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Educational Applications

A good portion of ESM research to date has involved children and adolescents. Because school looms so large in the lives of youth, substantial research has been done exploring both the structure of classrooms as well as students' and teachers' subjective experience in them. How students feel when they are in the classroom has been compared with how they feel on the job or at home, and the quality of experience in classrooms while involved in different instructional practices (such as lecture vs. group activity) has also been documented. An advantage of using ESM to study classrooms is that the researcher is able to link variation in attention, interest, or challenge to specific instructional practices or conditions while avoiding the problems of having students attempt to recall their experiences over the course of an entire day or an entire class period.

ESM can be an even more powerful educational research tool when it is used in conjunction with other information about student performance, school characteristics, or the format of particular classes. One may examine, for instance, whether there are systematic differences in how academically successful students and those who are less successful feel while in the classroom. Some ESM studies also involve an observational component where researchers have the opportunity to assess in greater detail particular teaching styles or classroom characteristics and then link these observations to students' subjective reports. In this chapter we review the variety of ways ESM research has been used to better understand students' educational experiences.

Methodological Concerns and Variations

Because of the types of demands placed on individuals who participate in ESM studies, the method is not particularly suited to studying the educational experiences of very young students. In order to fully participate, a person must be able to read and write quickly and with little effort and must be responsible enough to keep track of a signaling device and, if necessary, a diary containing the ESFs and a pen or pencil for an entire week. If participants are still learning how to read or write, participation could be too burdensome and in the end yield data of questionable quality. Looking across the many studies of children and adolescents, the youngest children studied using ESM have typically been in the fifth or sixth grade. Our experience has been that children younger than this are overburdened by standard ESM procedures and would require drastic modifications to produce meaningful data. Mulligan and colleagues (2000) examined ESM data from a national sample of students to compare response rates of students in grades 6, 8, 10, and 12. They found few systematic relationships between age and response rate. They did find, however, that 12th graders tended to respond to fewer signals compared to 6th, 8th, or 10th graders. Overall though, they concluded that the age of students did not introduce significant selection bias into the sample.

In order to obtain the best response rates possible, we have stressed in previous chapters the importance of forming a research alliance with participants—this is no less important in studies of middle or high school students. Students are often flattered that an adult is interested in hearing what they have to say, and potential participants are often enticed by the thought that what they tell us could make things "better" for students in the future. With research conducted in schools, we have found it very effective for researchers to be a presence in the schools during the week of ESM. Whenever a school allows it, we recommend that researchers make an effort to be in the school every day, and that they make themselves unobtrusively visible to students by walking through the halls during passing periods or visiting the cafeteria during lunchtime. Often the sight of a researcher who appears genuinely interested in the school environment is enough to encourage a student to continue participating in the study. Moreover, if staff make themselves available during the school day, students are much more likely to contact them if a technical problem arises with their signaling device or if they have questions about the study. If at all possible, it is advisable to identify a "home base" in the school (e.g., a counselor's office or conference room) where students know they can drop by to find someone if they have any questions or concerns.

Educational studies have employed a number of variations on ESM procedures in order to best answer relevant questions. In a study of motivation in mathematics classes, Turner and colleagues (1998) employed ESM-type

methodology to elicit students' evaluations of their experience of a single class. In this study, which involved fifth and sixth graders in seven different mathematics classes, participants were asked to fill out an ESF during the last five minutes of the class. Rather than indicating how they felt at the moment, they were asked to rate the cognitive, affective, and motivational dimensions of their experiences over the entire class period. This procedure was repeated in each classroom for a period of four to five days. Though this study did not use any signaling device and did not gather reports at random time periods, as is typical in ESM studies, it did employ a fairly standard ESF and gathered data from the same students on multiple occasions.

