience” first appeared in Beyond Boredom and Anxiety (Csikszentmihalyi, 1975). Flow theory investigates the aspects of people’s “feelings” within a frame of intrinsic motivation. However, it differs from the general study of intrinsic motivation, which has a focus on human behavior. Whereas some well-known researchers of intrinsic motivation such as Lepper (1981), Deci and Ryan (1985), and deCharms (1984) all direct their attention on intrinsically motivated behavior, Csikszentmihalyi emphasizes the mental or psychological aspect of human behavior. He (1988) indicated that, “my first concern was about *the quality of subjective experience* that made a behavior intrinsically rewarding. How did intrinsic reward feel? Why were they rewarding?” (p. 7). The word *autotelic* used to describe respondents’ common experiences and feelings helped Csikszentmihalyi establish the base of his flow theory. In other words, flow refers to *autotelic* experiences, and sometimes is interchangeably with optimal experiences. Csikszentmihalyi developed

the word “flow” from hundreds of respondents he asked to describe what the optimal experience felt like. From the late seventies to mid eighties, the study of flow in natural settings drew much attention from distinguished scholars whose research on intrinsic motivation was largely laboratory based (deCharms & Muir 1978; Amabile 1983; Deci & Ryan 1985). The publication of Optimal Experience: Psychological Studies of Flow in Consciousness in 1988 signified the serious study of flow in human psychology on a much wider scale by not only psychologists, but also educational researchers.

One of the most important research methods used by Csikszentmihalyi was ESM (Experience-Sampling Method). ESMs (Experience-Sampling Methods) were used in the experience-sampling method which was developed and tested by Csikszentmihalyi to study the frequency, intensity, and context of flow-like experiences in everyday life. The need for this kind of approach arose from a dissatisfaction with the large body of research demonstrating an inability of people to provide accurate retrospective information on their daily behavior and experience (Csikszentmihalyi & Larson, 1987; Bernard et al., 1984; Yarmey, 1979). Instead of interviewing people to recall a flow experience, ESM is a quantitative approach to collect data by obtaining repeated self-reports from everyday life. The method used by Csikszentmihalyi and his team consisted of giving survey respondents an electronic pager and a booklet of ESMs to fill out during a week-long survey. A respondent filled out an ESM once he or she received a pager signal. This occurred eight times daily, up to a total of 56 times each week. Such a process of data collection was compared to taking a series of snapshots with a camera, which provided a window through which to see an overall detailed picture about the areas of research in daily life. All signals were sent by random order between 7:30 a.m. and 10:30 p.m. In the

past two decades, the ESM has been widely used in the study of social and psychological issues by many researchers. “The ESM provides a valid and representative record of what people do, think, and feel, and allows for intrapersonal as well as interpersonal comparisons across time and situations” (Shernoff et. Al., 1999, pp. 15-16). In fact, the data collection process and analysis procedures of ESM have proved effective in the study of flow and quality of life research.

When used in classroom situations, a powerful characteristic of ESM is its ‘on the spot’ feedback for the survey. Although this may interrupt the on-going class process due to random signals during class, it does raise the quality of the data collected because forms must be filled out to reflect the psychological state of the moment. ESFs that were filled out 30 minutes after the beep were excluded from data analysis by Csikszentmihalyi et al. (1993) for the sake of validity. In this regard, ESM has surpassed traditional qualitative methods, which rely on interviews to obtain data from memory. In her investigation of teachers’ flow, Caouette (1995) indicates that “no matter what the circumstances when working with individuals and relying on accounts of experiences through memory, the account is only as accurate as the recollection of the experience” (p. 10).

ESFs must be designed individually for specific research project, although the method is the same—ESM. The limitation of ESM, however, is its total dependence on respondents’ self-reports, which may provide inaccurate or distorted data. Csikszentmihalyi and Larson (1987) indicate that such distortion is particularly true when ESM is used by an employer to study the employees during “...private, sensitive, or illegal activities” (p. 533).

The Definition, Concept, and Characteristics of Flow

The definition of flow is loosely based on the highlighted reports by those who have experienced it. “Flow is a subjective state that people... are completely involved in something to the point of losing track of time and of being unaware of fatigue and of everything else but the activity itself” (Csikszentmihalyi et al., 1993, p. 14). They initially described flow experiences as such activities as reading, playing chess, teaching a class of students, and having a stimulating conversation. The person who experiences flow finds the activity extremely enjoyable and intrinsically rewarding and is doing the activity for its own sake. However, the characteristics of flow provide a more comprehensive idea of flow in context. The characteristics of flow, as given by Csikszentmihalyi (1990), refer to “a sense that one’s skills are adequate to cope with the challenges at hand, in a goal-directed, rule-bound action system that provides clear clues as to how well one is performing” (p. 71). This is consistent with numerous reports from those who experience flow, and who report experiencing: 1) clear goals; 2) balance of challenge and skills; 3) immediate feedback; and 4) focused concentration (Csikszentmihalyi, 1988, 1990, 1993, 1997a). Perceiving the experience of flow as a “powerful motivator”, Csikszentmihalyi (1990) concludes his findings by suggesting that every flow activity, whether it involves competition, chance, or any other dimension of experience, has this in common: It provides a sense of discovery, a creative feeling of transporting the person into a new reality. It pushes the person to higher levels of performance, and leads to previously undreamed-of states of consciousness (p. 74).

Csikszentmihalyi (1993) identified eight distinct dimensions of experience reported by those who experienced flow:

1. Clear goals: an objective is distinctly defined; immediate feedback: one knows instantly how well one is doing.
2. The opportunities for acting decisively are relatively high, and they are matched by one's perceived ability to act. In other words, personal skills are well suited to given challenges.
3. Action and awareness merge; one-pointedness of mind.
4. Concentration on the task at hand; irrelevant stimuli disappear from consciousness, worries and concerns are temporarily suspended.
5. A sense of potential control.
6. Loss of self-consciousness, transcendence of ego boundaries, a sense of growth and of being part of some greater entity.
7. Altered sense of time, which usually seems to pass faster.
8. Experience becomes autotelic: If several of the previous conditions are present, what one does becomes autotelic, or worth doing for its own sake. (pp. 178-179)

The concept of flow shares several characteristics with certain ideas found in the writings of early philosophers, both ancient and contemporary, both oriental and occidental. For example, Dao De Jing (also spelled Tao Te Ching), by Chinese Lao Zi (also spelled Lao Tzu) in 600 b.c., and Conquest of Happiness by Bertrand Russell in 1930. These 'coincidences' are, as Csikszentmihalyi (1993) opines, "... minds reflecting on experience independently of each other have come to almost identical conclusions" (p. 300).

Since its inception, flow theory has been essentially considered unfalsifiable. One of the reasons appears to be that the theory itself suggests no hypotheses that can be subject to test. For example, Csikszentmihalyi (1993) discusses much about growth of the self, or an enhanced state of self, and asserts that "every flow experience contributes to the growth of the self" (p. 237). In other major works of Csikszentmihalyi (1988, 1990, 1993, and 1997a), he repeatedly emphasizes flow as undreamed of state of consciousness. However, nowhere in his works has Csikszentmihalyi ever discussed how to operationalize either an enhanced state of self or undreamed state of consciousness about

flow. This remains an area for further research in order to perfect the theory. One of the three main characteristics of flow is to have a clear goal. Yet, flow theory does not distinguish goals that are intrinsically or extrinsically orientated. According to some motivation theories, only intrinsic goals lead to deeper levels of cognitive engagement and concentration (Pintrich & Schrauben, 1992). The close relationship between cognitive engagement and flow itself, as well as their clear distinction, has created an interesting area for future research.

Flow, Confucianism, and Taoism

Flow, as a psychological phenomenon and optimal experience, has roots as old as human history and spans across many cultures in the world. In fact, the description and pursuit of flow experiences can be found in all walks of life, particularly in some folk religions in the Orient. For example, flow shares common characteristics with the teachings of Confucius and Tao. Although Confucianism and Taoism have been the two most popular religions in China for centuries, they have had considerable influences on many neighboring countries in Asia, as well as abroad. Furthermore, Confucianism and Taoism are opposite in both their approaches and beliefs, yet both share certain fundamental roots with flow theory. More importantly, they also both focus on the same psychological effects—a combination of psychologically enjoyable and effortless experience of human mind and body.

Confucianism emphasizes ‘li’ which generally refers to personal harmony, social order, duty, morality, ceremony, and social service in restrictive manner. Confucianism believes that people will develop flow and society will benefit from peace when ‘li’ is in place. However, ‘li’ can not be forced, rather, it is automatic and spontaneous from the

doer when he understands what he does and enjoys doing it for its own sake. In the case of a judge, for instance, 'li' is not reached if he does not know why he does the job, or if he does not enjoy his job, or if he does not know how well he does it. Interestingly enough, Confucianism also teaches people to observe 'li' with high concentration as their only goal, and requests people to get feedback from the government rather than themselves for their behaviors and activities. According to Confucius, the very reason he was able to teach 'li' based on his Lun Yu was because he experienced flow in front of his disciples when he was teaching. Confucius' proverbial instruction has influenced millions of people for over two thousand years. As quoted by Ruoshui Ni (1974) from Confucius, "when one follows 'li', he experiences flow, when all follow 'li', the world will be in peace" (p. 49). There is no doubt, even during Confucius' lifetime, there were many conflicting views of 'li' which were intended to help restore the old social order. As pointed out by Csikszentmihalyi (1993) "...the Confucian system was from its very beginning manipulated by selfish rulers" (p. 265). Historically, the golden mean of the Confucian school, through its publication of Lun Yu, was for the purpose of defending the ruler in order to consolidate power and its social system.

Taoism, on the other hand, emerged as a range of alternatives to the Confucian way of life and point of view. Tao philosophy was initially formulated by Laozi, the editor of Tao Te Ching (I Ching or The Book of Change if literally translated), and Zhuangzi (also spelled Chuangzi), the co-founder of Taoism. Unlike Confucianism, Taoism emphasizes life that is close to nature with simplicity, harmony, longevity, and even immortality. The Taoists hold that the objective of life must be the cultivation of inner human powers. Although Taoism avoids conventional social obligations, it teaches people to enjoy the

flow of life in order to achieve longevity through harmony, and advises rulers and leaders to be virtuous. Taoism describes smart and skillful leaders who are “walking as if flowing in the air”, and divides leaders based on their abilities to lead. Here is an example of my translation from Chapter 17 of I Ching: “The best leaders are those that people barely know their existence; the next best, people honor and praise; and the next, people fear; and the last, people hate. When the best have completed their tasks, people would say: ‘we did it’” (p. 26). I Ching is regarded as the world’s oldest and most revered system of personal guidance and prophecy. Much of it is devoted to the teaching of personal growth, and optimal experience in social and political life. The topic of Chapter 58 in I Ching is Pleasure, or interchangeably in this case, Happiness. The following is translated from the original by Sam Reifler (1974):

Every experience gives you pleasure. You are always content. Your quiet, untroubled character is open and accepting. You see no reason to defend or disguise your deepest feelings. Your imperturbable ingenuousness gives solace and hope to others. You give others the opportunity to reveal their deepest feelings, to share in your sense of pleasure. (p. 249)

Whereas pleasure is closer to happiness, it is not simply a form of flow.

Csikszentmihalyi (1993) makes a distinction between pleasure and enjoyment or flow as follows:

The distinction between pleasure and enjoyment—or flow—is that pleasure involves the satisfaction of a homeostatic imbalance in a genetically programmed need (such as eating, drinking, resting, sex, sociability, and so on), whereas enjoyment is usually the result of using one’s skills to match an opportunity for action that is not genetically programmed. Pleasure is easily sated, but also easily replenished—one can derive pleasure from eating more or less that same food several times a day. (p. 306)

Taoism divides human pleasure into two sections: pleasures of the flesh, which should not be sought after, and spiritual pleasure which emphasizes personal

development and character building. It is necessary to mention that flow as a theory within the frame of intrinsic motivation has a connection with the study of human physical pleasure. In a study of creativity of artists who experienced flow, Csikszentmihalyi (1996) asked his participants what accomplishment in their lives they were most proud of. A number of them answered, “making love” and “sex and songs” (p. 187). His findings concluded that creative individuals often had a stable and satisfying marital relationships, and “most of them married early and stayed married to their spouses for thirty, forty, or more than fifty years” (p. 197). Scholars across many cultures discuss pleasure which can lead to flow experience. Berlyne (1966), Hunt (1965), and Kagan (1972) all claim that human beings derive pleasure from such activities which provide them with an optimal level of surprise, incongruity, complexity, or discrepancy in their expectations. Speaking about pleasure from a motivational view, Stipek (1988) maintains that “pleasure is assumed to drive from creating, investigating, or processing stimuli that are moderately discrepant. Stimuli that are not at all discrepant or novel will not arouse interest” (p. 43). It is clear that flow theory shares many of the same descriptions.

As the co-founder of Taoism, Zhuangzi placed emphasis on personal development, especially in the areas of the arts and living trades such as carpentry and opera. As Berling (1996) describes, “Zhuangzi’s sages were often artisans—butchers or woodcarvers... they had to have inner spiritual concentration and put aside concern with externals, such as monetary rewards, fame, and praise” (p. 9). One popular Chinese idiom, which originated from Taoism that describes people who are so skilled in their trades and feel so happy to do their jobs at the same time, i.e., in flow as they do the job,

is called 'Pao Ding Jie Niu'. This idiom is often used to describe someone who is so skillful at his job that he does it without any mistake. Some western scholars who study Chinese history and language misunderstand the whole story behind the idiom. For example, in his Three Ways of Thought in Ancient China, Arthur Waley (1982) misunderstood Pao Ding, the butcher in the story behind the idiom, for a carver: "When this carver Ting was carving a bull for the king, ..." (p. 47). Others, such as Ames (1998), attempts to explain the idiom literally word by word, "In an apparent reference to the skill of Cook Ding, Eno states 'the dao of butchering people might provide the same spiritual spontaneity as the dao of butchering oxen.'" (p. 66). In fact, the legendary story tells of a butcher, Pao Ting, who loves his job, and how often he experiences flow at work. The story suggests that Pao is so skillful in butchering cows that the knife he uses does not dull for nineteen years. He is able to carve so well simply because he knows the bone structure of cows so well that he can always find the space between the joints when he butchers them. He does his job with ease and often gets of flow while he works. The idiom is simply used to describe a person who experiences flow not only because he is highly skilled, but also because he enjoys what he does. Like many other Chinese idioms, this one is originally derived from Zhuangzi's Principles of Life Nurture (cited in Waley, 1982, p. 46). Zhuangzi taught people how to enjoy working so as to arrive at psychologically optimal states. Zhuangzi encouraged people to pursue flow at work, and he is probably the first Chinese philosopher to emphasize the link between work and happiness. As indicated in Ames (1998), "when it comes to leading a whole lifetime of flow, Zhuang de-emphasizes control as well as the pursuit of success (merit, name, etc.).... Seeing a universe in flow, he invites us to participate in the flow, like fish

swimming in water” (p. 65). Unlike the approach to flow study today, the ancient Chinese philosophers such as Confucius and Zhuangzi, emphasized flow for the purpose of defending the rulers of the society.

Autotelic Personality and Autotelic Job

Both phrases, *autotelic* personality and *autotelic* job, were used by Csikszentmihalyi when he theorized flow. *Autotelic* personality refers to “a life filled with complex flow activities” (Csikszentmihalyi, 1997a, p. 116). A person with *autotelic* personality enjoys life and work. He is motivated by intrinsic factors. The word *autotelic* comes from two Greek words: *auto* which means self, and *telic* which means goal. Csikszentmihalyi calls *autotelic* experience flow (1990) because such experience produces and reflects the same dimensions of flow. For example, a student with *autotelic* personality does school work because he or she enjoys doing it for its own sake, and is therefore said to be intrinsically motivated rather than motivated by an outside goal, e.g., for receiving teacher’s praise or parents’ rewards. People with *autotelic* personality are creative, less concerned with themselves, and often able to face life with positive involvement and enthusiasm. The study of *autotelic* personality is closely related to flow research. Early findings indicate that although the ability to experience flow could be “due to individual differences which are in part inborn, it certainly can be learned” (Csikszentmihalyi & Csikszentmihalyi, 1988, p. 31). The home environment, for example, has long been regarded by psychiatrists as the key to the development of a child’s personality. When discussing the home environment as an important factor in

influencing the formation of *autotelic* personality, Csikszentmihalyi et al. (1993) suggest that “complex family environments breed complex, *autotelic* personalities” (p. 157).

Autotelic jobs, on the other hand, emphasize the aspects of work environment and conditions that are conducive to flow. An *autotelic* job does not always refer to jobs with favorable working conditions. Indeed, in most cases, it is the person who makes the job *autotelic*, even under unfavorable working conditions. “Some activities such as art, music, and sports are usually autotelic: There is no reason for doing them except to feel the experience they provide. Most things in life are exotelic” (Csikszentmihalyi, 1996, p. 113). However, there are some jobs that are more *autotelic* than others. Professional sports such as playing chess and basketball have more of the characteristics of flow than farming although they all can be *autotelic* jobs under certain circumstances.

Csikszentmihalyi (1990) explains that “the more a job inherently resembles a game—with variety, appropriate and flexible challenges, clear goals, and immediate feedback—the more enjoyable it will be regardless of the worker’s level of development” (p. 152). Likewise, teaching can be an *autotelic* job to some people, but not necessarily so to others. In order to reach *autotelic* jobs and enjoy what one does, Csikszentmihalyi (1990) suggests, as does Hackman and Oldham (1980) to the management in industry, is to change the job for the sake of both personal change and organization improvement.

Happiness and Flow

The investigation of flow was first built on the psychological research on human happiness. It is misleading to say that happiness is flow although there is certain connection between happiness and flow. Besides, many studies have shown that

happiness has little to do with mere money and material life. Quality of life is not the only indicator of happiness. Rather, what one does plays an important role for someone to be happy. In other words, the activity itself makes us happy because we enjoy doing it. A common example is the work we love to do on a regular basis. Aivanhov (1994), the French philosopher and spiritual Master, informs us of his views about happiness and pleasure with work:

Sensual pleasures are agreeable to begin with of course, but little by little they destroy you. Work on the other hand is painful to begin with but as time goes on you become tireless, rich and happy. It is in your own best interest therefore to make work your goal in life, that is to say, to make every moment of the day an occasion to advance and grow in self-mastery, harmony and light. And you will see that it is in this work that, one day, you will find the most exquisite pleasure. (p. 22)

Happiness is not equivalent to flow. It is important to point out that being happy does not mean that one is in flow. Nevertheless, when a person experiences flow, he does not necessarily feel happy at the same time. As Csikszentmihalyi (1997a) opines, “When we are in flow, we are not happy, because to experience happiness we must focus on our inner states, and that would take away attention from the task at hand” (p. 32). In addition to such tangible materials as money and wealth, happiness also depends on social and psychological factors such as friendship, interaction, and sexual relationship. Flow, on the other hand, depends on a number of criteria or conditions that are only intrinsically motivating and rewarding, for example, a clearly defined goal, a balance of skills and challenges, and clear feedback.

Flow Theory and Its Development

In its initial appearance, flow theory had a strong focus on human happiness, and was heavily influenced by Abraham Maslow's theory of "peak experience" which was derived in his works, Toward a Psychology of Being (1968) and The Farther Reaches of Human Nature (1971). Another early focus in the study of flow was the examination of the aspect of play in relationship with flow. To Csikszentmihalyi, whose studies into human happiness have spanned a quarter century, the two are seen as synonymous. As Csikszentmihalyi (1993) explains that "... because recognition of phenomena similar to flow could only be found in the literature on play (e.g., Piaget 1951; Bruner, Jolly, and Sylva 1976; Huizinga [1939] 1970)" (pp. 300-301). In Beyond Boredom and Anxiety (1975), Csikszentmihalyi explores why "...people do get immersed in games so deeply as to forget hunger and other problems. What power does play have that men relinquish basic needs for its sake?" (p. ix). He focuses on studying such activities as chess playing, rock climbing, dancing, and even surgery. He concludes that the flow model can be applied to more than just the study of activities from the field of leisure and arts. He (1975) expounds:

The surgeon's work consists of discrete episodes with clearly designated beginnings and ends. The surgical operation requires complete concentration, it provides immediate feedback, it has unambiguous criteria of right and wrong. Because of its structural characteristics, one expects that surgery will be experienced as enjoyable for the same reason that 'leisure' activities are enjoyable. (pp. 123-124)

During mid 1980s, flow research took many new directions and crossed many continents of the world. In Italy, Dr. Fausto Massimini led his research team into an investigation of flow experienced by Himalayan mountain climbers. Flow has been

studied not only in laboratories and clinics, but also in schools and factories. One of the most significant findings has been that flow occurs more in work than in leisure. For example, watching television is usually relaxing but rarely reported to concur with flow experience. “The mere act of watching TV has different consequences for the mind from reading or listening to music, and very different from those that follow on more active forms of leisure” (Csikszentihalyi, 1993, p. 135). The extensive study across cultures and geographical region rebutted the criticism that flow theory has a western bias. For instance, Optimal Experience (Csikszentihalyi & Csikszentihalyi, 1988) contains individual studies of flow among both Japanese motorcycle gangs and elderly Korean immigrants. Flow is recognized to be a psychological phenomenon that can be experienced by most people. In the words of Csikszentmihalyi (1988), “flow can happen anywhere, at any time, provided that the person’s capacities and the opportunities for action in the environment are well matched” (p. 85).

Flow Study in Education

Since the onset of the study of flow, much effort has been put forth to apply flow theory to educational practice. Calling himself an applied psychologist, Csikszentmihalyi focuses much of his research on education. Published in Bess’s (1982) Motivating Professors to Teach Effectively, Csikszentihalyi’s “Intrinsic Motivation and Effective Teaching: A Flow Analysis” approaches the issue by arguing that “the importance of intrinsic motivation, both as a means and as a goal of education, should be recognized” (p. 25). Subsequently, his major publications such as Optimal Experience (1988), Flow (1990), The Evolving Self (1993), as well as Finding Flow (1997) all devote special

attention to educational research of flow experiences in the work place. At the same time, a number of articles and dissertations on various topics in education have been written by many researchers. For example, both Mayers and Plihal (cited in Csikszentmihalyi, 1990) devote their study to finding the relationship between flow experience and educational “outcomes”. Mayers’s study shows that a group of high school students’ enjoyment of a certain course has a direct effect on their final grades. Plihal examines the relationship between teachers’ flow and that of students’. Examining the phenomenon of flow as experienced by classroom teachers, Caouette (1995) investigates the conditions that started, enhanced, and stopped the flow experience; how teachers’ experiences of flow compared with the framework drawn from the studies of flow conducted by Csikszentmihalyi, and the implications of her findings for leadership practice. Frase (1998), through both quantitative and qualitative methods, explores and creates a new path for educational leaders to examine teachers’ flow experiences, efficacy, and instructional leadership.

The study of flow has also been transformed into practice in many parts of the world. As summarized by Csikszentmihalyi (1990), flow theory has been implemented in K-6 curriculum at the ‘Key School’ in the Indianapolis public school system as well as by the faculty at Oklahoma State University to train teachers of physically handicapped children to enjoy themselves. In the study conducted by Carli et.al. and Nakamura (p. 12), there are also records of the effects that flow had made in the scholastic achievement of Italian and American students. Talented Teenagers (Csikszentmihalyi et al., 1993) is a study of over 200 talented teenagers, and the development of talent, with a focus on the

“ongoing experience” over four years of high school. The study also examines the context of the learning environment in order to help students experience flow.

More recently, the study of flow has paid much attention to exploring how teachers can better help students experience flow in their learning process in order to improve learning outcomes (Whalen & Csikszentmihalyi, 1991; Rezabek, 1994; Fernando, 1997;). For example, in their study of an elementary Key School in Indianapolis, Whalen and Csikszentmihalyi (1991) focus their research on the Flow Activities Room (FAR), which is established on the basis of flow theory and multiple intelligence. Through interviews of both teachers and students, their findings about FAR include: 1) intensified play could be a learning experience for elementary students; 2) providing choices in student learning could help clarify their interests; and 3) game-playing could provide students with opportunities for practicing process-oriented skills and developing sustained attention. Urging educators to approach the use of flow in leadership and management as indeterministic, Frase (1998) conceives the notion that such effects of theory and productivity are not necessarily mystical and unknowable (p. 17).

In a discussion about flow and education, Csikszentmihalyi (1997b) discerns that students obtain their deepest experience of flow from extracurricular activities simply because of “a more realistic kind of rhythm of involvement instead of this jerky exposure to information” (p. 26). The “jerky exposure to information” refers to interruptions such as clocks, class bells, and loudspeakers in regular schools. Csikszentmihalyi gives high credence to the learning environment in the Montessori school system which allows students to access more control, choice, and freedom in their learning process. The reason why students in the Montessori system are more engaged and on task is because of

“enough interesting, useful, growth-producing material to catch the child’s attention” (Csikszentmihalyi, 1997b, p. 28). Within the same work, Csikszentmihalyi also claims that students’ attention is related to the flow of the teacher in almost every subject. However, Csikszentmihalyi does not provide evidence as for what condition or environment usually supports teachers to experience flow. The issue still appears to be the same today as Caouette (1995) commented about five years ago that, “the investigation... does not specifically delve into improving optimal experiences for teachers” (pp. 28-29). Therefore, this is one area that needs more studies.

Teachers in Flow and Leadership

The purpose to study teachers in flow is ultimately to improve student learning and achievement. Although there have been some studies of flow in education in the past decade or so, very few have focused on the study of teachers in flow. This is particularly true in terms of empirical research. Most studies so far have focused on students in flow, or have directed ways for teachers to help students experience flow. However, the missing link is the understanding of the teachers’ psychological states in class. For example, if a teacher is unmotivated or not experiencing flow in the classroom, how likely are his or her students going to experience flow? Criticizing the work of Csikszentmihalyi et al. (1993), Caouette (1995) points out that, “[it] tells us little about the disparity in teacher motivation, satisfaction, and performance, as their research perspective focuses on how the teacher creates flow environment for students” (p. 27). If student motivation and interest in learning need to be nurtured; if the conditions that facilitate flow to occur in the learning process need to be attended; and if clear goals,

choices, environments, challenges, and feedback are important factors to student cognitive engagement, who can make all these possible except teachers? Frase (1998) avers that “it is irrational to believe that teachers can deliver and maintain stimulating learning environments for their students without the same degree of consideration being given to them” (p. 3). It is obvious that a shift of focus towards teachers is necessary in the sense of leadership in education research.

In his empirical study of teachers’ flow experiences, efficacy, and instructional leadership, Frase (1998) examines three principal activities—teacher evaluation, professional development, and management by wandering around (MBWA)—all of which could have a positive or negative impact on teachers and student achievement. The problem stated in Frase’s study points to three areas that have been poorly done in schools. One important issue for school leadership emerges: Teachers are being deprived of their greatest reward—doing an important job well. The study focuses on finding out what aspects of school principals’ behavior affect teachers’ sense of efficacy; their perceived value towards teacher evaluation and professional development; and their frequency of flow experiences. Through the analysis of both qualitative and quantitative data which were collected from 201 teachers of large urban, inner-city school districts, Frase’s four major findings include:

- ◆ principal’s frequency of classroom visits predicted organizational efficacy and the perceived efficacy of others, which in turn also predicated the frequency of flow experiences.
- ◆ There was a positive link between the teachers’ flow experiences as directly related to instruction and the following of school organization functions. 3)

- ◆ Teachers' feelings, while experiencing flow, centered on feelings of being connected with students, being prepared, being absorbed in the teaching activity, being productive, and having high energy and enjoyment in an activity directly related to teaching.
- ◆ Teachers' flow experiences depended on planning, and therefore, teachers must be provided time to conduct planning before they started teaching (pp. 12-15).

Replicating theories from Csikszentmihalyi (1988, 1993), Deci (1985), Hackman and Oldham (1985), Herzberg, (1959), Frase (1998) suggests that teaching itself is innately meaningful to teachers and that good job done well is a powerful source of pride, satisfaction, and motivation (p. 17).

Flow and Its Possible Negative Impact

For many people, flow is a positive symbol and experience in life that has contributed to the construction of human development and personal growth. Yet, flow can also be a negative force in one's life. Speaking about the progress of human evolution, Csikszentmihalyi (1993) warns us that "flow can be experienced in activities that are destructive rather than constructive, that led to entropy instead of harmony" (p. 207). More specific problems with flow's negative impact have also been identified (Csikszentmihalyi & Larson, 1978; Csikszentmihalyi & Rathunde, 1993). "There are two dangers inherent in flow: one is that the enjoyment can become addictive, the other that it can be experienced in antisocial contexts" (Csikszentmihalyi, 1993, p. 91). Discussing the dark side of flow, Caouette (1995) illustrates that:

Workaholics, runners who cannot go a day without running, and students who cannot find pleasure in any activity outside their studies are all examples of

individuals who have found a sense of flow (which includes fulfillment, satisfaction, self-esteem) in their specific area of interest, but cannot leave it alone. (p. 22)

Since flow can have both positive and negative consequences, it is therefore very important to understand what kind of activities may lead one to experience positive effects. Viewing flow as a form of energy that can be used to either cook a meal or to burn down a house, Csikszentmihalyi (1997b) suggests that “the goal of educators is to make sure that the flow will be directed, the energy will be used for productive purposes and not destructive ones” (p. 19).

The Study of Cognitive Engagement and Flow

As all learning is cognitive, cognitive engagement then can be viewed as the very process for purposeful and meaningful learning. Although a fair amount of research has been done in cognitive engagement, few researchers have attempted to define the term. Echoing previous researchers such as Blumenfeld and Meece (1988); Doyle, (1986); and Tobin et al. (1990), Lee and Anderson (1993) clearly define cognitive engagement as “deeper cognitive processing that would lead to meaningful understanding” (p. 586). Combining other scholars’ wordings with their own, Cothran and Ennis (2000) define cognitive engagement as “the willingness of students to make the ‘psychological investment required to comprehend and master knowledge and skills’” (p. 106).

Although both cognitive theorists and learning theorists study human cognition and motivation, cognitive engagement *per se* has been the focus of research for cognitive theorists for decades. Jean Piaget (1951, 1952) and Jerome Bruner (1960) are two of the pioneer cognitive theorists. Strongly influenced by the European rationalist tradition on

the one hand and heavily criticized by learning theorists on the other, cognitive theorists believe that when human beings approach problems, they are motivated by their basic competence rather than a stimulus-response reinforcement (Bruner & Haste, 1987). Cognitive theorists are primarily concerned with mind development and contextual thinking, and therefore are sometimes referred to as structuralists. Many cognitive theories have been widely applied to education to help teachers plan instruction based on students' ages and their development. Although cognitive theorists study human cognition and intellectual development, learning theorists also have conducted research on both human motivation and cognitive engagement. Learning theories, including both behavioral theories (Pavlov, 1928; Skinner, 1971) and social-learning theory (Bandura, 1986), look at learning itself as a pervasive process. As Craig (1996) points out, learning theorists "find the key to a person's nature in the way she is shaped by the environment" (p. 42). One of the major contributions of contemporary behavioral theorists is the recognition and exploration of the role of situational, environmental variables in influencing human's cognition and behavior. For this reason, cognitive engagement is closely studied in the learning context by both behavioral psychologists and educational researchers.

Recently, empirical researchers have revealed that the measurement of student engagement can be done through examining a number of characteristics from flow theory (Csikszentmihalyi et al., 1993; Turner et al., 1998; Shernoff et al., 1999). For example, to be in flow, one must be in high concentration. In other words, a person has to be highly engaged in what he or she is doing in order to arrive at flow. In a study of student engagement, Shernoff et al. (1999) apply the characteristics of flow to examine five

different aspects of student experiences within the context of their learning environment:

1) balance of challenge and skills; 2) enjoyment; 3) concentration; 4) clear goals and feedback; and 5) optimal learning. The study intends to find out how engagement is encouraged or undermined in classrooms and what aspects of classroom structure influences different motivational patterns and affective consequences in adolescents.

They argue that classrooms should be viewed as psychological environments rather than physical environments since flow itself is a psychological phenomenon. The findings in their study include that students are significantly more engaged while taking a test or quiz, doing group work, or doing individual work, and less engaged while watching audio-visual media, or while listening to a lecture. They point out that “while in computer science, students report engaging in individual work about 62.5 percent of the time, more than twice the percentage reported in other subjects” (p. 25). In addition, Shernoff et al. confirm that the three basic requirements of flow all have a direct link with student cognitive engagement. First, a balance of challenge and skill indicates that if a task is too difficult, students will feel discouraged whereas if it is too easy, they will feel bored. Second, a clear goal will help keep students constantly on task. Studies show that cognitive engagement is diminished when students lose sight of what they work for (Ames & Archer, 1988; Meece, 1991). Third, immediate feedback guarantees that students are always conscious of how well they perform so they can timely regulate the level of challenge to stay on task. However, this study lacks discussion of the recent developments in intrinsic motivation research. More importantly, it lacks consideration of teachers’ effects in students’ engagement, as teachers are no doubt the main source of

students' motivation to learn. Teachers' psychological states in the classroom may have strong influence or impact on students' learning experiences.

Although there has been no study to date on the empirical relationship between teachers' flow and student cognitive engagement, this does not mean that a close relationship between the two does not exist. One of the reasons for a lack of such a study is that flow theory itself is still relatively new in the field of psychology and, even newer in its transformational use in education. Although there have been some researchers who have shown interest in applying flow theory in education, so far they have mainly focused on looking at ways to help students experience flow. Only a few studies have been done so far on teachers' flow experiences, and no research has been done on the study of the relationship between teachers' flow and student cognitive engagement.

Current Theories and Research on Cognitive Engagement

It is within expectations that highly motivated students usually have high academic achievement. This has been empirically researched and reported by various researchers (Ames & Ames, 1984; Csikszentmihalyi et al., 1993). In a study of conceptual change for student learning, Pintrich et al. (1993) demonstrate that the degree to which students are engaged in different types of cognitive behaviors and their persistence at a task are likely a function of motivational beliefs. In order to build the connections between the motivational and cognitive components of student learning, the authors suggest four specific motivational constructs as potential mediators of the process of conceptual change—goals, values, self-efficacy, and control beliefs. Motivation and its nurturing are considered essential in student performance and continued learning. They also argue that

“personal interest and the value of a task do not have a direct influence on academic performance but they do relate to students’ choice of becoming cognitively engaged in a task or course and to their willingness to persist at the task” (p. 184).

Research findings (deCharms, 1976; Ames & Ames, 1984; Csikszentmihalyi et al. 1993) indicate that achievement correlates more closely with motivation than with intelligence. According to a study on student classroom engagement, Shernoff et al. (1999) conclude that “strong engagement in tasks promotes long-term and high-quality learning” (p. 4). Therefore, creating a learning environment that nurtures and supports motivation and engagement is fundamental to the learning outcome. Both educators and researchers have been exploring ways to help students either find or sustain cognitive engagement in classroom environment. One of such ways is to help students experience flow. Csikszentmihalyi et al. (1993) assert that, “Memories of peak moments motivate students to keep improving in hopes of achieving the same intensity of experience again” (p. 253). Researchers on motivation and classroom processes have also investigated the relationship between teaching methods which influence motivation to learn and student achievement (Lepper & Greene, 1978; Brophy et al., 1983; Ames & Ames, 1985; Pintrich & Schrauben, 1992). Two fundamental questions are raised to tackle the issue: 1) What promotes cognitive engagement? This is approached from the human internal need, which is largely motivation theory-based; 2) How can cognitive engagement be fostered and further supported? This approach sets out to find out effective ways to be applied in educational settings. Hoyle et al. (1998) suggest one way to promote student engagement be through the use of problem-based learning. According to Hyle et al, the problem-based learning involve four basic steps: 1) students form a hypothesis when presented with a

problem to solve or an event to explain; 2) students collect information to test the hypothesis; 3) students draw conclusion based on the information reviewed; and 4) time is provided for reflection regarding the problem and the process used to draw the conclusions (p. 92).

Factors that Affect Student Cognitive Engagement

Although little research has been conducted to investigate the relationship between teachers' flow experiences and student cognitive engagement, it is nevertheless a valid and important issue that deserves serious study. This study hypothesizes that teachers' flow experiences have a positive effect on student cognitive engagement. That is to say, teachers' psychological state in the classroom may have a direct relationship with student cognitive engagement. This hypothesis is partly built on the research (Csikszentmihalyi, 1997b) which claims that students experience flow more easily when teachers are in flow. This means that teachers' flow can become the predictor of students' flow. Cognitive engagement, i.e., the act of paying attention and concentration, is only one of the characteristics that concurs with flow. Findings from this study will provide in-depth views on student cognitive engagement as a result of teachers' flow experiences. Thus said, there are research findings that suggest other factors that are attributable to student cognitive engagement. Although most of these factors have been largely looked at from an 'external' perspective, i.e., teaching environments and students' extrinsic motivation, some can still be examined through the lens of flow theory.

Goal Orientation as a Central Factor

The effects of students' goals in learning have been the focus of much recent research, and many of these findings have shown to significantly influence a number of aspects of their cognitive engagement and achievement. Research results have indicated that student cognitive engagement has a direct relationship with goal orientations (Elliot, 1999; Husman & Lens, 1999; Greene & Miller, 1996; Miller et al., 1996; Butler, 1993; Lee & Anderson, 1993; Wentzel, 1992; Meece et al., 1988; Ames & Archer, 1988; Elliott & Dweck, 1988; Nicholls, 1984). There are generally two distinctive goal orientations, i.e., intrinsically motivated and task-mastery orientated versus extrinsically motivated and ego-involved. Students who have different goal orientations are found to have different patterns of cognitive engagement (Pintrich & Schrauben, 1992). For example, students who are task oriented are found to focus more on learning and understanding the materials, whereas students who are ego-involved are found to focus more on good grades and competing with others (Nicholls, 1984; Ames, 1992). In their study of student's goal orientations and cognitive engagement in six different classroom activities, Meece et al.'s (1988) findings show that "student placing a stronger emphasis on task-mastery goals reported more active cognitive engagement in learning activities" (p. 521).

Researchers approach the issue of goals in relation with cognitive engagement in a more general manner. They do not purposefully distinguish goals that are intrinsically or extrinsically orientated. In a study of student conceptual change and motivation, Pintrich et al. (1993) summarize their findings by stating that, "goals, interests, and value beliefs represent students' reasons for engaging in different tasks" (p. 185). Their findings are

consistent with other researchers' about the positive relationship between student engagement and learning goals (Dweck 1986; Nicholls, 1989, Ames, 1992). In the words of Shernoff et al. (1999), for example, "student engagement increases when tasks are directly relevant to the goals of students and their lives outside of classrooms" (p. 8). Acknowledging the importance of goals as a factor that affects students' cognitive engagement, they also argue that "interest and value beliefs might help shape goal adoption and that interest can be related to cognitive engagement independent of goals" (p. 185). Closely related to the issue of goals is the "sense of meaning" for students, because "students are more likely to become fully engaged in activities when they perceive clear and important reasons to do so" (Shernoff et al., 1999, p. 8). This shows the importance of the teacher's role in the class as a guide and good 'salesperson' for to-be-learned materials and tasks that are both meaningful and useful in the future lives of students.

Choice and Control as Related Factors

The issue of choice and control concerns the autonomy of students in the learning environment. The strong effects of autonomy on students' intrinsic motivation and engagement have been supported by a wide range of researches (deCharms, 1976; Grolnick & Ryan, 1987; Ryan & Grolnick, 1986; Spaulding, 1992; Csikszentmihalyi et al., 1993; Pintrich et al., 1993; Turner et al., 1998; Schraw et al., 1998; Shernoff et al., 1999). Those findings all suggest that when students perceive they have choice and control in the process of learning, the quality of learning, interest, performance, cognitive engagement, and creativity are greatly increased. As revealed in a study by Pintrich et al.

(1994), student cognitive engagement and motivation to learn as reported by students themselves are shown to have a direct relationship with the choices of tasks given by the teacher and freedom of working with others (p. 146). Students tend to take ownership of their learning when they are empowered by teachers with choices and control. However, this autonomy is often discussed together with teachers' use of pedagogy. In other words, teachers must know how to use choice and control for students without undermining students' self-perceptions of control. Spaulding (1992) points out that, "because intrinsic motivation is largely a function of feeling in control, teachers who want to promote their students' intrinsic motivation must learn how to give their students real opportunities to control their learning environment" (pp. 43-44). In general, it is difficult to keep students motivated in class if they are not provided with certain amount of control in their learning.

When having some control, students may become highly engaged in their learning. Flow theory suggests that when a person is in flow, he has the feelings of high concentration and total control. In this regard, flow is referred to the involvement associated with intrinsic motivation, which is in strong contrast to any extrinsically-induced concentration and engagement in any classroom activities. In education, choice and control is more than a pedagogical issue for teachers; it is seen as a way to empower teachers from school administrators, as well as a way to empower students to engage learning. Therefore, it is also an issue of leadership for both teachers and administrators, as teachers are generally regarded as the most influential people in students' motivation. It is important to point out, however, that only a limited number of studies have been done so far to deal with what specific types of classroom activities are recommendable

for controlling or choice-given. Shernoff et al.'s (1999) article is one of them. By applying flow theory, Shernoff et al. (1999) investigate how engagement is encouraged or undermined in classrooms and what aspects of classroom structure influence different motivational patterns and affective consequences in students. One of their findings indicates that students are far more engaged while taking a test, or doing group work or even individual work than watching audio-visual media, or listening to a lecture. This is simply because watching videos and listening to a lecture provide the least amount of control to students. The finding is consistent with the previous (e.g., Csikszentmihalyi et al., 1993) that watching TV does not provide opportunities to produce flow. "The loss of control students experience while watching television or a video, and especially while in lecture, explains a substantial portion of the low engagement reported in those activities" (Shernoff et al., 1999, p. 38). It is important to note that identifying the types of classroom activities that particularly promote secondary students' choice and control can help both teachers teach better and students learn more effectively. The needs of the secondary students and those of elementary students in the classroom are totally different. More choice and control need to be considered for secondary students compared to elementary students. As opined by Shernoff et al. (1999) that, "the peer group, romantic interests, sports, and other extra-curriculum become dominant interests for early adolescents... it may be a mistake to dismiss the influence that differences in the practice of instruction may make as students move through the upper grades" (p. 49).