A second variation to the procedures in this study was that on the days that the ESFs were gathered, the mathematics classes were audiotaped and observed by trained researchers who provided detailed descriptions of instructional activities. In this way, the students' subjective experiences in the classroom could be linked to features of instruction of interest to the researchers. Adding this observational component could be particularly valuable to educational research where investigators want to understand students' experiences as they relate to specific activities, pedagogies, or other properties of classrooms that might not be easily identifiable by the students themselves.

Using a variation of Turner's method, Uekawa and Borman (2005) conducted a study of high school students in which students in mathematics and science classes were signaled every 10 minutes over the course of a 40-minute class period. Within a given class period, participating students were divided into two groups: one group responded only to the first and third signals and the other group responded only to the second and fourth signals. This method allowed for frequent signaling during the period of interest while attempting to minimize the disruption of students. Each student responded to two signals per class period each day for one week, producing a total of ten responses. This study also included classroom observation during the signaling period as well as focus groups with students at the end of the study.

Another variant of experience sampling has been used by Crocker and colleagues in studies of college students (Crocker, Karpinski, Quinn, & Chase, 2003; Crocker, Sommers, & Luhtanen, 2002). These studies combined interval- and event-contingent sampling methods. Participants were asked to complete Internet questionnaires at regular intervals several times a week and whenever an event of interest occurred. For example, in one study, participants were asked to log on to the survey Web site and complete a questionnaire three times a week and on days when they received a grade in one of their courses for a period of three weeks (Crocker et al., 2003).

When conducting ESM research in schools, it is important to be aware of how often participants are likely to be in the same place at the same time. For example, in a study involving 25 students randomly selected from a large

urban high school, it is unlikely that many participants will be in the same classroom at the time of a signal. On the other hand, another study may involve all (or almost all) students in a 6th grade classroom. The likely locations of students at the time of the signals is important: while 1 or 2 students receiving a signal during class may go unnoticed by the teacher and other students, 15 or 20 signaling devices sounding simultaneously can be downright annoying. In situations where large groups of participants are likely to be together, several steps can be taken to minimize the annoyance of the method. First and foremost, teachers and other relevant school personnel should be warned ahead of time of the possibility of intrusion. In situations where the majority of a class will be signaled, it is advisable to seek the teachers' cooperation in pausing for a moment if possible to allow students respond to the signal. To make sure that a "mass signaling" passes as quickly as possible, it is crucial for all signaling devices to be synchronized to *exactly* the same time. If the display time on watches, pagers, or PDAs are set even 15 seconds apart and several students are in the same room at the time of the signal, there could be relatively constant beeping in a classroom for several minutes. Further, it may be necessary to gently remind students to turn their watches or pagers off as soon as the first signal is heard. In one study we conducted involving 33 schools across the United States, the *only* complaint from school personnel we received about the intrusiveness of the beeping came from a 6th grade teacher who charged that her students were not properly instructed to turn their signaling devices off, which resulted in long interruptions, rather than the brief ones she had agreed to. Most of the students in her class were participating in our study, so even though all watches were synchronized to beep at the same time, the result was a cacophony of electronic sounds that lasted, according to her, nearly a minute. Worried that we had neglected some important piece of ESM training with her students, we looked into the matter further. We discovered that that this teacher was particularly unpopular among her students, and students conveniently "forgot" how to turn their watches off only during those times when they were in her class, leaving the watches to beep for the full 20 seconds before they shut themselves off automatically. Once we addressed this problem with the students, they attended to their watches immediately and the disturbance was minimized.

Time Use and the Structure of Classrooms

As we have discussed in previous chapters, in most ESM studies the signaling schedule is carefully designed to provide a random sample of participants'

waking hours. When multiple participants report on their experiences at these random moments over the period of a week, the resulting data yields rough but fairly reliable estimates of the amount of time participants spend doing various activities. Because the volume of data thus produced is substantial and coding schemes for activities can be very detailed, it is possible to get both general and specific descriptions of time use. For example, Leone and Richards (1989) examined classwork and homework among early adolescents and estimated that students spent about 15.5 hours per week engaged in schoolwork and only 6 hours per week doing homework outside of class. Not surprisingly, they found that students who spent more time doing homework had higher achievement than students who studied less. The researchers also found that while most students did homework alone, those who tended to study with their parents had higher achievement as well.