Nature of Tasks, Challenge, and Feedback as Combined Factors

Evidence from empirical research (Cooper et al., 1979; Brophy et al., 1983; Jagacinski & Nicholls, 1987; Lee & Anderson, 1993; Turner et al., 1998; Shernoff et al., 1999) shows that the nature of tasks, level of challenges, and feedback are closely related to the cognitive engagement of students. Regarding the importance of tasks perceived by students, Shernoff et al. (1999) report that, “a variety of differentiated tasks have been found to foster a mastery orientation and interest in learning... in contrast, students are likely to become discouraged with tasks that make them feel incompetent” (p. 8).

Pedagogically, tasks are perceived as both a means to the mastery of materials and a way to motivate students’ interest in learning. Teachers must consider the level of challenge to students when tasks are assigned to them. Tasks and challenge must be considered at the same time. When properly done, it not only helps students concentrate more on tasks, but also assists them in experiencing flow. Describing the balancing of challenge and skill, Csikszentmihalyi and Csikszentmihalyi (1988) explain that when a task was too easy, a person became bored, and if a task was too difficult, he or she got frustrated and gave up. Therefore, teachers must consider the two factors at the same time when they assign tasks. Some researchers (e.g., Cooper et al., 1979) have found that teachers often assign tasks that are poorly matched with students’ skills and abilities. Teachers must from time to time monitor the level of challenge in both teaching and activities for students, as “students who are intellectually stimulated are more likely to invest in their schooling than those who feel bored and disinterested” (Shernoff et al., 1999, p. 8).

Aside from challenge, another pedagogically related factor is the use of feedback and evaluation from teachers. In fact, feedback is the third characteristics of flow which

plays a very important role in obtaining the optimal experience. To be in flow and to keep students cognitively engaged during class, teachers must provide constant feedback to themselves about how well they are doing as well as how well students are doing.

Meanwhile, some tasks and activities may enable students to monitor themselves in how they do. When challenge and skills are balanced, students are likely to be highly engaged.

In order to sustain their engagement, students must be provided with clear feedback, whether it is self-directed or teacher-facilitated. For example, in a theoretical synthesis about feedback and self-regulated learning, Butler and Winne (1995) use their SRL (self-regulated learning) model to examine how feedback affects cognitive engagement with tasks and the relation among forms of engagement and achievement. They distinguish internal feedback from the external which, according to Butler and Winne, is the traditional type of feedback in most educational settings. By reviewing four views on feedback and engagement for learning, they argue that external feedback might provide information that students would use to monitor their self-regulating function. “It influences how students cognitively engage with a task within which a goal is learning domain information” (Butler & Winne, 1995, p. 272). Although this is not an empirically based study, the synthesis has, in addition to the proposal of SRL model, provided a very comprehensive review and critique of studies and theories on feedback. The authors conclude that self-regulated feedback is an inherent catalyst and is generated by the monitoring process.

Many studies (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Kulhavy & Stock, 1989; Meyer, 1986) report that when students seek external feedback, they are more effective. However, external feedback from teachers and peers must focus on growth and

the purpose of learning rather than social comparison. Research reveals that external evaluation and the emphasis on social comparisons appear to have negative implications for students' interest (Ames, 1984; Deci & Ryan, 1985). In terms of fostering intrinsic motivation and enhancing learning performance, some researchers have found that the receipt of negative feedback in fact undermined students' interest (Boggiano & Ruble, 1979; Deci et al., 1973; Butler & Nisan, 1986). Stipek (1984) reports that, "feedback increasingly influences children's achievement-related cognitions over the early elementary school grades" (p. 158). The purpose of providing feedback is not only to facilitate the mastery of materials, but also to intrinsically motivate students for continuous learning. Nicholls (1983) affirms to us that when students are intrinsically motivated, their attention is more focused on the task than when they are extrinsically motivated. As students are more cognitively engaged in classroom tasks given by the teacher rather than anything else, their achievement results will no doubt improve.

Time-of-Day as a Factor

Many studies have been done to examine the effects of time-of-day on students' psychological and physiological states in class. For example, Mackenberg et al. (1974) did a study on morning-to-afternoon changes in cognitive performances; and Millar et al. (1980) studied time-of-day and retrieval from long-term memory. Other similar research includes: the effect of time-of-day on problem solving and classroom behavior by Zagar and Bowers (1983); the effects of time-of-day of instruction on beginning reading achievement by Davis (1987); and recently, the optimal testing time and negative priming by Intons-Peterson et al. (1998). Most of these studies are based on the theory that human

beings, just like plants that are affected by circadian rhythms, also have an ‘internal timing mechanism’. Some empirical studies demonstrate that there is a better time in a day for students to learn. This generally refers to student’s abilities to focus during different times of a day. Most researchers divide a day into two distinguishable time frames, i.e., morning and afternoon. Nevertheless, there are conflicting theories and research findings about the effectiveness of a certain time in a day. According to Callan’s (1997/1998) summary of two different studies conducted in the early 1980s, one research finding shows that high school students who tend to study in the morning graduate with a letter grade that averaged half a grade higher than those who prefer to study in the afternoon. The other study’s findings (Folkhard, 1980), however, suggested that it is not good to give school children difficult tasks early in the morning, as morning is not the best time of the day for them. This statement was echoed by another research finding which also indicated the afternoon preference by young adults regarding the best time-of-day for their learning. As May et al. (cited in Intons-Peterson et al., 1998) revealed, young adults, when tested during their preferred time, performed better in sentence recognition than older adults who, in turn, when tested during their preferred time, performed better than young adults. That is to say, each group performed better than the other when tested at a preferred time. Partially echoing the findings, Intons-Peterson et al. (1998) obtained the same results from their study with the participants in their preferred time. However, Intons-Peterson et al. point out that there are differences between theirs and May et al.’s findings, as May et al. did not have enough younger adults with morning preferences or older adults with evening preferences to conduct a fully crossed design. In their attempt to remedy this defect, Intons-Peterson et al. tested both older and younger adults at preferred and at non-

preferred times in their study. They believe that it is possible that time-of-day preferences and circadian-physiological-neurological concomitants are modulated by lifestyles associated with different ages. For example, most young adults they tested are first or second year students at college. As most of them live in noisy dorms, it is difficult to go to bed early and in turn to get up early in the morning. Older adults whose daily schedule is heavily influenced by their work hours preferred the morning versus the afternoon. Intons-Peterson et al. conducted two experiments with 975 younger adults and 143 older adults, their findings indicated that preferences for the morning hours did not increase monotonically with age, at least for ages over 55. All three groups of older adults who participated in the study preferred morning even though they differed in age, education, living situation, and occupation. According to Intons-Peterson (1998), "Time-of-day preferences shift from early adulthood to later adulthood. We found relatively few older people who preferred the evening and relatively few younger people who preferred the morning" (p. 371).

In a study about the effects of time-of-day of instruction on beginning reading achievement, Davis (1987) indicated that, "the benefits of morning and afternoon instruction might not be the same for older and more experienced readers as it is for beginning or younger readers" (p. 140). Therefore, time-of-day should be studied in consideration of participants' age or grade level at the same time.

Gender and Grade as Common Factors

As pointed out by Gill (1998), "In practice, dichotomous sex differences typically are translated to mean that we should treat males one way and females the other way" (p.

185). Although little research has been conducted about the impact of gender differences on cognitive engagement, ample research is available on: a) gender differences on student achievement which can be viewed as related to their cognitive engagement in class and, b) the effects of teachers' gender on male or female students in class. However, these studies often have inconsistent and even contradictory results. In education, gender is often studied with subject preferences. For example, Schunk (1992) reported that boys often hold higher performance expectations in mathematics than girls and that gender-role identities and socialization practices can influence the value that children attach to task. This finding suggest that boys are more focused in mathematics lessons than girls do in class. Although Meece and Courtney (1992) reviewed a number of similar studies that also support these findings, they also showed some inconsistencies in the relative influence of expectancy and value perceptions between boys and girls. They concluded that gender differences could not adequately explain the differences of student achievement. Eccles and Blumenfeld (1985) also reported, "Surprisingly, we found few blatant sex differences. All of the sex differences we found were small; and even these were not consistent across the classrooms we studied" (p. 80). The findings on the relationship between gender and achievement, because of inconsistent results, warrant further research. Search results have found no literature available on the relationship between gender and cognitive engagement.

Do male and female students show any differences in their cognitive engagement in class? Furthermore, do male, or female, teachers make any difference on male or female students' cognitive engagement in class? And if so, what are the possible causes for these differences? In a study by Huston and Carpenter (cited in Lindow et al., 1985), girls were

found to spend more time in highly structured activities than boys. The researchers defined structure as 1) the amount of feedback given by adults, and 2) the extent to which the child could observe adults performing activities similar to those in which the child was engaged. They found that children who are engaged in highly structured activities are more likely to seek approval from adults than those engaged in less structured activities. Although this study was conducted with preschool children, Lindow et al. (1985) predicted that "...the gender differences in responsiveness to adults that appear during the preschool years continue into the later years, stimulating teachers to react differently to male than to female students" (p. 6). Research shows that there exists relationship between gender differences and student interests in certain subjects in school. Findings from Serbin et al. (1993) on gender stereotypes indicated that boys usually show more interest in and therefore pay more attention to numbers and things, whereas girls tend to be more interested in words and people. In another gender-related study on junior high students by Good et al. (1973), boys are found to be much more active and interacted more frequently with the teachers than girls during class although the study did not imply that boys pay more attention to the teachers than do the girls. This finding was subsequently explained in a similar study by Schneider et al. (1995) that:

Females may feel less excited and involved in academic classes because they do not feel encouraged to participate in class activities... teachers' behavior may lessen females' opportunities for involvement during school. It may also be that females, knowing that they are less likely to receive encouragement to participate, internalize a sense of disengagement and consequently are less excited while in class. (p. 189)

In a study about the quality and quantity of classroom interactions that teachers have with their male and female students, Brophy (1985) postulated that male and female teachers can be expected to model the characteristics and behavior expected of male and

females in the society. He further explained that, “in their general approach to teaching, male teachers usually model masculine role behaviors... both male and female teachers tend to project expectations that male students conform to the male role and female students conform to the female role” (p. 117).

Gender and grade effects on student achievement are often examined through empirical research in which student achievement and cognitive engagement are regarded as having a close association. Few would challenge the statement that a student will not achieve in school if he or she does not pay attention during class, regardless if this student is male or female. This, however, does not mean that gender and grade effects do not exist. As reported by Wigfield and Harold (1992), the grade effects for all school activities, with the exception of sports, reveal that younger children have more positive ability perceptions than do the older children. Concerning how much children value academics or care about different subjects, Wigfield and Harold argue that, “the grade effects for achievement values were significant for reading, computers, music, and sports activities... These results paint a rather gloomy picture of how children’s perceptions of ability and valuing of academic activities change across the school years” (pp. 106-107).

Subject Matter as a Factor

The effects of subject matter on student engagement during class time has been a popular as well as a controversial topic in research. Many research findings point to a disheartening picture of high school students’ disengagement in most academic classes. Examining student attitudes towards school subjects, Stodolsky (1988) reported that,

On the average, students like math and science in the elementary grades, but they dislike both subjects more in junior high and high school... if anything, many

students find social studies lacks challenge; it is boring... students in high school liked English better than they did in junior high, and it was at the top of the list... foreign language was ranked the least liked subject at all grades. (p. 126)

Stodolsky listed many research findings that demonstrate the effects of students' perceptions and attitudes towards school subjects. However, the teachers' role in influencing students' perceptions and attitudes was not thoroughly examined.

The study of student cognitive engagement is often connected with the investigation of student's liking of a certain subject. But, why does a student prefer one subject to another? In this regard, future goals and motivational beliefs are seen as powerful and important factors. For example, science has been a failing subject in school for many American teenagers. Indeed, most students who failed the subject did not see the value in their future careers. In other words, students do not feel interested in the subject and that disinterest helps lead them to failure. Not surprisingly, interest and motivation to learn play an important role in affecting a student's success or failure in a subject. Therefore, a teacher's role in motivating students is crucial, and this issue has often been linked in the general debate over educational reform. According to Lee and Anderson (1993), evidence exists that the system is "failing in a motivational and affective sense" (p. 686). In their effort to find out how deeply students engage themselves in science class and how cognitive, motivational and affective factors may interact to influence students' quality of task engagement, Lee and Anderson examined four case studies of 12 sixth grade students. Factors such as the participants' goals in science class, attitudes toward science, task engagement, and knowledge and achievement were examined. The results of the study revealed the complex interactions among cognitive qualities of academic tasks and students' motivational and affective orientations in science class (p. 606). The real

issue does not lie in subjects only, although some students may show more interests in one certain subject than others. Often, there are reasons for a student to like a certain subject. If teachers can combine their teaching subjects with students' personal goals and interests, chances are students will be more cognitively engaged in class and in turn their achievement will increase.

In general, although notable differences have been found between how much students may like certain subjects, or how hard and important those subjects may appear to them (Goodlad, 1984), many studies have reached different conclusions. Some researchers clearly point out that personal liking for a subject as a factor for student cognitive engagement can not stand by itself (Brophy & Evertson, 1978; Stodolsky, 1988; Harp & Mayer, 1997). Instead, student cognitive engagement in any given subject is more influenced by students' personal goals and beliefs. Personal goals and beliefs are generally seen as having a connection with student internal drive and motivation.

Instructional Method as a Factor

The use of various instructional methods by teachers is conventionally found to be an important factor in influencing student motivation in learning and achievement. A teacher may have his or her teaching philosophy realized through classroom management by either providing a teacher-centered, or student-centered approach. Numerous research findings show that student-centered approach often provides students with choices and control, and therefore students feel empowered and motivated. Consequently, the so-called 'context variables in teaching' (teacher-centered versus student centered) are linked with the study of student cognitive engagement by some researchers (Brophy & Evertson,

1978; Brophy et al., 1983; Wentzel, 1997). One of such examples can be how the classrooms are structured so students may work either cooperatively or individually and each of these structures leads to different consequences for student engagement and learning. As Newman and Schwager (1992) point out, “how students view themselves in the context of the classroom is associated with their level of interest, persistence, task engagement, and task performance” (p. 123). Other ways for teachers to motivate students include the use of technology or a wide variety of media such as TV, audio tapes, video recordings, computers, and so on. In a recent study, Wentzel (1997) examined some students’ perceptions of pedagogical caring in relation to their motivation to achieve positive social and academic outcomes in class. Through a longitudinal sample of 248 middle school students from grade six to grade eight, Wentzel concluded that his findings “provide strong evidence in support of the notion that students are more likely to engage in classroom activities if they feel supported and valued” (p. 417). Two other important findings were also reported. First, students enjoyed ‘activities’ that were organized by the teacher, which is different from the teacher simply lecturing in class. Second, the students’ perception of their teacher as being supportive and appreciative determined their level of cognitive engagement.

More often than not, teachers are the ones who often decide what kind of activities takes place at a certain time during class, and how long an activity may last. Whereas it is impossible to have a certain kind of activity to fit all students’ interests, it is likely that most students can engage themselves in an activity that is both interesting and stimulating. However, careful planning is important and it often dictates the success or failure of a class. For example, no matter how interesting an activity may be, students may feel bored

when it lasts too long. Although some teachers prefer to use group activities to foster learning, studies show that many teachers still prefer to use traditional teaching method. In a study about how time is allocated in American public schools, Ornstein (1992) reported that in fifth-grade math instruction, teachers spent about 44 percent of instructional time on seatwork activities; and another 31 percent was devoted to uniform recitation. Checking or reviewing work only accounted for 6 percent. In social studies, on the other hand, uniform recitation was the main instructional method used by the teacher, accounting for about 28 percent of the time. Reviewing and checking took only 2.5 percent of the time. In the same study, Ornstein also revealed that academically engaged time for students in class was highest during activities directed by teachers, about 84 percent, compared with other seatwork activities combined, a total of 70 percent (pp. 2-3).

In a similar study, Schneider et al. (1995) indicated that, “high school students are spending only about a third of their time on independent work that can be thought of as intellectually challenging... Considerably less time is spent on activities that could be considered as more engaging” (pp. 184-185). However, it appears that computer classes or subjects that involve using computers help students sustain attention. For example, in an empirical study of whether students’ time off-task rating during computer-assisted instruction (CAI) was different from the seatwork, Din (1996) observed two grade 10 classes for seven weeks. The findings showed that students’ time off-task during CAI was consistently lower than that during seatwork. Besides, students’ achievement in computer assignments was found to be significantly better than that in seatwork assignments. The study suggests that CAI can be used as an effective instructional method and a classroom management strategy for high school student engagement.

Summary of the Literature Review

This chapter provides a review of literature with critique in three different but related areas of research: intrinsic motivation, flow study, and cognitive engagement. First of all, a comprehensive review on motivation research in work and job satisfaction was conducted. This also included the study of intrinsic motivation in education. Secondly, a review of flow theory was provided. This part of the review consisted of the definition, concept and characteristics of flow, the method to study flow phenomenon, *autotelic* personality and *autotelic* job. In addition, the review also covered flow study and its application in education, flow and its relevance with other cultures, e.g., Confucianism and Taoism, possible negative impact of flow, and teachers in flow and leadership implications. Thirdly, a review of empirical research in the study of student cognitive engagement was presented. This section covered the areas of current theories and research on cognitive engagement, relevance of cognitive engagement and flow, as well as some factors that may affect student cognitive engagement, e.g., goal orientation, feedback, time-of-day, subject liking, gender, and instructional methods.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

Introduction

This chapter explains the research design and methodology for the current study. To study the relationship between teachers' flow experiences and student cognitive engagement in class, the following two research questions are addressed:

1. Are there differences in the cognitive engagement of students when teachers are experiencing flow?
2. To what extent do these differences in cognitive engagement vary by grade level, subject matter, time-of-day, instructional method, and the gender composition of the class and instructor?

Although the methodology used in answering these questions will be described in detail in this section, multiple regression analysis was used to estimate the effect that teachers' flow experiences, as well as the other independent variables used in the study had on the cognitive engagement of students. In the following sections a number of important issues concerning the research design and methodology used in this study are discussed. First, the dependent and six types of independent variables used in the analysis are described in detail. Then, a discussion of the sample and the survey instruments, including their validity and reliability is given. Finally, a presentation of the pilot study

that preceded the current research effort is provided followed by a description of the data processing and an analysis of the variables.

Independent and Dependent Variables

In this study, there is only one dependent variable: student cognitive engagement. The measurement of whether a student is cognitively engaged or not at the time of the survey was based on the “Yes” or “No” response the students provided in their ESFs. Since class is the unit of analysis, the dependent variable was measured as the percentage of students cognitively engaged at the time of the survey. For instance, in a class of 30 students, if fifteen students positively indicated their cognitive engagement, then the percentage of student engagement in this class is fifty percent. A model of the independent and dependent variables for this study is attached in Appendix G.

There are six groups of independent variables in this study: Flow; Time-of-day; Gender; Grade; Subject, and Instructional method. A description and justification of each variable selected for this research follows:

1) Flow. This is the most important independent variable. In fact, this study is built primarily on investigating the relationship between teachers’ flow and student cognitive engagement. Data collected from the participants were categorized into two distinctive categories—teachers in flow and teachers not in flow. This was done through the creation of a dummy, or binary variable, that took on the values zero and one, depending on whether the teacher was in a non-flow or flow state respectively.

2) Time-of-day. This variable was included to test whether time-of-day had a different psychological impact on student cognitive engagement. It was also represented

by a dummy variable that took on the value “one” in the morning and “zero” in the afternoon.

3) Gender. To test the effects of gender on the cognitive engagement of students, two gender-related variables were created—teacher’s gender and student’s gender. While teacher’s gender was also represented by a dummy variable in the analysis (male equals one, and female equals zero), the student’s gender variable was measured simply as the percentage of male students in a given class.

4) Grade. Since my study involved students from five different grades (6 to 10), I created a series of dummy variables to allow the cognitive engagement of student to vary by grade. To create these dummy variables, I deleted one category of the variable to avoid the dummy variable “trap” and created the following variables:

D1 = 1 if Grade 6, 0 otherwise;

D2 = 1 if Grade 7, 0 otherwise;

D3 = 1 if Grade 8, 0 otherwise;

D4 = 1 if Grade 9, 0 otherwise;

Although Grade 10 served as the omitted category, it makes no difference which category is omitted, since equivalent results would have been obtained if a different category had been omitted.

5) Subject. Different subjects may play an important role in influencing student cognitive engagement in class. Some students may prefer one subject to another. With this assumption in mind, students who particularly like English may be more cognitively engaged during English class. Since there were eight subjects in this study, dummy

variables were created to test the effect of each subject on student cognitive engagement.

These variables are listed below except for computer class which is the omitted category:

English = 1 if subject is English, 0 otherwise;

Math = 1 if subject is math, 0 otherwise;

Science = 1 if subject is science, 0 otherwise;

Social Studies = 1 if subject is social studies, 0 otherwise;

Woodwork = 1 if subject is woodwork, 0 otherwise;

French = 1 if subject is French, 0 otherwise;

Arts = 1 if subject is arts, 0 otherwise.

6) Instructional Method. This variable was considered necessary because previous studies in the literature (e.g., Brophy et al., 1983; Spaulding, 1992; Shernoff et al., 1999) have pointed to the importance of such factors as students' choices and control as well as teachers' lectures versus independent work in determining the cognitive engagement of students. A number of different instructional methods frequently used by teachers in class were included in this study: teaching (teacher lecturing in front of the class); individual work (students doing seatwork individually); group work (group activities organized by teacher); one-on-one (teacher helping individual students one at a time), and other (any other forms that did not fall into the four instructional methods). To avoid dummy variable trap, "other" served as the omitted category. Other variables are listed below:

Teaching = 1 if instructional method is teaching, 0 otherwise;

Group work = 1 if instructional method is group work, 0 otherwise;

Individual work = 1 if instructional method is individual work, 0 otherwise;

One-on-one = 1 if instructional method is one-on-one, 0 otherwise.

The Hypotheses

The competing hypotheses for the first research question in this study are as follows:

H_O: There is no statistically significant relationship between teachers' flow experiences and their student cognitive engagement in class.

H_A: There is a non-zero relationship between teachers' flow experiences and student cognitive engagement in class.

Similarly, the hypotheses for the second research question are:

H_O: There is no statistically significant relationship between all the other variables included in this study (time-of-day, gender, grade, subject, and instructional method) and student cognitive engagement.

H_A: For all the other variables included in this study, e.g., time-of-day, gender, grade, subject, and instructional method, a non-zero relationship exists between them and the cognitive engagement of students.

It is important to indicate here that confidence levels of .05, .01, and .001 were used in all tests for statistical significance. Although confidence levels of .05 and .01 are commonly used in social science study, I chose to include a confidence level of .001 because of the importance of the effects that might be displayed by independent variables in this study. Throughout the analysis section, when tests of significance were performed, a confidence level of .05 was noted with one asterisk (*), .01 with two asterisks (**), and .001 with three asterisks (***).

Participants and Sample

Participants consisted of a total of thirteen randomly sampled teachers and their students voluntarily participating in this project. Participants were from a number of urban elementary and secondary schools in the province of British Columbia, Canada. Teachers who participated in the survey had at least two years of teaching experience. To maintain gender equality in the selection of teachers, the male-female ratio of teachers in my sample represented an approximately equivalent ratio of the overall teacher population in the school district. Such random selection was done through first dividing male and female volunteers into two groups and then taking the proper percentage from each group that represented the appropriate ratio of a certain gender.

Students were from grades 6 to 10. All participants also gave their written consent to participate in the study prior to the survey started. A sample of the written consent used in the research is attached in Appendix A.

Due to the length of the survey that spanned five consecutive school days for participating teachers, concerns over the student participants coming from different rather than the same group were dealt with. The question about the possibility of some participants might have filled out more forms than others was justified as follows. Just as a teacher did not have control over the number of students attending his or her class on any particular day, e.g., illness or other family business, it was impossible for a teacher to anticipate or control the psychological conditions of any particular group of students. Therefore, it really did not matter whether a student participant in fact filled out more ESFs than some others. In fact, such differences reflected the reality. On the other hand, it is equally unnecessary to be concerned that some student participants might have

rigidly filled out ESFs without truly recording his or her psychological state at the time of the survey. It was quite unlikely that a student had the same level of cognitive engagement recorded on the ESFs three times a day for five consecutive days. It must be assumed that participants complete the survey to their best ability and with honesty. The focus of this research was on the examination of the relationship between teachers' flow experiences and student cognitive engagement in class. It did not really matter, as far as the reliability of the total sample was concerned, that some students might have filled out the form just once, while others might have done more than once. Furthermore, it is necessary to point out that there was no information about the student participants' ethnicity and SES (socioeconomic status), although both ethnicity and SES may be related to student cognitive engagement. This is discussed in more detail in chapter 5.

Procedures

The general procedures of the ESM (Experience-Sampling Method) adopted for this research followed the patterns that had worked satisfactorily in previous studies on adolescents by Csikszentmihalyi and his research team at the University of Chicago. Before the survey took place, teachers that were to participate in the survey were trained in a 45-minute session to identify the experience of flow and how to properly complete the ESFs when a signal was received. Using the characteristics of flow by Csikszentmihalyi (1993, 1997b), a simple and practical protocol was followed during the training session (see Appendix F). In addition, a handout about flow and its contextual characteristics in teaching was also provided to the teachers. This handout, adapted from "The Conditions of the Flow Experience" (Csikszentmihalyi, 1997b, p. 8), was used as

the training ‘protocol’ for the teacher participants. All the teachers who took part in the survey were confident in identifying flow after the training session. The students were also coached on the proper use of ESFs for Student before the survey took place. Before the week of the survey, all students and teachers who voluntarily participated in the study had also signed the consent form (see Appendix A).

During the week of the survey, teachers used either electronic pagers or digital wristwatches that were programmed in a random order to beep during school hours three times per day. Since the study focused on finding the relationship between teachers’ flow experiences and student cognitive engagement in class, it was pre-determined that all survey forms would be filled out during class time. If an electronic beep was sent during break time or lunch hour, then another random programming would follow. Based on the experience from the pilot study, teachers were also advised to modify the first and last five minutes of a class if a signal was sent through the beeper. Whenever this happened, another random programming would follow. Both teachers and students filled out their respective ESM forms at the same time immediately after each beep. Then the teacher collected the forms from the students and bundled them together with the form that they filled out to form a ‘batch’ (one class) for data analysis.

One of the reasons why the ESFs were filled out three times daily for five consecutive days was simply for the sake of the validity and reliability of the data. When the survey was completed by the end of the week, each teacher would have 15 potential batches for analysis.

Instruments and Their Validity and Reliability

Both ESF for Teachers' Flow Experience in the Classroom and ESF for Student Cognitive Engagement in the Classroom (see Appendix D and E) were used for this study. The two ESFs were revised versions based on the ESFs used in the 1999 pilot study (see Appendix I and J). Both of the improved forms contained a series of open-ended questions on the state of optimal experience to complete at the moment the beeper sent out a signal to the participants. Both of the ESFs for this research were adapted from the original ESF (Csikszentmihalyi & Csikszentmihalyi, 1988, pp. 257-258) by Csikszentmihalyi, the scholar who established flow theory. The original ESF was designed to determine the frequency and some accompanying characteristics of flow in a respondent's daily life. For this study, a modified ESF was necessary, because the purpose of the study was to investigate the relationship between teachers' flow and student cognitive engagement in class. It is worth discussing the feasibility of adapting the original ESM. As Csikszentmihalyi and Rathunde (1993) indicated that, "many variations on the basic method are possible... the items in the ESFs can be changed according to the goals of the study. Instead of intensive signaling for one week, it is possible to signal less frequently for longer period" (p. 67). Many recent researchers (Shernoff et al., 1999; Turner et al., 1998; Larson & Richards, 1991) have used the ESM and revised ESFs as major analytical tools for their respective researches. The following is a description of the design of the two ESFs used in this study.

ESF for Teachers' Flow Experience in the Classroom

Based on the research questions in this study, the form was designed to find out from teachers whether they were experiencing flow when a signal was received. A total

of eight questions were asked on the ESF for Teachers. It took approximately one to two minutes to complete each form. Since teachers were trained on how to identify flow, there was a direct question (#4) on the form requiring teachers to indicate whether they were in flow at the time a randomly programmed signal was received. This question might well justify the validity of the instrument based on the purpose of the study. Further, three other questions (#1–3) were asked, and they were all related to the psychological state of the teacher at the moment of signaling, thus providing considerable reliability to the instrument. They also helped to confirm, or validate, the response for question 4. Question 7 gave the teacher an opportunity to state, from his or her perspective, the percentage of the students engaged in the assigned task. The data obtained from this question could not only indicate a possible relationship between teachers' flow with their perception of student cognitive engagement, but it could also be compared with the students' self reports on their cognitive engagement. Information concerning a number of other independent variables was also collected through this form. For example, teacher's gender, time-of-day, grade he or she was teaching, instructional methods used, and the subject the teacher was teaching.

ESF for Student Cognitive Engagement in the Classroom

Unlike the ESF for Teachers which focused on identifying teachers' flow experiences, the ESF for Students was adapted and designed for students to report their perceptions and levels of cognitive engagement in the classroom. A total of nine questions were asked. It took students no more than three minutes to complete each form during class. The first two questions were open-ended, which required students to provide

objective answers on the spot. Question 1 (what were you doing when your teacher handed this form to you?) was designed to check if a student was paying attention to the teacher at the time of the beep. This question was directly taken from Csikszentmihalyi and Csikszentmihalyi's (1988) original survey form. Question 2 (were you paying attention at that moment?) directly asked the psychological state of each student. It required a direct answer—yes or no—from the student to indicate if he or she was paying attention. Questions 3-7 asked students about their level and willingness of cognitive engagement. Information on questions 1, 3, 5, and 7 were mainly used to validate responses of Question 2—engaged or not engaged. For example, if a student indicated “yes” to the question 2 (Were you paying attention at that moment?) but then later chose “very low” to the question 3 (Indicate the level of attention you paid to your teacher or the organized activities), this would render that data sheet invalid. Therefore, information on questions 1, 3, 5, and 7 would confirm and validate Question 2, ensuring the validity and reliability of the data. Question 8 required students to specify the kind of instructional methods that helped them pay attention better. This information was used to evaluate the effect of instructional method on student engagement. Participants were asked to rate each question on a five-point Likert-type scale from number ‘1’ (not at all) to ‘5’ (very much).

It is very important to contemplate the reliability and validity of the instruments for this study—the two ESFs. In the words of Pyrczak and Bruce (2000), “the two most important characteristics of an instrument are its reliability (consistency of results) and validity (whether the instrument measures what it is designed to measure)” (p. 69). Based on the fundamentals of Experience-Sampling Method from Csikszentmihalyi, both the

ESF for Teachers and ESF for Students were closely adapted from the original ESF which was used over many years by Csikszentmihalyi and his research team. In addition, both ESFs were field-tested in the 1999 pilot study which yielded a positive relationship between teachers' flow experiences and student cognitive engagement. In terms of the validity and reliability of the ESM, Csikszentmihalyi et al. (1993) affirmed that:

It is a demanding method that requires a substantial commitment from researchers and participants alike. Fifteen years of ESM research, though, have more than done justice to the efforts of those involved. As a methodological innovation, ESM bridges the precision of paper-and-pencil measurement and the ecological validity of on-site observational techniques. Its contextual immediacy avoids the biases and distortions to which more global self-report measures are sometimes prone. As a research tool, it has already entered the methodologies of numerous fields, from life span development to cross-cultural investigations to the study of such clinical disorders as anorexia, bulimia, and schizophrenia. (p. 49)

In addition, the positive feedback from Csikszentmihalyi via emails about the adaptation from his original ESF for flow study has added reliability and credibility for the adapted ESF for Teachers and ESF for Students used in this study. Finally, the results from the pilot study conducted in 1999 (detailed in the next section) have also proven to be both a credible and replicable model for this study.

Pilot Study

As both fulfilling a course requirement and as a need for “a useful form of anticipation” (Locke et al., 1987, p. 66) for this study, a pilot study was conducted in November 1999. It was designed to test the practicality of the survey instruments used in the study. Three teachers from three different urban middle schools volunteered to participate in the pilot study. About 168 students taught by those teachers in various subjects also participated in the study. A notice about the nature of the study and the

permission slips were sent home to the students' parents and guardians a week before the survey took place. During the week of survey, each teacher filled out the ESF for Teachers (see Appendix I) twice a day for five consecutive days, with a total return of 29 out of a possible 30 completed ESF for Teachers. A total of 778 ESF for Students (see Appendix J) were also collected from students, totaling altogether 29 batches (classes) for analysis. As previously stated, a batch refers to a package of completed forms from one teacher and all student participants at any given time during class. For the sake of the content validity, 51 forms were excluded because those forms were filled out either 30 minutes after the beep (see Csikszentmihalyi et al., 1993) or, were incomplete, leaving a total of 726 valid forms for data analysis. Students (N=168) were in the eighth and ninth grades. The beeper was programmed to activate randomly during class time. A little over fifty per cent of the beeps occurred during the morning classes and just under fifty per cent in the afternoon classes. Five academic subjects were included in the study. They were: English, math, science, social studies, and career and personal planning (CAPP). During the week-long survey, beeps in English classes occurred six times; three teachers indicated experiencing of flow and three others experienced non-flow. There were nine beeps in math; three teachers experienced flow and six others had non-flow. During CAPP, there were three beeps, one teacher had flow and two others experienced non-flow. Science was beeped three times; one experienced flow and two others had non-flow. During social studies, beeps occurred eight times; five experienced flow and three others had non-flow.

Data were analyzed using the Chi-square test in this study because the technique serves well for screening purposes. The first two questions from ESF for Students were

“What was your teacher doing when the beeper went off?” and “What was on your mind?” respectively. The answers from the participants were compared and evaluated based on the answers from what the teachers put in the ESF for Teachers. The questions that were used to determine if a student was cognitively engaged were, “What were you doing?” and, “Based on your observation when beeped, about ____% of the students in class were engaged in tasks given.” The following null hypotheses and alternative hypotheses were tested in the pilot study:

H_O: No positive relationship exists between teachers’ flow experiences and student cognitive engagement.

H_A: There is a positive relationship between teachers’ flow experiences and student cognitive engagement during class.

Based on the above hypotheses, four possibilities (also see Appendix K) were established: 1) Teachers experienced flow and students reported cognitive engagement; 2) Teachers experienced flow and students reported no cognitive engagement; 3) Teachers did not experience flow and students reported cognitive engagement; and 4) Teachers did not experience flow and students reported no cognitive engagement.

Data from this pilot study revealed the following:

ESF for Students: question#1—“What was your teacher doing when the beeper went off?” From a total of 338 reports, when teachers were in flow, 274 students (81.07%) reported cognitive engagement, compared with 64 students (18.93%) reporting no cognitive engagement. When teachers were not in flow, 268 students (69.07%) reported cognitive engagement, compared with 120 students (30.93%) reporting no cognitive engagement for a total of 388 reports.

ESF for Students: questions#2—“What was on your mind?” Teachers in flow: 271 students (80.18%) reported cognitive engagement, compared with 67 (19.82%) students reporting no cognitive engagement for a total 338 reports. Teachers not in flow: 254 students (65.46%) reported cognitive engagement, compared with 134 students (34.54%) reporting no cognitive engagement for a total of 388 reports.

The Chi-square goodness-of-fit test formula was used (Hopkins, et al., 1987, p. 192). Detailed calculation is shown in Appendix B and Appendix C respectively. Since the observed Chi-square value exceeded $.999X^2_1 = 10.8$, the null hypothesis was rejected at the .001 level ($p < .001$). At the same time, the null hypotheses which stated that no positive relationship existed between teachers’ flow experiences and student cognitive engagement was rejected.

$$X^2 = \sum_{r=1}^2 \sum_{c=1}^3 \frac{n_{rc} (P_{rc} - \pi_r)^2}{\pi_r}$$

The results of the analysis from the Chi-square test revealed a strong relationship between teacher’s flow and student cognitive engagement. The outcome of the analysis and comparison of the data of student cognitive engagement between teachers’ flow and non-flow situations is illustrated in the charts (see Appendix B & C). However, it is very important to point out that, although there were still more students who reported being cognitive engagement than non-engagement when teachers reported non-flow, the number of students who were cognitively engaged simply doubled when teachers reported flow experiences. This is the highlight of the key findings in 1999 pilot study.

Data Processing and Analysis of Variables in This Study

All data collected were processed based on batches (classes) as the class was the unit of analysis. Only valid data were used to produce the final results. Two general criteria were applied to assess the validity of the data. First, any ESFs that were completed 30 minutes after the beep were not used for this study. This is in accordance with the criteria that are consistently applied in the use of ESM (see Csikszentmihalyi et al., 1993). Second, any incomplete ESFs that did not have all the critical information were not considered as valid, and therefore were not entered into the analysis. For example, if a teacher did not check whether he or she was in flow or not, then the ESF was considered to lack critical information and consequently, that batch of ESFs was not included in the data analyses. The same applied to the ESFs for students. If any student did not check whether he or she was cognitively engaged, then the ESF was not considered as valid data either.

Two separate categories were established for data analysis: 1) Teachers in flow, and 2) Teachers not in flow. Each batch was grouped into either of the two categories using SPSS software. Conditions of student cognitive engagement, together with a few other independent variables, were examined and analyzed based on the data within each class. The measurement of cognitive engagement was the percentage of engagement from each class at the time of the survey. Multiple regression analysis was used to evaluate the data and estimate a series of five related models. This technique was used since as Hopkins et al. (1987) stated, “*Multiple regression* is the statistical term for predicting performance on Y from two or more *optimally weighted* independent variables” (p. 101). This research design consisted of one dependent variable (student cognitive engagement) and six

groups of independent variables (flow, time-of-day, gender, grade, subject, and instructional method).

As indicated above, there was only one dependent variable in this study, student cognitive engagement. Teachers' flow was the first independent variable reflecting the major goal of the investigation. This focus also addressed the first research question of this study: Are there differences in the cognitive engagement of students when teachers are experiencing flow? Regression analysis was used to examine the effects of flow on the cognitive engagement of students.

My second research question concerns to what extent the differences in cognitive engagement varied by grade level, subject matter, time-of-day, instructional method, and gender composition of the class and instructor. Based on the existing literature, five other groups of independent variables were considered due to their effects on student cognitive engagement. These five independent variables were hypothetically viewed as having lesser influence on the dependent variable than did teachers' flow. Besides, the hypotheses about their relationship with the dependent variable in this study were assumed to be tentative. It must be emphasized that any one of the six groups of independent variables, taken together or just a dummy, might have a positive effect on student cognitive engagement. For this very reason, I will run different regression models through SPSS to show their various levels of relationship with the dependent variable. A series of five models, one unrestricted and four restricted, are constructed to test for the general effects by each group of independent variable first. This is to be done through the use of F-test to see if any of these categories of independent variables were significant in explaining the cognitive engagement of students. Then, having shown the important role

that some categories of independent variables might have in explaining student cognitive engagement, I'd move on to find out the specific independent variables that have effects on student cognitive engagement. A detailed description of F-test will be presented in the next chapter.

Summary of the Research Design and Methodology

Both research design and methodology are important considerations in this chapter. Because of the nature of this investigation, multiple regression analysis was conducted to measure the relationship between the independent and dependent variables. One dependent variable and six groups of independent variables were identified and included in this study. A number of important issues concerning the research design and methodology for this study were elaborated with their subtopics. Independent and dependent variables were defined, including the use of dummy variables. Then, an explanation of participants and a justification of the sample size were given. Following the discussion of the procedures, the instruments and their validity and reliability were presented. The completed pilot study with its resulting data was presented. Finally, the data processing and analyses were explained and interpreted.

CHAPTER IV

DISCUSSION AND INTERPRETATION OF THE FINDINGS

Introduction

In this chapter, I will present and discuss the data analyses that resulted from a series of five multiple regression models. Firstly, I will describe the classification and measurement of all variables used in this study. Secondly, I will present the initial findings based on the raw data generated using the SPSS (8.0) software. Thirdly, I will report the key findings regarding the relationship between teachers' flow and student cognitive engagement in class. Moving from a discussion of general effects to the specific effects of the independent variables, five major regression models are introduced. The first model (Model 1) contains all of the independent variables used in the analysis and is considered the "unrestricted" model. The remaining four models are all restricted models which mean that a group of variables has been removed from the core model. For example, in model 3, all dummy variables of grades such as grade 6, grade 7, grade 8, and grade 9 are left out of the model. These restricted models will then be sequentially compared with the unrestricted models through the use of F-tests to demonstrate the statistical significance of the sets of independent variables. All independent variables are examined and interpreted in terms of their relationship with cognitive engagement.

Classification and Measurement of All Variables

To provide readers with an overview of the variables used in my analysis, Table 1 describes these variables in more detail. In particular, for each of the variable in my analysis, the following table lists the variable's name, its classification type, and most importantly, how the variable itself is measured. For example, the variable that measures whether a teacher is in a state of flow is called "flow" and it is classified as a dummy independent variable. When a teacher is in a state of flow, the variable takes on the value "one", and when a teacher is not in a state of flow, it takes on the value "zero".