Csikszentmihalyi and Larson (1984) examined adolescents' reports of their activities every time they were signaled in a school class. They found that during class, students were doing some form of academic activity about 78 percent of the time (see Figure 12.1). The remaining 22 percent of classroom reports were comprised of activities such as socializing, resting, or daydreaming. The most common activity in classes was individual seatwork or studying, which accounted for approximately one-quarter of all classroom activity. The second most common activity was listening to the teacher lecture, which accounted for approximately 18 percent of all class time. In this particular study, cooperative activities such as group work and discussion were relatively rare, together accounting for only about 10 percent of all class reports. In a study of adolescents conducted nearly two decades later, Csikszentmihalyi and colleagues found nearly identical results (Shernoff, Csikszentmihalyi, Schneider, & Steele-Shernoff, 2003; Shernoff, Knauth, & Makris, 2000). The similarity in the structure of classroom time between these studies is remarkable, particularly given the push in education over the past few decades to include more constructivist, collaborative activities in classrooms. The consistency over time in the structure of classroom activities suggests that while the rhetoric about how class should be conducted has changed, what happens in classrooms (at least in middle and high school classrooms) has not.

A similar resistance to change in educational practice in also evident in research by DiBianca (2000). In a unique study of high school mathematics and science classes, each time students were signaled they recorded on a checklist whether or not they were using various tools and materials at that moment. In spite of the recent push in education to promote "hands-on" learning in these subject areas, DiBianca found that in math classes students most often reported using only textbooks (44.6%), while in science classes
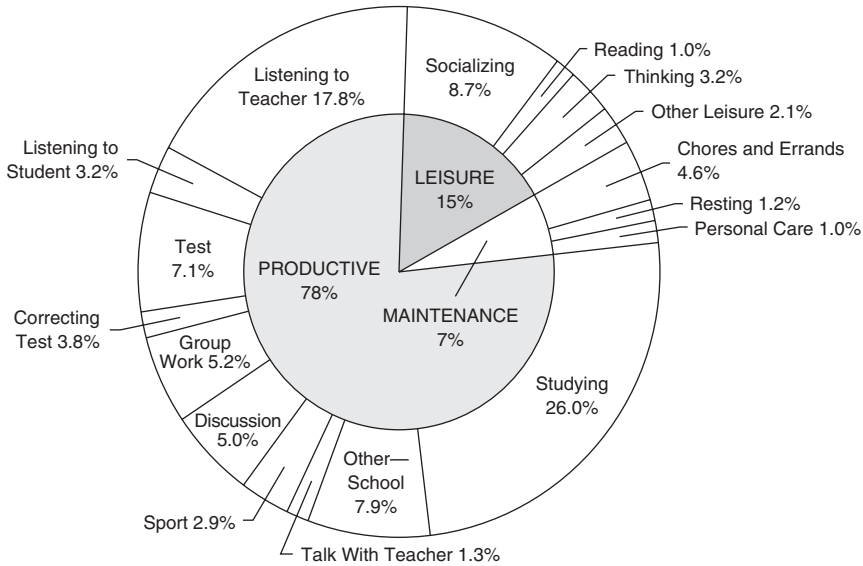
Figure 12.1   What Teenagers Do in Class

NOTE: N = 1,785 unweighted.

students most often reported using no materials at all (52.2%). The frequency and types of materials used in each subject area is reported in Table 12.1.

While lecture and individual seatwork still appear to dominate the American high school classroom, Shernoff and colleagues (2000) did find considerable variation in the types of instructional strategies used in different subject areas. They found, for example, that lecture is used far more often in history classes than it is in mathematics, science, or foreign language classes. Though lecture is still the dominant practice even in science classes, Shernoff and his colleagues found that group activities are used more frequently in science classes than any other classes (though still accounting for less than 10 percent of all class time). In contrast, only about 1 percent of students' time in history classes involves group work.