Table 1

Classification and Measurement of Dependent and Independent Variables

Variable Name	Classification	Measurement
Student cognitive engagement	dependent V.	percentage of engagement
Flow	dummy I.V.	Flow=1; else=0
Non-flow	criteria variable	served as omitted category
A.M.	dummy I.V.	A.M.=1; else=0
P.M.	criteria variable	served as omitted category
Gender (male teacher)	dummy I.V.	Gender=1; elses=0
(Female teacher)	criteria variable	served as omitted category
Student-male	independent	percentage of males in class
Grade 6	dummy I.V.	Grade 6=1; else=0
Grade 7	dummy I.V.	Grade 7=1; else=0
Grade 8	dummy I.V.	Grade 8=1; else=0
Grade 9	dummy I.V.	Grade 9=1; else=0
Grade 10	criteria variable	served as omitted category
English	dummy I.V.	English=1; else=0
Math	dummy I.V.	Math=1; else=0
Social Studies	dummy I.V.	S.S.=1; else=0
Science	dummy I.V.	Science=1; else=0
French	dummy I.V.	French=1; else=0
Woodwork	dummy I.V.	Woodwork=1; else=0
Arts	dummy I.V.	Arts=1; else=0
Computers	criteria variable	served as omitted category
Teaching	dummy I.V.	Teaching=1; else=0
Group Work	dummy I.V.	Groupwk.=1; else=0
Individual Work	dummy I.V.	Individualwk.=1; else=0

One-on-one Other	dummy I.V. criteria variable	One-on-one=1; else=0 served as omitted category
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Report of Raw Data Collection and Findings

A detailed break-down of the frequency and percentages of all variables used in this study is presented in Table 2. As described in the previous chapter, a total of 190 classes were surveyed with 5047 ESF returns received from students describing their level of cognitive engagement in class. Invalid or incomplete data were not included in the final analysis.

Thirteen teachers participated in this study. Each teacher was beeped three times a day for five days; a total of 15 classes were supposedly surveyed for each teacher ($3 \times 5 = 15$). With thirteen teachers, the total number of classes should be 195 ($13 \times 15 = 195$). However, for various reasons during the week of survey, only 190 valid classes were sampled from the thirteen teachers and their students. Consistent with the use of the Experience-Sampling Method, any ESFs that were filled out after thirty minutes of the beep were not considered valid.

Table 2 shows the comparison of the frequencies and percentages within each of the six groups of independent variables (Flow, Time-of-day, Gender, Grade, Subject, and Instructional method). It is important to indicate that class is the unit of analysis in this study. For a specific percentage of student cognitive engagement from each of the 190 classes, please refer to Appendix N. Within each of the six categories of independent variable there are dummy variables (Table 2). The frequency of each dummy within a total of 190 surveyed classes is given. For example, in the category of teachers' flow, the

total number of teachers who reported flow is 93, accounting for 48.9 percent of the 190 classes whereas 97 classes were reported by the teachers as not-in-flow, accounting for 51.1 percent of the total surveyed classes. The total frequency and percentage of each of the six categories are rounded so that totals sum to 100 percent.

Table 2

Frequency and Percentage of 6 Groups of Independent Variables (N=190)

I.V. Categories	Dummies	Class Frequency	Percentage
1. Teachers' Flow	Non-Flow*	97	51.1%
	Flow	93	48.9%
	Total	190	100%
2. Time-of-day	A.M.	108	56.8%
	P.M.*	82	43.2%
	Total	190	100%
3. Gender (teacher)**	Male	86	45.3%
	Female*	104	54.7%
	Total	190	100%
4. Grade	Grade 6	38	20%
	Grade 7	34	17.9%
	Grade 8	36	18.9%
	Grade 9	41	21.6%
	Grade 10*	41	21.6%
	Total	190	100%
5. Subject	English	43	22.6%
	Math	36	18.9%
	Social S.	25	13.2%
	Science	16	8.4%
	French	27	14.2%
	Woodwork	10	5.3%
	Arts	14	7.4%
	Computers*	19	10%
	Total	190	100%
6. Instructional method	Teaching	84	44.2%
	Group wk.	33	17.4%
	Individual wk.	69	36.3%
	One-on-one	3	1.6%

Other*	1	0.5%
Total	190	100%

* Served as criteria variable and was deleted for dummies in the regression model.

** Gender is a dummy variable that refers to male teachers. Student gender, not a dummy, is calculated by the percentage of the male in each class.

It is important to note that the percentages of teachers' flow versus non-flow experiences were almost equally distributed in Table 2. For example, less than a 4% difference exists between teachers' flow and non-flow from the 190 teachers' ESF reports (51.1% non-flow versus 48.9% flow). It should be noted that these percentages were obtained from the teachers' ESFs rather than the student ESFs.

Data concerning the frequency of student cognitive engagement from 190 classes can be found in Appendix L. Although the frequencies of both class and individual raw data are available, only class was chosen as the unit for regression analyses in this study. Data concerning individual students (5024 observations) was not used in the regression analyses, although their responses were aggregated to the class level.

As shown in Table 3, descriptive statistics generated scores for the mean and standard deviation of the dependent variable (student cognitive engagement) and for the nineteen independent variables from the total 190 units of analysis. On average, in this sample of 190 classes, student cognitive engagement was about 74% during each class whereas teachers' flow was 49%. This means that in each of the 190 classes, 74% of the students reported cognitive engagement, whereas 49% of the teachers reported having experienced flow.

Table 3

Descriptive Statistics of Mean and Standard Deviation (N = 190)

Variables	Mean	Std. Deviation
Engaged-Or-Not	74.3433	22.0382
Flow	.49	.50
A.M.	.57	.50
Gender	.45	.50
Student-male	47.7490	9.9941
Grade 6	.20	.40
Grade 7	.18	.38
Grade 8	.19	.39
Grade 9	.22	.41
English	.23	.42
Math	.19	.39
Social S.	.13	.34
Science	8.42E-02	.28
French	.14	.35
Woodwork	5.26E-02	.22
Arts	7.37E-02	.26
Teaching	.44	.50
Group work	.17	.38
Individual wk.	.36	.48
One-on-one	1.58E-02	.12

Principal Findings from Multiple Regression Analyses

In this section, I will first discuss some general effects on student cognitive engagement by the different types of independent variables. Then, I will discuss the specific variables that have proven to be significant determinants of cognitive engagement. In my analysis, five separate models were estimated with Model 1 being the core model consisting of one dependent variable and all nineteen independent variables. This model, also called the unrestricted model, takes all variables in this study into consideration. Six groups of independent variables that were determined from the

literature review were entered for data analysis. All six groups of independent variables are included in Model 1. This is very important, because unless a model is correctly specified, the coefficients in the model are biased and inconsistent (Pindyck and Rubinfeld, 1981).

Model 1 (Unrestricted/Core Model)

Table 4

Coefficients of Independent Variables (N = 190)

Variables	B	Std. Error	Beta	t	Sig.
(constant)	85.246	17.102		4.984	.000
Flow	24.949	2.353	.567	10.604	.000***
A.M.	-.558	2.218	-.013	-.251	.802
Gender	1.934	2.495	.044	.775	.439
Student-male	-.446	.123	-.202	-3.622	.000***
Grade 6	9.813	3.554	.179	2.761	.006**
Grade 7	3.854	3.827	.067	1.007	.315
Grade 8	-8.614	4.070	-.154	-2.116	.036*
Grade 9	-.618	3.650	-.012	-.169	.866
English	-3.937	4.651	-.075	-.846	.398
Math	-6.917	4.807	-.123	-1.439	.152
Social S.	-14.276	5.122	-.220	-2.787	.006**
Science	-1.689	5.463	-.021	-.309	.758
French	-1.176	5.496	-.019	-.214	.831
Woodwork	-22.152	6.457	-.225	-3.431	.001***
Arts	-5.576	5.555	-.066	-1.004	.317
Teaching	3.144	15.156	.071	.207	.836
Group work	3.474	15.274	.060	.227	.820
Individual wk.	1.516	15.207	.033	.100	.921
One-on-one	9.192	17.128	.052	.537	.592

* p<.05

** p<.01

*** p<.001

Before discussing some of the effects of specific independent variables on the cognitive engagement, I would like to summarize the overall effect by each of the six groups of independent variables on cognitive engagement through the use of F tests in Table 5. In the case of those categories of independent variables such as time-of-day and

gender that are represented by only one variable, t-statistics are provided. A more detailed discussion of this methodology follows.

Table 5

General Effect by 6 Groups of Independent Variables

Categories of Variables	T-stats/F Stats	Significant at 5% level
1. Flow	10.604*	Yes
2. Time-of-Day	-.251*	No
3. Gender (Teacher-male)	.775*	No
4. Grade	6.17	Yes
5. Subject	3.27	Yes
6. Instructional Method	0.34	No

*Refers to t-statistic value.

To test to see if any of these categories of independent variables were significant in explaining the cognitive engagement of students, a series of restricted models were estimated with each restricted model formed by deleting an entire category of independent variables from the complete, or unrestricted model. As Pindyck and Rubinfeld (1981) point out, this F-test allows the researcher to “test whether the group of variables is significant, not individual variables in that group” (p. 118). In this regard, the following four restricted models were constructed:

- 1) Model 2, containing all of the independent variables except flow;
- 2) Model 3, containing all of the independent variables except the Grade 6, Grade 7, Grade 8, and Grade 9 dummies;

- 3) Model 4, containing all of the independent variables except the seven subject matter dummies; and
- 4) Model 5, containing all of the independent variables except the teaching, group work, individual work, and one-on-one dummies.

For each of these models, the R-squared was compared with the R-squared from the unrestricted model to calculate an F-statistic in the following manner:

$$\frac{(R^2_{UR} - R^2_R) / q}{(1 - R^2_{UR}) / (N - k)}$$

In this formula, R^2_{UR} refers to the R square in the unrestricted model while R^2_R refers to the R square in the restricted model. The 'q' is the number of variables taken out of the restricted model. In the denominator, 'N' stands for the total number of observations whereas 'k' stands for the total number of variables, including the constant, in the unrestricted model. For those categories of variables that contained only one variable, the same F-statistic as described above could have been calculated, but an equivalent test was provided by examining the relevant t-statistic from the unrestricted model. Using the above equation, the F-statistic for model 3 where all four grade level variable were left out of the equation can be calculated as follows:

$$\frac{(R^2_{UR} - R^2_R) / q}{(1 - R^2_{UR}) / (N - k)} = \frac{(0.621 - 0.566) / 4}{(1 - 0.621) / (190 - 20)} = 6.17$$

In terms of model 4 in which 7 dummy variables of Subject were left out, the F test statistic is 3.27. In the case of model 5, in which 4 dummy variables of Instructional method were left out, the F test statistic is 0.34. In summary, the F-statistic for each of the models 3 to 5, is respectively: 6.17, 3.27, and 0.34. The purpose of computing the F-

statistic is to compare it with the critical value of the F distribution. As Pindyck and Rubinfeld (1981) explained, “If the test statistic is larger than the critical value, we reject the null hypothesis and conclude that the subset of variables is statistically significant” (p. 118). As for the critical values of model 3 (3.41 if $\alpha=.01$; 4.81 if $\alpha=.001$) and model 4 (2.73 if $\alpha=.01$; 3.65 if $\alpha=.001$), the calculated F-statistics are both larger than the F-statistic, and only in model 5 (3.41 if $\alpha=.01$; 4.81 if $\alpha=.001$) is smaller than the F-statistic critical value from the F-distribution. In conclusion, both Grade and Subject have an effect on the student’s level of cognitive engagement, and as such, the null hypothesis that there is no effect by Grade and Subject on student cognitive engagement is therefore rejected. However, for model 5, due to the fact that the calculated F-statistic is smaller than the critical value, the null hypothesis that there is no effect on the student cognitive engagement by Instructional method cannot be rejected. For the above three models, only models 3 and 4 still need to be examined further, because a discussion of exactly which grade levels and subjects are statistically significant is desirable. I will discuss those specific effects of student cognitive engagement by the independent variables in the next section.

Table 6 shows a comparison of critical information and statistical values for models 1 to 5. Except for model 1, which is an unrestricted model, the rest of the four models are all restricted models. The R squared value for the unrestricted model was .621—the highest value among the five models—which means over 62 percent of the variation of student cognitive engagement is predicted or explained by the independent variables in the regression equation.

Table 6

Comparison of the Unrestricted and Restricted Multiple Regression Models (N = 190)

Model #	R	R-square	Adjusted R ²	Std. Error	F	Sig.
Model 1 (unrestricted)	.788	.621	.578	14.3090	14.649	.000***
Model 2 (restricted)	.608	.370	.304	18.3899	5.579	.000***
Model 3 (restricted)	.753	.566	.529	15.1244	15.153	.000***
Model 4 (restricted)	.755	.570	.540	14.9416	19.514	.000***
Model 5 (restricted)	.786	.618	.585	14.1934	18.777	.000***

* p<.05

** p<.01

*** p<.001

Model 1 employs all nineteen independent dummy variables and is an unrestricted model because, as explained by Pindyck and Rubinfeld (1981), “no assumptions have been made about any of the regression coefficients” (p. 117). Model 2 includes all the independent dummy variables except Flow. Notice that over 62% of the variation of student cognitive engagement is predicated by the independent variables in model 1, and only 37% of the variation of cognitive engagement is predicated by the rest of the independent variables when Flow was taken out in model 2. This shows not only the significant role of the flow variable in the regression equation, but also the best model—the unrestricted model—out of a series of five different models. Without Flow, the R squared value for all eighteen dummy variables in model 2 (.370) is not even as high as the R squared value (.486) in a simple regression model for which only Flow was chosen as the independent variable. The results from this simple regression indicated that a strong level of significance was found in student cognitive engagement ($t=13.345$, $B=$

30.667, $p < .001$) when teachers were in flow. However, the R square is only .486, which places the proportion of total variation in student cognitive engagement at about 49 percent. Statistically, not even half of the variance of student cognitive engagement is predicted by Flow. Apparently, a better model is needed to achieve a higher R squared value and create a stronger model. Ultimately, Model 1 is considered as the best because it reflects the strong effects of teachers' flow in the multiple regression equation with a much higher R square value (.621). Practically, it tells us the importance of teachers' flow on the effect of student cognitive engagement.

This study seeks to find if there is a positive relationship between teachers' flow and student cognitive engagement in class. As shown in Table 4, Flow has the highest statistical value ($B=24.949$) with student cognitive engagement. This is the critical and the most important finding in this study, as 25% increase in student cognitive engagement associated with teacher being in flow. Except for Time-of-day and Instructional method, Flow, Gender, Grade, and Subject all showed significant relationship at various levels, either negatively or positively. It is important to point out that some of the dummies within these four categories of independent variables showed significance. None of the dummy variables in the categories of Instructional method and Time-of-day revealed any statistical significance.

Having shown the important role that several categories of independent variables have in explaining student cognitive engagement, I'd now like to discuss the importance of several specific independent variables. In the category of grade, two out of five grades (grades 6 and 8) showed significance, whereas in the category of subject, two out of eight subjects showed significance. In the case of gender, only male students were found to

demonstrate a negative relationship with cognitive engagement. To sum up, statistically, six independent variables, i.e., Flow ($t=10.604$, $p<.001$), Grade 6 ($t=2.761$, $p<.05$), Grade 8 ($t=-2.116$, $p<.05$), Social Studies ($t=-2.787$, $p<.05$), Woodwork ($t=-3.431$, $p<.001$), and Student-male ($t=-3.622$, $p<.001$), showed significance at either $p<.05$ or lower levels.

But, except for Flow and Grade 6, the remaining four independent variables are all negatively related to student cognitive engagement. Grade 6 (.006 Sig.), with the t ratio of 2.761, is significant only at .01 level. Compared with Flow that is significant at $p<.001$ level, however, Grade 6 is still less significant. Therefore, teachers' flow has the strongest and most positive relationship with student cognitive engagement in this study. It is also worth mentioning here that a couple of other regression models were also run to test for possible differences in statistical significance. For example, to test if any of the dummies in the category of Instructional method had a significant relationship with student cognitive engagement, I ran two related multiple regression models. In the first model, I took out all the dummies of the instructional method variable. That means, Teaching, Group work, Individual work, and One-on-one were all left out of the model. Since these dummies did not indicate the existence of a significant relationship with the dependent variable in the core model, I wanted to find out how much difference these dummies could make when they were all taken out of the core model. To examine any possible differences from the second model, all dummies of Instructional method except Group work were removed from consideration. This was to see if Group work might have some effects on the dependent variable, since Group work showed the highest correlation (.107) among all the dummies of Instructional method. Apparently, it does not make any difference whether Group work was present or not. The statistical significance of Group

work ($p=.820$) with student cognitive engagement did not yield any significance at either .01 or .05 level. Both models shared the same R square value (.618), which although strong, still came under the R square value of the core model (.621). In general, Group work did not indicate any significance with the p value at 0.737 ($t=.336$). Therefore, neither of the models was considered worthwhile for further examination, and the variables describing instructional method were removed to produce my final model.

Discussion and Interpretation of Data Analyses and Results

Results from the present study indicated that flow variable was found to correlate significantly with student cognitive engagement during class; more so than any of the other eighteen independent variables included in this study. In other words, the most important variable in predicting student cognitive engagement in my study was teachers' flow. This is the first, and the most important, conclusion from the analysis of a series of multiple regression models. Specifically, when teachers were experiencing flow, 25 percent more of the students in class were cognitively engaged than when teachers were not experiencing flow ($B=24.949$, $t=10.604$, $p<.001$). The other eighteen independent variables in the core model did not contribute significantly to the prediction of student cognitive engagement in class although a few of them indicated various levels of effects (see Appendix M), which I will discuss in the next section.

The R square for the core model was .621, which means over 62 percent of the variation of student cognitive engagement was predicted or explained by the independent variables in the regression equation. This study shows that Flow does have a strong effect on student cognitive engagement. Interpreting the data leads to the obvious conclusion

that the more teachers experienced flow, the greater the number of students that were cognitively engaged. In general, this is consistent with previous research involving a group of talented teenagers (Csikszentmihalyi et al., 1993).

Although the flow variable showed the strongest relationship with student cognitive engagement, the multiple linear regression revealed a fairly high level of significance for a few other dummy variables, e.g., Grade 6, Woodwork, and Social Studies, among others. For example, Grade 6 ($t=2.761, p<.01$) is the only grade that shows positive statistical effects on student cognitive engagement. In the case of Subject, both Social Studies ($B=14.276, t=-2.787, p<.01$) and Woodwork ($B=22.152, t=-3.431, p<.001$) have statistical significance, but both subjects are negatively related to student cognitive engagement. This negative relationship means that every time the survey was conducted in Social Studies class, students were about 14 percent less cognitively engaged. In the case of Woodwork class during each survey, students were about 22 percent less cognitively engaged. Following is a discussion of some of these in relation to the six groups of independent variables. I will focus on those that were significantly related to the dependent variable. In addition, since the major purpose of this study is to examine the relationship between teachers' flow and student cognitive engagement, I will also discuss the interactions of Flow while commenting on the significant relationship between cognitive engagement and the other independent variables.

Time-of-day. There is no significant relationship between the Time-of-day and student cognitive engagement. From a statistical point of view, neither morning nor afternoon showed any significant differences in student cognitive engagement, even

though the data suggested that morning ($t=-.251$, $B=-.558$) was a comparatively worse time than afternoon for cognitive engagement.

Gender (Male-teacher). Multiple regression yielded the estimated coefficient ($t=.775$, $B=1.934$) with no significance ($p=.439$) using 2-tailed test between Gender (male teachers—dummy variable) and student cognitive engagement. However, a significant negative relationship ($t=-3.622$, $p<.001$) was found between male students and cognitive engagement. The unstandardized coefficient of B is $-.446$, which means that as the percentage of males increased by a percentage point, about half a percent fewer students in class were cognitively engaged. In the case of female students, however, the estimated coefficient would be the exact opposite of the male students. It is necessary to point out that student gender is calculated by the percentage male in each individual class. For a detailed account of student gender from the 190 classes, please refer to Appendix O.

Grade. Among the five grades entered for this study, i.e., grade 6 to 10, only grade 6 showed strong and positive relationship with student cognitive engagement ($t=2.761$, $p<.05$). Although Grade 8 also showed statistical relationship with the dependent variable, it, however, indicated a negative relationship ($B=-8.614$, $t=-2.116$, $p<.05$). One possible reason why Grade 6 stood out may be explained by the fact that all grade 6 classes are self-contained, meaning that teachers teach all subjects and stay in the same class through the day. Although there is no other empirical evidence to support the advantage of self-contained classes, it is assumed, based on the results of this study, that self-contained classes may provide both teachers and students with more stable environment in which students and teachers understand and communicate more effectively with one another. For this reason, teachers may experience more flow.