ESM has also been used to explore how participation in nonschool activities impacts the amount of time students spend on school-related activities. Schneider and Stevenson (1999) found that when students have paying jobs, their hours at the workplace appear to cut into the time they spend at school

Table 12.1   Percentage of Student Responses Indicating Use of Certain Tools and Materials[a]

Tool/Material	Math	Science
Textbook	44.6	21.3
Calculator	11.3	7.1
Other instruments/equipment	9.1	14.6
Computer	7.5	1.9
Manipulative	5.7	7.4
Measuring tool	2.9	6.3
Other tools	1.2	0.7
Materials used (total)[b]	60.3	47.8
No materials used	30.7	52.2
Total lessons	100.0	100.0

SOURCE: Copyright © 2000 by Richard P. DiBianca, *Teaching adolescents*. Reprinted with permission.

a. $N = 5{,}238$

b. Indicates the percentage of all lessons in which materials were used. It is not a sum of the percentages of lessons in which individual materials were used because some lessons featured the use of multiple tools and materials.

and doing homework. Among a national sample of high schoolers, they found that those who held jobs during the school year spent considerably less time at school than students who were not employed—averaging about an hour less per day. Teens who worked spent more time commuting than their nonemployed peers (about an hour and a half more per week) and spent about 15 minutes less per day doing homework. Thus ESM makes it possible to study whether participation in paid work or extracurricular activities takes away from school-related pursuits or whether they diminish the amount of time teenagers spend with family or friends.

The Quality of Students' Classroom Experiences

Beyond simply describing how students spend their time in classrooms, ESM can be used to understand how students feel across the various activities that make up their school days. Analyses involving person-level *Z*-scores make it possible to compare subjective experience in school to the other contexts.

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Csikszentmihalyi and Larson (1984) found that compared to the other contexts in adolescents' lives, when they were in class they reported lower-than-average states on nearly every self-report dimension on the ESF (see Figure 12.2). They reported feeling generally sad, irritable, and bored. They found it difficult to concentrate, felt very constrained, and strongly wished to be doing something else. The single encouraging pattern in this profile of classroom experience was that adolescents reported relatively high levels of concentration compared to the other contexts of their lives. Thus it appears that in spite of all of the negative feelings students report from their classes, they are concentrating at least some of the time.
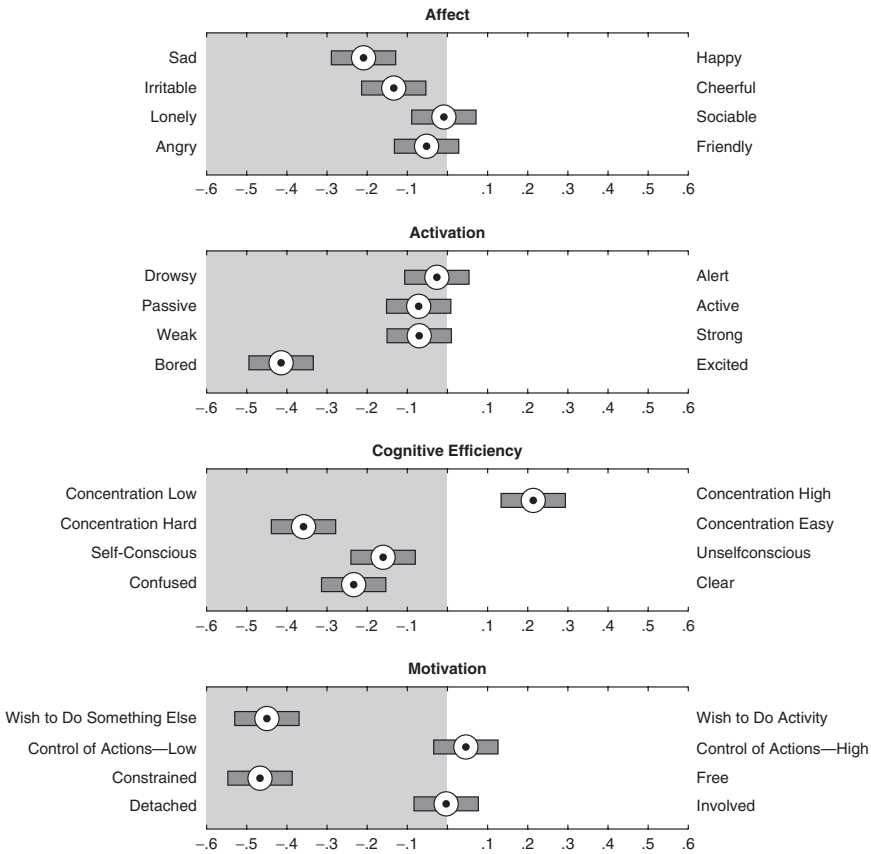
Figure 12.2   Quality of Experience in Class

SOURCE: From *Being Adolescent: Conflict and Growth in the Teenage Years* by Mihaly Csikszentmihalyi. Copyright © 1984 by Basic Books, Inc. Reprinted by permission of Basic Books, a member of Perseus Books, L.L.C.

In a study of middle school students, Larson and Richards (1991a) provide evidence that the boredom students report in school may be as much a function of their personality as a result of the tasks they are asked to complete in school. They conclude that while schools could certainly be structured to minimize students' boredom, a significant portion of students' boredom in school is attributable to dispositional traits rather than one's state. They explored boredom in and out of school and found that those who reported boredom in school were most likely to report boredom outside of school as well.

Of course, ESM is not the only method used to make the relatively unsurprising discovery that many students are bored in school. Studies using a variety of other methods have come to similar conclusions. In a study of student engagement, Steinberg, Brown, and Dornbusch (1996) reported that half of the students in their sample found their classes to be boring and a substantial proportion of students resorted to "goofing off" with their friends as a means of surviving the monotony each day. Boredom with school is not only apparent in academically unsuccessful students but in students of all achievement levels (Goodlad, 1984; Larson & Richards, 1991a). In recent years, however, a connection has been made between student engagement in school and learning and achievement (Christensen, Sinclair, Lahr, & Godber, 2001; Newmann, 1992; Steinberg, Dornbusch, & Brown, 1992).

Rather than comparing classroom experience to all other nonclassroom experiences, some researchers have made comparisons between school and other specific contexts. For example, Schneider and Stevenson (1999) compared the way high school students felt in class to they way they felt working in part-time jobs. They found that employed students reported greater levels of enjoyment at work than at school. They hypothesized that at work teenagers may feel more in control and less threatened than at school. School on the other hand may present more pressure to live up to parents and others' high expectations. Because job-related expectations are often easier to meet, students may enjoy work more. When at school, however, students reported that their activities were far more important to their futures than what they do at work. Schneider and Stevenson argue that school is felt to be more important by students than work because most teenagers plan to attend college (thus making high school important to their future) and because work available to teenagers seldom leads to meaningful adult employment.

Because of its repeated measures design, ESM is an ideal tool for understanding differences in student experiences as they relate to different subject matter, learning activities, or instructional formats. For the past several decades at least, researchers have recognized that student engagement and learning vary by activity and subject. In her book *The Subject Matters,* Susan

Stodolsky (1988) argues that what teachers are teaching and how they are teaching it will have profound effects on students' learning. One way that classroom activities have commonly been characterized is in terms of the degree of control students or teachers have over the activity. Whole-group instruction tends to be perceived by students as an activity where the teacher is primarily in control, whereas individual or small group instruction as advocated by constructivist approaches is perceived as being more student controlled (Marks, 2000). Research using a variety of methods suggests that students are often more engaged in student-controlled versus teacher-controlled learning activities (Grannis, 1978; Stodolsky, 1988). ESM has been used by a number of researchers to examine the way students feel when engaged in different learning activities and in different subject areas.