Another reason why grade 6 students had such a strong relationship with cognitive engagement may have something to do with their age. Most grade 6 students are about 12 years old, and the youngest among all grades participating in this study. Numerous studies (Larson & Richards, 1991; Csikszentmihalyi et al., 1993; Shernoff et al., 1999) have shown that the teenage years are the most challenging and troublesome in terms of cognitive engagement during class. It appears both logical and understandable why the 'pre-teen' grade 6 students were more cognitively engaged when compared with teenage students from grades 7 to 10. Statistically, from a total of 93 classes in which teachers reported flow, 24 classes were in grade 6 (25.8%), the highest among the five grades.

Subject. Two subjects, Social Studies and Woodwork, revealed strong relationship with cognitive engagement. However, both Social Studies ($B=-14.276$, $t=-2.787$, $p<0.5$) and Woodwork ($B=-22.152$, $t=-3.431$, $p<.001$) showed statistically significant negative relationship with cognitive engagement. That is to say, students in Social Studies classes were about 14 percent less cognitively engaged. This finding is consistent with Stodolsky's (1988) finding. In Woodwork classes, students were about 22 percent less cognitively engaged. One possible reason could be that most students in Woodwork class were male, as we already know that male students had about half a percent less cognitively engaged. Other subjects showed no statistically significant relationship with the dependent variable.

Instructional Method. No dummy variables in the category of Instructional method revealed any statistical significance even at the .05 level. Consistent with previous findings (Csikszentmihalyi, 1997b; Shernoff et al., 1999), students were less cognitively engaged when teachers were lecturing. In fact, except for Group work which

showed a slightly positive relationship ($t=.227, p=.820$) with student cognitive engagement, none of the instructional methods indicated any meaningful relationship with statistical significance. From 93 teacher-in-flow classes, 37 (39.8%) classes were reported by teachers as Teaching, consisting of the largest in the category of instructional method. Nevertheless, Teaching was negative correlated with student cognitive engagement without statistical significance ($p=.836$). On the other hand, 22 (23.7%) teacher-in-flow classes were described as engaged in Group Work, again yielding no statistical significance ($p=.820$) with student cognitive engagement. Although it makes sense that cooperative learning, as group work usually denotes, might be an influencing factor for such a positive relationship, teachers' flow frequency did not seem to explain why Teaching failed to yield a strong positive relationship with cognitive engagement. In fact, none of the dummies in the category of Instructional Method showed any statistical significance with student cognitive engagement.

In general, the relationship between all dummy variables and student cognitive engagement indicated that Flow showed the highest statistical significance. Although a few other independent variables entered in this study also showed certain level of relationship with student cognitive engagement, their statistical significance is far less when compared with Flow. This is by no means accidental, as many research in motivation, and particularly in the study of flow theory, have revealed that when teachers are in flow, they tend to influence their students to experience the same (Caouette, 1995; Csikszentmihalyi, 1997b; Frase, 1998). High concentration, as one of the attributes of flow experience, helps students to experience flow. Although this study does not intend to investigate the relationship between teachers' flow and students' flow during class, the

findings have clearly indicated that the more teachers experienced flow, the higher the number of students who were cognitively engaged during class. The findings also demonstrate the importance of supporting teachers to experience more flow in the classroom.

Summary of the Chapter

This chapter presents and reports the results of data analyses and findings from the sample of 190 classes with a total of 5047 individual observations. Class was the unit of analysis and multiple regression analyses was conducted with the entire sample. First, initial findings were presented through the description of raw data. Then, a series of multiple regression (both unrestricted and restricted) models were introduced to demonstrate the general effects on student engagement by the 6 groups of independent variables. The focus was on the examination of the relationship between teachers' flow and student cognitive engagement. The last part of the chapter involved a discussion and interpretation of the data analyses based on the findings. This included a discussion of the specific effects on student engagement by the independent variables.

The major finding of this study indicated that there was a strong statistical relationship between teachers' flow and student cognitive engagement in class. The rest of the variables in the equation did not contribute significantly to the prediction of student cognitive engagement when compared with Flow. Along with the major finding, there are also a series of other findings as the result of this study, e.g., the effects of cognitive engagement by Grade 6, Social Studies, and male students. All six groups of independent variables, along with their respective dummies, were examined for their relationship with student cognitive engagement, and their interactions with teachers' flow. In summary,

this study shows that Flow does have a strong effect on student cognitive engagement.

Interpreting the data leads to the obvious conclusion that the more teachers experienced flow, the greater the number of students who were cognitively engaged.

CHAPTER V

CONCLUSION AND RECOMMENDATIONS OF THE STUDY

Introduction

This study investigates the relationship between teachers' flow experiences and student cognitive engagement in class. Chapter 1 states the problem, importance and significance of the research, the research question and hypotheses. It also includes the delimitation and limitations of this study. Chapter 2 is a review of literature related to this study. It combines reviews and critiques of flow research in education and multiple factors concerning student cognitive engagement in the context of the classroom. Chapter 3 outlines and frames the research design and methodology employed in this study. The research question and hypotheses are identified, with an elaboration of the dependent variable and independent variables. Chapter 4 deals with data analysis and presentation. Results from multiple regression analyses suggest that when teachers are experiencing flow, 25 percent more of the students in class are cognitively engaged. In addition to this effect being large and positive, the results are also robust across alternate model specifications. In addition to the importance of flow, this chapter also examines the significance of the other independent variables used in the models. Conclusions are

drawn and recommendations are made for implementation of the findings as well as for future research.

Summary of the Study

The purpose of this study was to examine the relationship between teachers' flow and student cognitive engagement in class. This study set out to answer the following two research questions through the application of quantitative data analyses:

1. Are there differences in the cognitive engagement of students when teachers are experiencing flow?
2. To what extent do these differences in cognitive engagement vary by grade level, subject matter, time-of-day, instructional method, and the gender composition of the class and instructor?

To answer these questions, this study gathered data from students and their teachers in grades 6 through 10 from a number of elementary and secondary schools in the Fraser Valley region of British Columbia, Canada. A total of 190 classes were surveyed, with 190 teacher ESFs on flow experiences and 5047 student ESFs on their cognitive engagement collected. Multiple regression analysis was used to analyze the data with class as the unit of analysis. To test for the significance of flow and to measure the effects of the other independent variables, a series of regression models were constructed. Results reveal that Flow to be an important determinant of student cognitive engagement in class, with 25 percent more of the class reporting that they were cognitively engaged when their teachers were having flow experiences. Other significant determinants of

student cognitive engagement included grade level, subject matter, and the gender composition of the class.

The important finding about the relationship between teachers' flow and student engagement in this study not only testifies the powerful effects of flow at work, but also provides commanding insights for educators to take a leadership role by enlisting its power to support student learning and achievement. This is particularly true in terms of how school administrators can better support teachers to experience more flow in the classroom. The 'so what' of this primary finding lies in this leadership opportunity for educators. Although there have been very few studies done in this area, the effects of flow as an influencing factor in the process of promoting both teaching and learning have been reported by researchers (Schneider et al., 1995; Csikszentmihalyi, 1997b; Frase, 1998; Turner et al., 1998; Shernoff et al., 1999).

Some other findings in this study may also provide educators with food for thought. For example, although there was little difference between morning and afternoon classes in terms of student cognitive engagement, teachers' flow frequency, however, took place far more in the morning (59 times out of 93, 63.4%) than in the afternoon (34 times out of 93, 36.6%). This suggests that morning may be a better time for teachers to experience more of flow experiences. Another finding pertains to the significance of different grade levels. Grade 6 was the most positively correlated with cognitive engagement among the five grades in this study. This finding is consistent with many other studies in which the teenage years were identified as a more difficult and challenging time for students to be cognitively engaged (e.g., Larson & Richards, 1991; Csikszentmihalyi et al., 1993; Shernoff et al., 1999). Regarding the finding for the Gender variable, the male students

were about one half a percent less cognitively engaged during class, and teenage male students appeared to respond to male teachers more positively. This was demonstrated by the fact that male students were more cognitively engaged during class with male teachers than with female teachers. In terms of the findings in the category of Subject, only English was found positively correlated with student cognitive engagement. This is also consistent with the previous finding (e.g., Stodolsky, 1988) that English is usually perceived by students to be easier than other subjects such as Social Studies, Science, and Math. Therefore, it is understandable that students were more cognitively engaged during English classes than others. Finally, although the dummy variable, Group work, showed a modest level of positive relationship with cognitive engagement, the important interpretation of the finding from this category is that none of the instructional methods had any significant effect on student cognitive engagement in this study.

Recommendations

The following are recommendations for future research. They are partly based on some of the limitations of this study.

1. I would recommend using student SES (Socioeconomic status) as an independent variable to be included in the future study. Student SES may be a powerful indicator of student cognitive engagement although obtaining such data may turn out to be a challenge. This is mainly because of potential problems with accessing confidential records, as SES data usually need to include such information as parental income, parent marital status, the number of siblings in the family, and so on. Due to these problems, the initial attempt to include this variable in the study was abandoned during the process of

data collection (see Question 8 on ESF for Teachers, Appendix D and, Question 9 on ESF for Students, Appendix E). Since personal information does not usually change during the week-long survey as the student's psychological states do, it may create certain problems to request such information appears on each page of the ESF. If using a separate form in addition to the ESFs, a researcher still has the challenge of matching student ESF with SES information after data being collected. I suggest that participants use a booklet of ESFs. SES data appear only once at the beginning of the booklet, so participants do not have to fill out the information more than once. The major challenge, however, will lie in both the rights to access the information and the validity of the data. Even if a researcher has the privilege of collecting such data, some participants may not be willing to share such information. It is therefore for the researcher to anticipate a certain percentage of non-returned or invalid (incomplete) data, in which case, more participants should be included initially. Closely related to the SES variable, variations in culture or ethnicity may also be considered as a variable to be included in the future study. However, the inclusion of such information in a regression model may be challenging, since one has to use something other than class as the unit of analysis.

2. In addition to quantitative methods, I also recommend using both qualitative and quantitative methods, whenever possible, to further study some of the independent variables such as Flow, Time-of-day, Gender, Grade, Subject, Instructional method, and their effect on the cognitive engagement of students. For example, interviews may provide the researcher with more specific and concrete answers as to why morning is a better or worse time for students to be cognitively engaged, or why teachers' gender really matters to either the same or opposite sex of students in class. Although there may

be some drawbacks from using both methodologies, the approach may prove to be more beneficial and worthwhile in the end. Furthermore, when teachers are interviewed, more specific questions about what may help teachers experience flow during classes may be directly answered.

3. My third recommendation involves the need for further study outside the grade 6 through grade 10 selection criteria. For these students, more research is needed to determine the effects of flow on student cognitive engagement. When younger aged and lower grade students are involved, there is one cautionary note pertaining to the design of the ESFs. My experience with the students who participated in this study suggests that questions in the ESFs must be phrased to fit the general level of functioning of the participants. In addition, the researcher must consider the limitations of using ESM, since its total dependence on respondents' self-reports may provide inaccurate or distorted data. Misunderstanding or miscomprehension of the questions in ESFs may make the situation worse, and render the collected data useless.

4. My fourth recommendation is for the further study in understanding teachers' flow. In particular, what factors and conditions are likely to promote teachers' flow experience. This is important to teacher development and also to the leadership approach in education. School leaders and administrators need to help create an environment in which teachers may experience flow more easily and frequently. In response, students' achievement will increase. The implications for further study of this approach are enormous. Regrettably, it is beyond the scope of this study to find out how teachers obtain or enjoy flow experiences during their teaching. Its focus is finding the extent to

which a positive relationship exists between student cognitive engagement and teachers' flow experiences.

5. My last recommendation is to undertake a larger-scaled sample, since this study has shown that a significant relationship exists between teachers' flow and student cognitive engagement. This study was limited to the involvement of a total of 13 teachers in one school district. Although these thirteen teachers took part in a week-long study and generated 190 classes of information (5047 observations on student cognitive engagement), additional studies with more participants are needed to further confirm the key findings in this study.

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APPENDICES

APPENDIX A

CONSENT TO PARTICIPATE IN RESEARCH STUDY

Teacher's Consent to Participate in Research Study

Nian Zhu, a doctoral student in the School of Education at the University of San Diego, is conducting a research study to understand more about the relationship between teachers' psychological state and students' cognitive engagement during class.

I am fully aware that my participation of this research will take a few minutes during class time to fill out the Experience Sampling Form (ESF). This will take place twice each day for five consecutive days.

I understand that, due to the nature of the research purpose, the potential risk or discomfort associated with this research may be such as interruption during class for the purpose of filling out the ESF forms.

I understand that my participation of this research is voluntary, and I may withdraw at any time without any obligation to the researcher.

Prior to signing this consent form, I understand that I will be given an opportunity to ask questions regarding the research and the researcher will answer my questions.

I understand that there is no other agreement, written or verbal, beyond what is expressed in this consent form.

I understand that any information and/or data to be collected during the research that may lead to my personal identity will be held in confidence. Confidentiality and anonymity will be strictly held.

I, the undersigned, understand the above explanations and, on that basis, I give consent to my voluntary participation in this research.

Signature of Participant

Date

City, Province or State

Signature of Researcher

Date

Signature of Witness

Date

APPENDIX B

CHI-SQUARE ANALYSIS FOR TEACHERS' FLOW/NON-FLOW AND STUDENT COGNITIVE ENGAGEMENT (Q1) IN THE PILOT STUDY

TEACHERS' FLOW AND STUDENT COGNITIVE ENGAGEMENT Q1

	STUDENT ENGAGED	STUDENT NOT ENGAGED	Row Totals
TEACHER IN FLOW	n11=274	n21=64	nf=338
	p11=0.5055	p21=0.3478	pf=0.4656
TEACHER NO FLOW	n12=268	n22=120	nnf=388
	p12=0.4945	p22=0.6522	pnf=0.5344
Column Totals	n1=542	n2=184	726

$$\chi^2 = 542 \frac{(0.5055-0.4656)^2}{0.4656} + 542 \frac{(0.4945-0.5344)^2}{0.5344} + 184 \frac{(0.3478-0.4656)^2}{0.4656} + 184 \frac{(0.6522-0.5344)^2}{0.5344}$$

$$\chi^2 = 1.853242 + 1.61465 + 5.48397 + 4.77795$$

$$\chi^2 = 13.73, .999\chi^2_1=10.8, p < .001.$$

APPENDIX C

CHI-SQUARE ANALYSIS FOR TEACHERS' FLOW/NON-FLOW AND STUDENT COGNITIVE ENGAGEMENT (Q2) IN THE PILOT STUDY

TEACHERS' FLOW AND STUDENT COGNITIVE ENGAGEMENT Q2

	STUDENT ENGAGED	STUDENT NOT ENGAGED	Row Totals
TEACHER IN FLOW	n11=271	n21=67	nf=338
	p11=0.5162	p21=0.3333	pf=0.4656
TEACHER NO FLOW	n12=254	n22=134	nnf=388
	p12=0.4838	p22=0.6667	pnf=0.5344
Column Totals	n1=525	n2=201	726
$x^2 = 525 \frac{(0.5162-0.4656)^2}{0.4656} + 525 \frac{(0.4838-0.5344)^2}{0.5344} + 201 \frac{(0.3333-0.4656)^2}{0.4656} + 201 \frac{(0.6667-0.5344)^2}{0.5344}$			
$x^2 = 2.88700 + 2.515324 + 7.556188 + 6.583386$			
$x^2 = 19.54, .999X^2_1=10.8, p< .001.$			

APPENDIX D

ESF FOR TEACHERS' FLOW EXPERIENCE IN THE CLASSROOM

ESF for Teachers' Flow Experience in the Classroom

Date: _____ Time of the day beeped: a. m. _____ p. m. _____

Gender: Male _____ Female _____ Grade you are teaching now: _____

This form was completed: a. within 30 minutes since the beep b. after 30 minutes since the beep

The subject you are teaching: a. English
b. Math
c. Social Studies
d. Science
e. Other: _____

As you were beeped...

1. What were you thinking about? (explain) _____

2. What were your feelings? (explain) _____

3. What were you doing? (explain) _____

4. According to your training about flow, were you in flow? Yes _____ No _____

5. If you were in flow, did you feel student engagement had a positive relation to your flow?

Yes _____ No _____

6. Based on your observation when beeped, were students overall engaged in the tasks given?

Yes _____ No _____

7. From your observation, about _____% of the students was engaged in the tasks given.

APPENDIX E

ESF FOR STUDENT COGNITIVE ENGAGEMENT IN THE CLASSROOM

ESF for Student Cognitive Engagement in the Classroom

Please complete the following and return this page to your teacher immediately:

The class you are in now: English ____ Math ____ Science ____ Social Study ____ Other ____

Gender: Male ____ Female ____

1. What were you doing when your teacher handed this form to you? _____

2. Were you paying attention at that moment? a. yes _____ b. no _____

3. If you were paying attention to your teacher or participating in an activity, indicate the degree to which you were paying attention:

a. very much	b. much	c. some	d. little	e. none
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4. How true was it that you were paying attention to work because you wanted to?

a. very true	b. true	c. neutral	d. untrue	e. very untrue
--------------	---------	------------	-----------	----------------

5. How much did your concentration have to do with your teacher?

a. very much	b. much	c. some	d. little	e. none
--------------	---------	---------	-----------	---------

6. How easy was it for you to concentrate?

a. very easy	b. easy	c. neutral	d. hard	e. very hard
--------------	---------	------------	---------	--------------

7. Did you enjoy what you were doing?

a. very much	b. much	c. some	d. a little	e. not at all
--------------	---------	---------	-------------	---------------

8. What would help you pay attention better in class?

a. teacher teaches	b. group work	c. work alone	d. other _____
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APPENDIX F

THE CONDITIONS OF THE FLOW EXPERIENCE --- TRAINING PROTOCOL USED FOR TEACHERS TO IDENTIFY FLOW IN TEACHING (Modified from Csikszentmihalyi, 1997b)

THE CONDITIONS OF THE FLOW EXPERIENCE

(Check the following to see if you are in flow. They don't have to occur at the same time.)

1. Goals are clear--one knows at every moment what one wants to do. In teaching, you've prepared your lesson and know what exactly you want to accomplish for a class.
2. Feedback is immediate--one knows at every moment how well one is doing. You know, as you teach, if students are paying attention, understanding what you teach.
3. Skills match challenges--the opportunities for action in the environment are in balance with the person's ability to act. Your teaching is going through smoothly as you planned.
4. Concentration is deep--attention is focussed on the task at hand.
5. Problems are forgotten--irrelevant stimuli are excluded from consciousness. You're not thinking anything outside what you do in the classroom
6. Control is possible--in principle, success is in one's hands. You are happy with what you do at the moment.
7. Self-consciousness disappears--one has a sense of transcending the limits of one's ego. You are not thinking or worrying about yourself and your problems.
8. The sense of time is altered--usually it seems that time passes much faster. You feel time flies fast and sometimes, you don't realize the class is over when the bells rings.
9. The experience becomes autotelic--it is worth having for its own sake. You really enjoy what you're doing in class.

APPENDIX G

MODEL FOR DEPENDENT AND INDEPENDENT VARIABLES

INDEPENDENT VARIABLES

Flow (Non-flow)

Time-of-day
(a.m. & p.m.)

Gender
(male & female)

Grade

Subject
(En., Ma., Sc., SS., etc.)

Instructional Method
(Lec., Ind-wk., Grp-wk., etc.)

DEPENDENT VARIABLE

Student Cognitive Engagement

APPENDIX I

ESF FOR TEACHERS USED IN PILOT STUDY

ESF for Teachers

Date: _____ Time of the day beeped: a. m. _____ p. m. _____

Gender: Male _____ Female _____

This form was completed: a. within 30 minutes since the beep b. after 30 minutes since the beep

The subject you are teaching: a. English
 b. Math
 c. Social Studies
 d. Science
 e. Other: _____

As you were beeped...

1. What were you thinking about? (explain) _____

2. What were your feelings? (explain) _____

3. What were you doing? (explain) _____

4. According to your training about flow, were you in flow? Yes _____ No _____

5. Based on your observation when beeped, were students overall engaged in the tasks given?

Yes _____ No _____

6. From your observation, about _____% of the students in class were engaged in the tasks given.

APPENDIX J

ESF FOR STUDENTS USED IN PILOT STUDY

ESF for Students

Please complete the following and return this page to your teacher:

The class you are in now: English ____ Math ____ Science ____ Social Study ____ Other ____

Gender: Male ____ Female ____

1. What were you doing when the beeper went off? _____.
2. What was on your mind? _____.
3. If you were paying attention to your teacher or participating in an activity, indicate the degree to which you were paying attention:

a. very much	b. much	c. some	d. little	e. none
--------------	---------	---------	-----------	---------
4. How true was it that you were paying attention to work because you wanted to?

a. very true	b. true	c. neutral	d. untrue	e. very untrue
--------------	---------	------------	-----------	----------------
5. Did your concentration have something to do with the teacher?

a. very much	b. much	c. some	d. little	e. none
--------------	---------	---------	-----------	---------
6. How easy was it for you to concentrate?

a. very easy	b. easy	c. neutral	d. hard	e. very hard
--------------	---------	------------	---------	--------------

APPENDIX K

MODEL FOR THE STUDY

Model for the Correlation Study

APPENDIX L

FREQUENCY AND PERCENTAGE OF STUDENT COGNITIVE ENGAGEMENT FROM 190 CLASSES

Per-Cent	Frequency	Percent	Valid %	Cumulative
20.00	1	.5	.5	.5
22.22	1	.5	.5	1.1
23.08	2	1.1	1.1	2.1
29.17	1	.5	.5	2.6
30.00	1	.5	.5	3.2
32.00	1	.5	.5	3.7
33.33	1	.5	.5	4.2
34.62	2	1.1	1.1	5.3
34.78	1	.5	.5	5.8
35.48	1	.5	.5	6.3
35.71	1	.5	.5	6.8
36.00	1	.5	.5	7.4
36.67	1	.5	.5	7.9
37.04	1	.5	.5	8.4
38.46	1	.5	.5	8.9
39.13	1	.5	.5	9.5
39.29	1	.5	.5	10.0
42.31	1	.5	.5	10.5
42.86	2	1.1	1.1	11.6
43.48	2	1.1	1.1	12.6
44.00	1	.5	.5	13.2
44.44	2	1.1	1.1	14.2
44.83	1	.5	.5	14.7
45.83	1	.5	.5	15.3
46.43	2	1.1	1.1	16.3
46.67	1	.5	.5	16.8
47.83	1	.5	.5	17.4
48.15	1	.5	.5	17.9
48.28	1	.5	.5	18.4
48.72	1	.5	.5	18.9
50.00	3	1.6	1.6	20.5
51.72	1	.5	.5	21.1
51.85	2	1.1	1.1	22.1
52.00	2	1.1	1.1	23.2
53.33	1	.5	.5	23.7
53.57	1	.5	.5	24.2
53.85	1	.5	.5	24.7
55.17	1	.5	.5	25.3
56.67	1	.5	.5	25.8
57.14	1	.5	.5	26.3
57.69	1	.5	.5	26.8
59.09	1	.5	.5	27.4
59.26	1	.5	.5	27.9

61.29	1	.5	.5	28.4
61.54	2	1.1	1.1	29.5
61.90	1	.5	.5	30.0
62.50	3	1.6	1.6	31.6
63.33	1	.5	.5	32.1
63.64	1	.5	.5	32.6
65.22	1	.5	.5	33.2
65.38	1	.5	.5	33.7
65.52	1	.5	.5	34.2
67.86	1	.5	.5	34.7
68.97	1	.5	.5	35.3
69.23	1	.5	.5	35.8
70.00	1	.5	.5	36.3
71.43	1	.5	.5	36.8
72.73	1	.5	.5	37.4
73.08	1	.5	.5	37.9
73.33	2	1.1	1.1	38.9
73.91	1	.5	.5	39.5
75.00	1	.5	.5	40.0
75.86	1	.5	.5	40.5
76.00	1	.5	.5	41.1
76.19	1	.5	.5	41.6
76.67	2	1.1	1.1	42.6
76.92	2	1.1	1.1	43.7
77.27	1	.5	.5	44.2
77.78	2	1.1	1.1	45.3
78.26	1	.5	.5	45.8
79.17	1	.5	.5	46.3
79.31	1	.5	.5	46.8
80.00	2	1.1	1.1	47.9
80.77	3	1.6	1.6	49.5
81.48	1	.5	.5	50.0
81.82	1	.5	.5	50.5
82.61	2	1.1	1.1	51.6
83.33	2	1.1	1.1	52.6
83.87	1	.5	.5	53.2
84.00	1	.5	.5	53.7
84.62	2	1.1	1.1	54.7
85.19	3	1.6	1.6	56.3
85.71	1	.5	.5	56.8
86.21	2	1.1	1.1	57.9
86.36	2	1.1	1.1	58.9
86.87	1	.5	.5	59.5
86.96	1	.5	.5	60.0
87.10	1	.5	.5	60.5
87.50	2	1.1	1.1	61.6

88.00	1	.5	.5	62.1
88.46	2	1.1	1.1	63.2
89.29	2	1.1	1.1	64.2
89.66	3	1.6	1.6	65.8
90.00	3	1.6	1.6	67.4
91.67	2	1.1	1.1	68.4
92.00	4	2.1	2.1	70.5
92.31	4	2.1	2.1	72.6
92.59	2	1.1	1.1	73.7
92.86	5	2.6	2.6	76.3
93.10	2	1.1	1.1	77.4
93.33	3	1.6	1.6	78.9
93.55	1	.5	.5	79.5
95.24	1	.5	.5	80.0
95.83	4	2.1	2.1	82.1
96.00	5	2.6	2.6	84.7
96.15	3	1.6	1.6	86.3
96.30	5	2.6	2.6	88.9
96.43	4	2.1	2.1	91.1
96.67	1	.5	.5	91.6
96.77	1	.5	.5	92.1
96.88	1	.5	.5	92.6
100.0	14	7.4	7.4	100.0
Total	190	100.0	100.0	

APPENDIX M

RELATIONSHIP BETWEEN STUDENT COGNITIVE ENGAGEMENT AND NINETEEN INDEPENDENT VARIABLES

Independent Variables	Engagement (D.V.)	Sig. (2-tailed)
FLOW	.697	.000
AM	.046	.802
T-GENDER (MALE)	-.052	.439
GRADE 6	.320	.006
GRADE 7	.036	.315
GRADE 8	-.155	.036
GRADE 9	-.229	.866
ENGLISH	.206	.398
MATH	-.089	.152
SOCIAL STUDIES	-.208	.006
SCIENCE	.047	.758
FRENCH	.019	.831
WOODWORK	-.295	.001
ARTS	.101	.317
TEACHING	-.082	.836
GROUPWORK	.107	.820
INDIVIDUALWORK	-.014	.921
ONE-ON-ONE	.013	.592
S-GENDER (MALE)	-.206	.000

APPENDIX N

PERCENTAGE OF STUDENT COGNITIVE ENGAGEMENT

FROM 190 CLASSES

Class#	%	Class#	%	Class#	%	Class#	%	Class#	%
1	91.67	46	100	91	46.43	136	93.33	181	77.78
2	79.17	47	92.86	92	92.86	137	87.50	182	37.04
3	76.92	48	93.33	93	92.00	138	86.36	183	61.54
4	96.00	49	90.00	94	83.33	139	96.00	184	32.00
5	52.00	50	92.86	95	100	140	46.67	185	34.78
6	75.00	51	90.00	96	80.77	141	62.50	186	86.96
7	57.69	52	96.88	97	78.26	142	96.30	187	86.21
8	62.50	53	96.15	98	96.30	143	39.29	188	76.19
9	80.77	54	77.78	99	84.62	144	38.46	189	96.30
10	43.48	55	96.15	100	89.29	145	22.22	190	51.85
11	82.61	56	92.59	101	44.44	146	45.83		
12	72.73	57	92.86	102	34.62	147	23.08		
13	84.62	58	86.21	103	76.67	148	86.36		
14	83.87	59	75.86	104	39.13	149	65.52		
15	61.29	60	73.33	105	36.00	150	61.54		
16	90.00	61	96.67	106	44.83	151	68.97		
17	73.08	62	92.00	107	34.62	152	50.00		
18	83.33	63	71.43	108	65.38	153	100		
19	63.64	64	67.86	109	53.85	154	96.00		
20	92.31	65	79.31	110	20.00	155	100		
21	93.55	66	80.77	111	47.83	156	81.48		
22	92.31	67	87.10	112	95.24	157	70.00		
23	100	68	77.27	113	59.09	158	96.43		
24	100	69	69.23	114	44.00	159	88.46		
25	96.30	70	57.14	115	61.90	160	95.83		
26	95.83	71	92.59	116	88.46	161	96.15		
27	92.31	72	100	117	53.33	162	56.67		
28	95.83	73	100	118	80.00	163	29.17		
29	85.19	74	88.00	119	52.00	164	23.08		
30	92.00	75	95.83	120	50.00	165	48.72		
31	85.19	76	100	121	100	166	63.33		
32	96.43	77	93.10	122	48.28	167	42.86		
33	96.43	78	76.92	123	53.57	168	51.72		
34	96.30	79	62.50	124	44.44	169	33.33		
35	100	80	76.67	125	91.67	170	48.15		
36	87.50	81	82.61	126	42.86	171	96.00		
37	96.00	82	84.00	127	51.85	172	35.48		
38	89.66	83	89.66	128	42.31	173	30.00		
39	96.43	84	59.26	129	35.71	174	100		
40	89.66	85	55.17	130	36.67	175	100		
41	89.29	86	80.00	131	86.87	176	50.00		
42	93.33	87	85.71	132	43.48	177	81.82		
43	92.86	88	73.91	133	100	178	92.00		
44	93.10	89	76.00	134	85.19	179	46.43		
45	96.77	90	65.22	135	73.33	180	92.31		

APPENDIX O

TOTAL STUDENT NUMBER IN EACH CLASS

AND PERCENTAGE OF MALE STUDENTS (N=190)

Class	Student#	Male#	Percent	Class	Student#	Male#	Percent
1	24	12	50.00%	47	28	13	46.43%
2	24	13	54.17%	48	30	15	50.00%
3	26	12	46.15%	49	30	15	50.00%
4	25	9	36.00%	50	28	12	42.86%
5	25	13	52.00%	51	30	15	50.00%
6	28	10	35.71%	52	32	16	50.00%
7	26	15	57.69%	53	26	12	46.15%
8	24	10	41.67%	54	27	17	62.96%
9	26	15	57.69%	55	26	12	46.15%
10	23	13	56.52%	56	27	14	51.85%
11	23	11	47.83%	57	28	13	46.43%
12	22	16	72.73%	58	29	13	44.83%
13	26	6	23.08%	59	29	12	41.38%
14	31	18	58.06%	60	30	14	46.67%
15	31	11	35.48%	61	30	14	46.67%
16	30	14	46.67%	62	25	12	48.00%
17	26	7	26.92%	63	28	11	39.29%
18	24	9	37.50%	64	28	11	39.29%
19	33	17	51.52%	65	29	12	41.38%
20	26	18	69.23%	66	26	10	38.46%
21	31	26	83.87%	67	31	16	51.61%
22	26	18	69.23%	68	22	10	45.45%
23	25	13	52.00%	69	26	14	53.85%
24	22	9	40.91%	70	28	15	53.57%
25	27	18	66.67%	71	27	14	51.85%
26	24	13	54.17%	72	24	13	54.17%
27	26	15	57.69%	73	27	11	40.74%
28	24	18	75.00%	74	25	12	48.00%
29	27	20	74.07%	75	24	12	50.00%
30	25	12	48.00%	76	23	10	43.48%
31	27	11	40.74%	77	29	16	55.17%
32	28	10	35.71%	78	26	12	46.15%
33	28	14	50.00%	79	24	12	50.00%
34	27	8	29.63%	80	30	14	46.67%
35	28	7	25.00%	81	23	10	43.48%
36	24	7	29.17%	82	25	12	48.00%
37	25	8	32.00%	83	29	14	48.28%
38	29	13	44.83%	84	27	13	48.15%
39	28	15	53.57%	85	29	15	51.72%
40	27	13	48.15%	86	25	12	48.00%
41	28	10	35.71%	87	28	15	53.57%
42	30	14	46.67%	88	23	9	39.13%
43	28	12	42.86%	89	25	12	48.00%
44	29	13	44.83%	90	23	12	51.17%
45	31	12	38.71%	91	28	18	64.29%
46	29	14	48.28%	92	28	10	35.71%

Class	Student#	Male#	Percent	Class	Student#	Male#	Percent
93	25	10	40.00%	139	25	12	48.00%
94	24	10	41.67%	140	30	11	36.67%
95	27	12	44.44%	141	24	15	62.50%
96	26	11	42.31%	142	27	13	48.15%
97	23	7	30.43%	143	28	15	53.57%
98	27	13	48.15%	144	26	13	50.00%
99	26	13	50.00%	145	27	17	62.96%
100	28	12	42.86%	146	24	13	54.17%
101	27	14	51.85%	147	26	17	65.38%
102	26	14	53.85%	148	22	9	40.91%
103	30	12	40.00%	149	29	17	58.62%
104	23	11	47.83%	150	26	16	61.54%
105	25	13	52.00%	151	29	12	41.38%
106	29	9	31.03%	152	26	12	46.15%
107	26	12	46.15%	153	23	10	43.48%
108	26	10	38.46%	154	25	11	44.00%
109	26	9	34.62%	155	26	11	42.31%
110	25	13	52.00%	156	27	11	40.74%
111	23	11	47.83%	157	30	12	40.00%
112	21	10	47.62%	158	28	11	39.29%
113	22	9	40.91%	159	26	8	30.77%
114	25	17	68.00%	160	24	9	37.50%
115	21	12	57.14%	161	26	11	42.31%
116	26	14	53.85%	162	30	14	46.67%
117	30	21	70.00%	163	24	9	37.50%
118	25	14	56.00%	164	26	16	61.54%
119	25	14	56.00%	165	39	16	41.03%
120	26	13	50.00%	166	30	14	46.67%
121	23	7	30.43%	167	28	11	39.29%
122	29	13	44.83%	168	29	13	44.83%
123	28	14	50.00%	169	24	13	54.17%
124	27	12	44.44%	170	27	12	44.44%
125	24	10	41.67%	171	25	14	56.00%
126	21	11	52.38%	172	31	15	48.39%
127	27	15	55.56%	173	30	16	53.33%
128	26	13	50.00%	174	28	9	32.14%
129	28	12	42.86%	175	25	6	24.00%
130	30	17	56.57%	176	28	16	57.14%
131	30	10	33.00%	177	22	11	50.00%
132	23	14	60.87%	178	25	9	36.00%
133	30	11	36.67%	179	28	11	39.29%
134	27	12	44.44%	180	26	15	57.69%
135	30	15	50.00%	181	27	15	55.56%
136	30	11	36.67%	182	27	12	44.44%
137	24	13	54.17%	183	26	17	65.38%
138	22	9	40.91%	184	25	12	48.00%

Class	Student#	Male#	Percent	Class	Student#	Male#	Percent
185	23	10	43.48%	188	21	15	71.43%
186	23	12	52.17%	189	27	12	44.44%
187	29	16	55.17%	190	27	13	48.15%

APPENDIX P

FIVE INDEPENDENT VARIABLES' FREQUENCY AND PERCENTAGE

DATA ON GRADE 6 DUMMY VARIABLE (N=38)

Category	Frequency	Percent
Flow	24	63.2%
Non-flow	14	36.8%
Total	38	100%
Time-of-day:		
a.m.	22	57.9%
p.m.	16	42.1%
Total	38	100%
T-gender:		
male	20	52.6%
female:	18	47.4%
Total	38	100%
Subject:		
English	15	39.5%
Math	8	21.1%
Social Std.	5	13.2%
Science	4	10.5%
Arts	3	7.9%
Computer	3	7.9%
Total	38	100%
Instructional Method:		
Teaching	14	36.8%
Group Wk.	6	15.8%
Indival.Wk.	18	47.4%
Total	38	100%

APPENDIX Q

CORRELATIONS OF ALL DEPENDENT AND INDEPENDENT VARIABLES

		Engaged-Or-Not	FLOW	AM	teacher's gender	grade 6
Pearson Correlation	Engaged-Or-Not	1.000	.697	.046	-.052	.320
	FLOW	.697	1.000	.130	-.065	.168
	AM	.046	.130	1.000	.195	.011
	teacher's gender	-.052	-.065	.195	1.000	.048
	grade 6	.320	.168	.011	.048	1.000
	grade 7	.036	.037	.102	.100	-.233
	grade 8	-.155	-.097	.015	-.197	-.242
	grade 9	-.229	-.155	-.034	-.066	-.262
	English	.206	.125	.065	.064	.201
	Math	-.089	-.124	.042	-.008	.027
	Social Study	-.208	-.132	-.038	-.010	-.039
	Science	.047	-.032	-.042	.105	.085
	French	.019	.024	-.071	-.279	-.203
	Woodwork	-.295	-.184	.063	.117	-.118
	Arts	.101	.167	.002	-.135	.010
	Teaching	-.082	-.087	.005	-.022	-.074
	GroupWork	.107	.163	.063	-.054	-.021
	IndividualWork	-.014	-.039	-.049	.105	.088
	One-on-One	.013	-.040	-.060	-.115	-.063
	S-Male	-.206	-.097	.081	.388	-.044
Sig. (1-tailed)	Engaged-Or-Not	.	.000	.263	.240	.000
	FLOW	.000	.	.036	.185	.010
	AM	.263	.036	.	.004	.442
	teacher's gender	.240	.185	.004	.	.257
	grade 6	.000	.010	.442	.257	.
	grade 7	.313	.305	.081	.086	.001
	grade 8	.017	.091	.421	.003	.000
	grade 9	.001	.016	.322	.184	.000
	English	.002	.043	.187	.190	.003
	Math	.112	.044	.284	.457	.356
	Social Study	.002	.035	.301	.446	.297
	Science	.262	.333	.283	.075	.121
	French	.398	.373	.164	.000	.002
	Woodwork	.000	.006	.195	.054	.053
	Arts	.084	.011	.491	.032	.445
	Teaching	.129	.116	.470	.383	.155
	GroupWork	.070	.013	.194	.229	.388
	IndividualWork	.424	.297	.251	.075	.115
	One-on-One	.427	.294	.205	.057	.193
	S-Male	.002	.091	.134	.000	.275

		grade 7	grade 8	grade 9	English	Math	Social Study
Pearson Correlation	Engaged-Or-Not	.036	-.155	-.229	.206	-.089	-.208
	FLOW	.037	-.097	-.155	.125	-.124	-.132
	AM	.102	.015	-.034	.065	.042	-.038
	teacher's gender	.100	-.197	-.066	.064	-.008	-.010
	grade 6	-.233	-.242	-.262	.201	.027	-.039
	grade 7	1.000	-.226	-.245	.076	.125	-.019
	grade 8	-.226	1.000	-.254	-.133	.040	-.109
	grade 9	-.245	-.254	1.000	-.070	-.090	.212
	English	.076	-.133	-.070	1.000	-.261	-.211
	Math	.125	.040	-.090	-.261	1.000	-.188
	Social Study	-.019	-.109	.212	-.211	-.188	1.000
	Science	-.043	.047	-.067	-.164	-.147	-.118
	French	.007	.457	-.067	-.220	-.197	-.158
	Woodwork	.074	-.114	.220	-.127	-.114	-.092
	Arts	-.132	-.085	.146	-.153	-.136	-.110
	Teaching	-.001	.029	.023	-.152	.110	.061
	GroupWork	.040	.062	-.004	.084	-.080	-.014
	IndividualWork	-.038	-.086	.003	.089	-.058	-.035
	One-on-One	.051	.046	-.066	.032	.046	-.049
	S-Male	.155	-.309	.066	-.109	.040	-.042
Sig. (1-tailed)	Engaged-Or-Not	.313	.017	.001	.002	.112	.002
	FLOW	.305	.091	.016	.043	.044	.035
	AM	.081	.421	.322	.187	.284	.301
	teacher's gender	.086	.003	.184	.190	.457	.446
	grade 6	.001	.000	.000	.003	.356	.297
	grade 7	.	.001	.000	.150	.043	.396
	grade 8	.001	.	.000	.034	.290	.068
	grade 9	.000	.000	.	.170	.107	.002
	English	.150	.034	.170	.	.000	.002
	Math	.043	.290	.107	.000	.	.005
	Social Study	.396	.068	.002	.002	.005	.
	Science	.279	.261	.179	.012	.022	.052
	French	.464	.000	.179	.001	.003	.015
	Woodwork	.154	.059	.001	.040	.059	.104
	Arts	.035	.122	.022	.018	.030	.066
	Teaching	.495	.344	.379	.018	.065	.201
	GroupWork	.293	.198	.478	.124	.137	.424
	IndividualWork	.299	.119	.484	.112	.214	.316
	One-on-One	.242	.262	.181	.329	.262	.250
	S-Male	.016	.000	.183	.068	.294	.282

		Science	French	Woodwork	Arts	Teaching
Pearson Correlation	Engaged-Or-Not	.047	.019	-.295	.101	-.082
	FLOW	-.032	.024	-.184	.167	-.087
	AM	-.042	-.071	.063	.002	.005
	teacher's gender	.105	-.279	.117	-.135	-.022
	grade 6	.085	-.203	-.118	.010	-.074
	grade 7	-.043	.007	.074	-.132	-.001
	grade 8	.047	.457	-.114	-.085	.029
	grade 9	-.067	-.067	.220	.146	.023
	English	-.164	-.220	-.127	-.153	-.152
	Math	-.147	-.197	-.114	-.136	.110
	Social Study	-.118	-.158	-.092	-.110	.061
	Science	1.000	-.123	-.071	-.086	-.003
	French	-.123	1.000	-.096	-.115	-.028
	Woodwork	-.071	-.096	1.000	-.066	.122
	Arts	-.086	-.115	-.066	1.000	-.089
	Teaching	-.003	-.028	.122	-.089	1.000
	GroupWork	-.039	.132	.016	-.023	-.408
	IndividualWork	-.032	-.057	-.129	.122	-.672
	One-on-One	.114	-.052	-.030	-.036	-.113
	S-Male	.039	-.159	.120	-.039	-.022
Sig. (1-tailed)	Engaged-Or-Not	.262	.398	.000	.084	.129
	FLOW	.333	.373	.006	.011	.116
	AM	.283	.164	.195	.491	.470
	teacher's gender	.075	.000	.054	.032	.383
	grade 6	.121	.002	.053	.445	.155
	grade 7	.279	.464	.154	.035	.495
	grade 8	.261	.000	.059	.122	.344
	grade 9	.179	.179	.001	.022	.379
	English	.012	.001	.040	.018	.018
	Math	.022	.003	.059	.030	.065
	Social Study	.052	.015	.104	.066	.201
	Science	.	.045	.164	.120	.485
	French	.045	.	.094	.057	.348
	Woodwork	.164	.094	.	.181	.046
	Arts	.120	.057	.181	.	.112
	Teaching	.485	.348	.046	.112	.
	GroupWork	.297	.035	.411	.377	.000
	IndividualWork	.331	.219	.038	.047	.000
	One-on-One	.059	.240	.341	.312	.061
	S-Male	.295	.014	.049	.297	.383

		GroupWork	IndividualWork	One-on-One	S-Male
Pearson Correlation	Engaged-Or-Not	.107	-.014	.013	-.206
	FLOW	.163	-.039	-.040	-.097
	AM	.063	-.049	-.060	.081
	teacher's gender	-.054	.105	-.115	.388
	grade 6	-.021	.088	-.063	-.044
	grade 7	.040	-.038	.051	.155
	grade 8	.062	-.086	.046	-.309
	grade 9	-.004	.003	-.066	.066
	English	.084	.089	.032	-.109
	Math	-.080	-.058	.046	.040
	Social Study	-.014	-.035	-.049	-.042
	Science	-.039	-.032	.114	.039
	French	.132	-.057	-.052	-.159
	Woodwork	.016	-.129	-.030	.120
	Arts	-.023	.122	-.036	-.039
	Teaching	-.408	-.672	-.113	-.022
	GroupWork	1.000	-.346	-.058	-.048
	IndividualWork	-.346	1.000	-.096	.069
	One-on-One	-.058	-.096	1.000	-.033
	S-Male	-.048	.069	-.033	1.000
Sig. (1-tailed)	Engaged-Or-Not	.070	.424	.427	.002
	FLOW	.013	.297	.294	.091
	AM	.194	.251	.205	.134
	teacher's gender	.229	.075	.057	.000
	grade 6	.388	.115	.193	.275
	grade 7	.293	.299	.242	.016
	grade 8	.198	.119	.262	.000
	grade 9	.478	.484	.181	.183
	English	.124	.112	.329	.068
	Math	.137	.214	.262	.294
	Social Study	.424	.316	.250	.282
	Science	.297	.331	.059	.295
	French	.035	.219	.240	.014
	Woodwork	.411	.038	.341	.049
	Arts	.377	.047	.312	.297
	Teaching	.000	.000	.061	.383
	GroupWork	.	.000	.213	.255
	IndividualWork	.000	.	.095	.174
	One-on-One	.213	.095	.	.326
	S-Male	.255	.174	.326	.

APPENDIX R

CORE MODEL SUMMARY FROM SPSS (8.0)

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.788 ^a	.621	.578	14.3090

Model Summary^b

Model	Change Statistics					Durbin-Watson
	R Square Change	F Change	df1	df2	Sig. F Change	
1	.621	14.649	19	170	.000	1.796

a. Predictors: (Constant), S-Male, Teaching, Science, AM, grade 9, One-on-One, Arts, French, FLOW, grade 7, Woodwork, Social Study, GroupWork, grade 6, Math, teacher's gender, grade 8, English, IndividualWork

b. Dependent Variable: Engaged-Or-Not

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	56986.753	19	2999.303	14.649	.000 ^a
	Residual	34806.859	170	204.746		
	Total	91793.612	189			

a. Predictors: (Constant), S-Male, Teaching, Science, AM, grade 9, One-on-One, Arts, French, FLOW, grade 7, Woodwork, Social Study, GroupWork, grade 6, Math, teacher's gender, grade 8, English, IndividualWork

b. Dependent Variable: Engaged-Or-Not

APPENDIX S

COEFFICIENTS OF ALL INDEPDNDENT DUMMY VARIABLES

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	85.246	17.102		4.984	.000	51.485	119.006
	FLOW	24.949	2.353	.567	10.604	.000	20.305	29.593
	AM	-.558	2.218	-.013	-.251	.802	-4.937	3.822
	teacher's gender	1.934	2.495	.044	.775	.439	-2.992	6.859
	grade 6	9.813	3.554	.179	2.761	.006	2.797	16.828
	grade 7	3.854	3.827	.067	1.007	.315	-3.700	11.407
	grade 8	-8.614	4.070	-.154	-2.116	.036	-16.649	-.579
	grade 9	-.618	3.650	-.012	-.169	.866	-7.823	6.587
	English	-3.937	4.651	-.075	-.846	.398	-13.118	5.244
	Math	-6.917	4.807	-.123	-1.439	.152	-16.407	2.573
	Social Study	-14.276	5.122	-.220	-2.787	.006	-24.386	-4.166
	Science	-1.689	5.463	-.021	-.309	.758	-12.473	9.096
	French	-1.176	5.496	-.019	-.214	.831	-12.025	9.674
	Woodwork	-22.152	6.457	-.225	-3.431	.001	-34.898	-9.406
	Arts	-5.576	5.555	-.066	-1.004	.317	-16.541	5.389
	Teaching	3.144	15.156	.071	.207	.836	-26.775	33.063
	GroupWork	3.474	15.274	.060	.227	.820	-26.678	33.626
	IndividualWork	1.516	15.207	.033	.100	.921	-28.503	31.536
	One-on-One	9.192	17.128	.052	.537	.592	-24.618	43.002
	S-Male	-.446	.123	-.202	-3.622	.000	-.689	-.203

Model		Correlations			Collinearity Statistics	
		Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)					
	FLOW	.697	.631	.501	.779	1.284
	AM	.046	-.019	-.012	.893	1.120
	teacher's gender	-.052	.059	.037	.699	1.431
	grade 6	.320	.207	.130	.533	1.875
	grade 7	.036	.077	.048	.501	1.996
	grade 8	-.155	-.160	-.100	.424	2.361
	grade 9	-.229	-.013	-.008	.478	2.092
	English	.206	-.065	-.040	.284	3.515
	Math	-.089	-.110	-.068	.304	3.294
	Social Study	-.208	-.209	-.132	.360	2.781
	Science	.047	-.024	-.015	.468	2.136
	French	.019	-.016	-.010	.293	3.417
	Woodwork	-.295	-.254	-.162	.518	1.929
	Arts	.101	-.077	-.047	.512	1.954
	Teaching	-.082	.016	.010	.019	52.578
	GroupWork	.107	.017	.011	.032	31.072
	IndividualWork	-.014	.008	.005	.020	49.633
	One-on-One	.013	.041	.025	.236	4.231
	S-Male	-.206	-.268	-.171	.716	1.397

a. Dependent Variable: Engaged-Or-Not

APPENDIX T

ESTIMATED COEFFICIENT VALUES OF ALL INDEPENDENT

DUMMY VARIABLES

Model			S-Male	Teaching	Science	AM	grade 9
1	Correlations	S-Male	1.000	.032	.117	-.045	-.068
		Teaching	.032	1.000	.178	.090	-.006
		Science	.117	.178	1.000	.035	-.290
		AM	-.045	.090	.035	1.000	-.049
		grade 9	-.068	-.006	-.290	-.049	1.000
		One-on-One	.017	.863	.103	.098	.028
		Arts	.128	-.021	.471	-.042	-.322
		French	.113	.007	.576	.024	-.350
		FLOW	.117	.051	.135	-.149	.047
		grade 7	-.103	-.008	-.310	-.092	.555
		Woodwork	.103	.012	.475	-.058	-.385
		Social Study	.197	.002	.580	-.018	-.410
		GroupWork	.025	.980	.166	.085	-.007
		grade 6	.014	.091	-.286	-.034	.521
		Math	.134	-.006	.623	-.044	-.345
		teacher's gender	-.300	-.120	-.034	-.184	.076
		grade 8	.172	-.028	-.294	-.129	.513
		English	.230	-.010	.626	-.046	-.357
		IndividualWork	.026	.987	.184	.096	-.011
	Covariances	S-Male	1.515E-02	6.030E-02	7.878E-02	-1.215E-02	-3.059E-02
		Teaching	6.030E-02	229.715	14.731	3.025	-.326
		Science	7.878E-02	14.731	29.847	.426	-5.785
		AM	-1.215E-02	3.025	.426	4.922	-.398
		grade 9	-3.059E-02	-.326	-5.785	-.398	13.322
		One-on-One	3.582E-02	223.963	9.621	3.711	1.735
		Arts	8.734E-02	-1.732	14.295	-.519	-6.523
		French	7.657E-02	.568	17.282	.293	-7.024
		FLOW	3.397E-02	1.835	1.741	-.775	.405
		grade 7	-4.833E-02	-.456	-6.478	-.785	7.745
		Woodwork	8.191E-02	1.222	16.745	-.832	-9.072
		Social Study	.124	.153	16.224	-.209	-7.660
		GroupWork	4.676E-02	226.888	13.882	2.869	-.399
		grade 6	6.324E-03	4.886	-5.543	-.265	6.761
		Math	7.913E-02	-.402	16.372	-.466	-6.056
		teacher's gender	-9.227E-02	-4.551	-.458	-1.019	.696
		grade 8	8.633E-02	-1.741	-6.547	-1.164	7.622
		English	.132	-.670	15.897	-.477	-6.065
		IndividualWork	4.926E-02	227.567	15.304	3.248	-.595

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Model			One-on-One	Arts	French	FLOW	grade 7
1	Correlations	S-Male	.017	.128	.113	.117	-.103
		Teaching	.863	-.021	.007	.051	-.008
		Science	.103	.471	.576	.135	-.310
		AM	.098	-.042	.024	-.149	-.092
		grade 9	.028	-.322	-.350	.047	.555
		One-on-One	1.000	-.020	.024	.058	-.011
		Arts	-.020	1.000	.554	-.016	-.219
		French	.024	.554	1.000	.087	-.410
		FLOW	.058	-.016	.087	1.000	-.077
		grade 7	-.011	-.219	-.410	-.077	1.000
		Woodwork	.011	.431	.506	.233	-.337
		Social Study	.003	.562	.645	.199	-.364
		GroupWork	.854	-.033	-.017	.023	-.009
		grade 6	.120	-.197	-.248	-.106	.532
		Math	-.022	.569	.701	.199	-.432
		teacher's gender	-.037	.160	.192	.051	-.014
		grade 8	-.027	-.179	-.482	.090	.522
		English	-.039	.601	.686	.115	-.407
		IndividualWork	.860	-.033	.007	.060	-.011
	Covariances	S-Male	3.582E-02	8.734E-02	7.657E-02	3.397E-02	-4.833E-02
		Teaching	223.963	-1.732	.568	1.835	-.456
		Science	9.621	14.295	17.282	1.741	-6.478
		AM	3.711	-.519	.293	-.775	-.785
		grade 9	1.735	-6.523	-7.024	.405	7.745
		One-on-One	293.359	-1.913	2.302	2.322	-.744
		Arts	-1.913	30.856	16.914	-.205	-4.661
		French	2.302	16.914	30.207	1.126	-8.623
		FLOW	2.322	-.205	1.126	5.536	-.694
		grade 7	-.744	-4.661	-8.623	-.694	14.643
		Woodwork	1.170	15.472	17.968	3.536	-8.334
		Social Study	.247	15.979	18.159	2.400	-7.135
		GroupWork	223.434	-2.794	-1.437	.836	-.519
		grade 6	7.333	-3.880	-4.850	-.885	7.236
		Math	-1.781	15.199	18.520	2.254	-7.940
		teacher's gender	-1.596	2.221	2.630	.298	-.133
		grade 8	-1.864	-4.049	-10.793	.866	8.131
		English	-3.076	15.540	17.530	1.260	-7.241
		IndividualWork	224.029	-2.788	.560	2.138	-.645

Model			Woodwork	Social Study	GroupWork	grade 6	Math
1	Correlations	S-Male	.103	.197	.025	.014	.134
		Teaching	.012	.002	.980	.091	-.006
		Science	.475	.580	.166	-.286	.623
		AM	-.058	-.018	.085	-.034	-.044
		grade 9	-.385	-.410	-.007	.521	-.345
		One-on-One	.011	.003	.854	.120	-.022
		Arts	.431	.562	-.033	-.197	.569
		French	.506	.645	-.017	-.248	.701
		FLOW	.233	.199	.023	-.106	.199
		grade 7	-.337	-.364	-.009	.532	-.432
		Woodwork	1.000	.569	.003	-.213	.575
		Social Study	.569	1.000	-.011	-.278	.700
		GroupWork	.003	-.011	1.000	.090	-.012
		grade 6	-.213	-.278	.090	1.000	-.332
		Math	.575	.700	-.012	-.332	1.000
		teacher's gender	-.010	.064	-.120	.003	.097
		grade 8	-.190	-.235	-.031	.475	-.330
		English	.563	.707	-.035	-.356	.745
		IndividualWork	.033	.010	.979	.080	.005
	Covariances	S-Male	8.191E-02	.124	4.676E-02	6.324E-03	7.913E-02
		Teaching	1.222	.153	226.888	4.886	-.402
		Science	16.745	16.224	13.882	-5.543	16.372
		AM	-.832	-.209	2.869	-.265	-.466
		grade 9	-9.072	-7.660	-.399	6.761	-6.056
		One-on-One	1.170	.247	223.434	7.333	-1.781
		Arts	15.472	15.979	-2.794	-3.880	15.199
		French	17.968	18.159	-1.437	-4.850	18.520
		FLOW	3.536	2.400	.836	-.885	2.254
		grade 7	-8.334	-7.135	-.519	7.236	-7.940
		Woodwork	41.693	18.832	.298	-4.896	17.857
		Social Study	18.832	26.230	-.873	-5.059	17.224
		GroupWork	.298	-.873	233.303	4.890	-.913
		grade 6	-4.896	-5.059	4.890	12.629	-5.667
		Math	17.857	17.224	-.913	-5.667	23.112
		teacher's gender	-.169	.817	-4.576	2.350E-02	1.158
		grade 8	-4.988	-4.904	-1.911	6.877	-6.449
		English	16.902	16.843	-2.457	-5.890	16.652
		IndividualWork	3.257	.794	227.306	4.338	.345

Model			teacher's gender	grade 8	English	IndividualWork
1	Correlations	S-Male	-.300	.172	.230	.026
		Teaching	-.120	-.028	-.010	.987
		Science	-.034	-.294	.626	.184
		AM	-.184	-.129	-.046	.096
		grade 9	.076	.513	-.357	-.011
		One-on-One	-.037	-.027	-.039	.860
		Arts	.160	-.179	.601	-.033
		French	.192	-.482	.686	.007
		FLOW	.051	.090	.115	.060
		grade 7	-.014	.522	-.407	-.011
		Woodwork	-.010	-.190	.563	.033
		Social Study	.064	-.235	.707	.010
		GroupWork	-.120	-.031	-.035	.979
		grade 6	.003	.475	-.356	.080
		Math	.097	-.330	.745	.005
		teacher's gender	1.000	.014	.043	-.133
		grade 8	.014	1.000	-.261	-.027
		English	.043	-.261	1.000	-.014
		IndividualWork	-.133	-.027	-.014	1.000
Covariances	S-Male	-9.227E-02	8.633E-02	.132	4.926E-02	
		-4.551	-1.741	-.670	227.567	
		-.458	-6.547	15.897	15.304	
		-1.019	-1.164	-.477	3.248	
		.696	7.622	-6.065	-.595	
		-1.596	-1.864	-3.076	224.029	
		2.221	-4.049	15.540	-2.788	
		2.630	-10.793	17.530	.560	
		.298	.866	1.260	2.138	
		-.133	8.131	-7.241	-.645	
		-.169	-4.988	16.902	3.257	
		.817	-4.904	16.843	.794	
		-4.576	-1.911	-2.457	227.306	
		2.350E-02	6.877	-5.890	4.338	
		1.158	-6.449	16.652	.345	
		6.226	.144	.502	-5.050	
		.144	16.568	-4.939	-1.689	
		.502	-4.939	21.632	-1.022	
		IndividualWork	-5.050	-1.689	-1.022	231.263

a. Dependent Variable: Engaged-Or-Not

APPENDIX U

COLLINEARITY DIAGNOSTICS FROM SPSS (8.0)

Collinearity Diagnostics^a

Model	Dimension	Variance Proportions						
		(Constant)	FLOW	AM	teacher's gender	grade 6	grade 7	grade 8
1	1	.00	.01	.01	.01	.00	.00	.00
	2	.00	.00	.00	.01	.02	.00	.08
	3	.00	.01	.00	.00	.04	.00	.00
	4	.00	.01	.00	.01	.00	.05	.00
	5	.00	.00	.00	.00	.01	.04	.01
	6	.00	.00	.00	.00	.00	.00	.00
	7	.00	.00	.00	.00	.03	.02	.00
	8	.00	.00	.00	.00	.02	.02	.00
	9	.00	.02	.00	.02	.02	.01	.00
	10	.00	.00	.00	.01	.02	.08	.01
	11	.00	.03	.00	.00	.01	.06	.01
	12	.00	.00	.00	.00	.15	.00	.00
	13	.00	.02	.04	.07	.06	.01	.13
	14	.00	.07	.06	.34	.02	.08	.07
	15	.00	.43	.15	.17	.04	.01	.00
	16	.00	.25	.72	.05	.04	.01	.01
	17	.00	.08	.01	.19	.31	.32	.36
	18	.00	.02	.00	.07	.20	.25	.29
	19	.03	.04	.00	.02	.00	.02	.02
	20	.97	.02	.01	.02	.01	.00	.00

Model	Dimension	Variance Proportions						
		grade 9	English	Math	Social Study	Science	French	Woodwork
1	1	.00	.00	.00	.00	.00	.00	.00
	2	.01	.01	.00	.00	.00	.06	.00
	3	.06	.02	.00	.02	.01	.00	.08
	4	.03	.00	.03	.00	.01	.01	.01
	5	.00	.03	.01	.00	.06	.00	.02
	6	.01	.00	.05	.00	.13	.00	.03
	7	.00	.00	.01	.07	.02	.00	.02
	8	.00	.00	.00	.11	.02	.00	.09
	9	.00	.00	.01	.00	.01	.01	.02
	10	.01	.06	.00	.00	.09	.00	.02
	11	.02	.01	.07	.00	.00	.01	.01
	12	.10	.05	.01	.04	.03	.01	.15
	13	.09	.00	.01	.02	.01	.09	.00
	14	.00	.04	.01	.02	.04	.03	.04
	15	.00	.00	.00	.00	.01	.04	.03
	16	.01	.00	.00	.00	.00	.01	.02
	17	.42	.00	.00	.00	.00	.00	.00
	18	.23	.56	.64	.52	.43	.61	.37
	19	.01	.20	.13	.17	.06	.11	.07
	20	.00	.02	.01	.02	.07	.01	.01

Collinearity Diagnostics^a

Model	Dimension	Variance Proportions					
		Arts	Teaching	GroupWork	IndividualWork	One-on-One	S-Male
1	1	.00	.00	.00	.00	.00	.00
	2	.01	.00	.00	.00	.00	.00
	3	.00	.00	.00	.00	.00	.00
	4	.09	.00	.00	.00	.01	.00
	5	.02	.00	.01	.00	.01	.00
	6	.00	.00	.00	.00	.05	.00
	7	.12	.00	.00	.00	.04	.00
	8	.01	.00	.00	.00	.05	.00
	9	.03	.00	.00	.00	.01	.00
	10	.03	.00	.00	.00	.03	.00
	11	.04	.00	.01	.00	.00	.00
	12	.00	.00	.00	.00	.02	.00
	13	.05	.00	.00	.00	.00	.00
	14	.02	.00	.00	.00	.02	.00
	15	.09	.00	.00	.00	.00	.00
	16	.00	.00	.00	.00	.00	.00
	17	.01	.00	.01	.00	.00	.03
	18	.37	.00	.00	.00	.00	.08
	19	.10	.07	.08	.07	.06	.82
	20	.01	.92	.89	.92	.70	.07

a. Dependent Variable: Engaged-Or-Not

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	37.8549	103.3366	74.3433	17.3643	190
Residual	-32.2788	37.8774	1.055E-14	13.5707	190
Std. Predicted Value	-2.101	1.670	.000	1.000	190
Std. Residual	-2.256	2.647	.000	.948	190

a. Dependent Variable: Engaged-Or-Not