In a comparison of student experience in specific subject areas, Shernoff and his colleagues (2003) report that high school students generally feel more engaged in nonacademic subjects (i.e., computer science, art, and vocational education) than in academic subjects (i.e., English, science, mathematics). Overall, students reported that mathematics was the most challenging of all their courses, although it is the class where they reported the lowest levels of engagement. In fact, computer science is the only subject in which students reported both high levels of challenge and enjoyment. In a study in which only academic classes were considered, Yair (2000) found that students reported the highest rates of engagement in mathematics and natural science courses and the lowest rates of engagement in English, social sciences, reading, and foreign language courses. These findings contradict those of Shernoff, and this contradiction is particularly intriguing because both studies employ the same data set. The difference in findings between the Shernoff and Yair studies (that in math class Shernoff finds low engagement and Yair finds high engagement) is due to the way engagement was measured in the two studies. Shernoff and colleagues measured engagement using reports of concentration, interest, and enjoyment. In Yair's study, on the other hand, students were said to be engaged if their thoughts at a given moment were consistent with their reports of their physical location (e.g., a student reporting that he was thinking about simultaneous equations in math class was considered "engaged" while one who was thinking about last night's ball game was not). Shernoff, Schmidt, and Rushi (2005) examined the relationship between these two distinct measures of engagement using the same data set. They refer to Yair's measure as *attention* and find that momentary attentional focus is positively associated with their measure of engagement, though the two measures represent two distinct constructs. Measuring engagement is a complex task whether one is using ESM or any other instrument. In a recent review of the many ways engagement has been measured, Fredricks,

Blumenfeld, and Paris (2004) call for measures of engagement that are multidimensional and context dependent. ESM is an ideal tool for addressing these concerns in the field of research on engagement.

ESM has been used to assess subjective experience as a function of specific instructional methods, such as lecture, group activities, class discussion, or watching a video. Shernoff and his colleagues (2000) compared five of the most common in-class activities (TV/Video, Lecture, Group work, Individual work, and Test/Quiz) in terms of students' ratings of challenge, importance to future goals, concentration, and enjoyment (see Figure 12.3). The pattern revealed by these analyses suggests that students perceive their classroom activities as either enjoyable but easy and meaningless or as important but not enjoyable. Watching videos in class was rated as most enjoyable, but it was also rated as least challenging, least important to future goals, and requiring the lowest levels of concentration. Taking tests and quizzes, on the other hand, was rated as least enjoyable but most challenging, most important to future goals, and requiring the highest levels of concentration. Yair (2000) examined adolescents' engagement (defined as consistency of thoughts and physical location) when various instructional methods were used in classrooms. The highest rates of engagement were reported during laboratory work, group work, individual or group presentation, and discussions. Students were least likely to be engaged when listening to teachers' lectures and when watching television or video presentations. One of the more troubling findings to emerge from both of these studies concerns the relatively poor quality of students' experience when listening to teachers lecture. Listening to lecture—which accounts for a considerable proportion of all classroom time—is perceived to be unenjoyable, lacking in engagement, and requiring only minimal concentration.

In the research just described, the activity taking place in the classroom is reported by the students themselves, and one must rely on these subjective reports in order to categorize classroom activities. In most situations this is desirable—the whole purpose of the method is to understand those elements of daily life that are salient to the participant. Only the participant can accurately report whether her primary focus is "listening to lecture" or "daydreaming," or whether she is principally engaged in "taking notes" or "doodling." These are not distinctions that could be easily made by an outside observer. The strength of ESM is that all reports of the external dimensions of one's experience—one's activities, locations, and even companions—are filtered through the perceptual lens of the participant. This makes it possible to detect important differences in the quality of classroom experience as a function of whether or not particular students were truly focused on the activity at hand or whether they were daydreaming or making plans for the weekend.
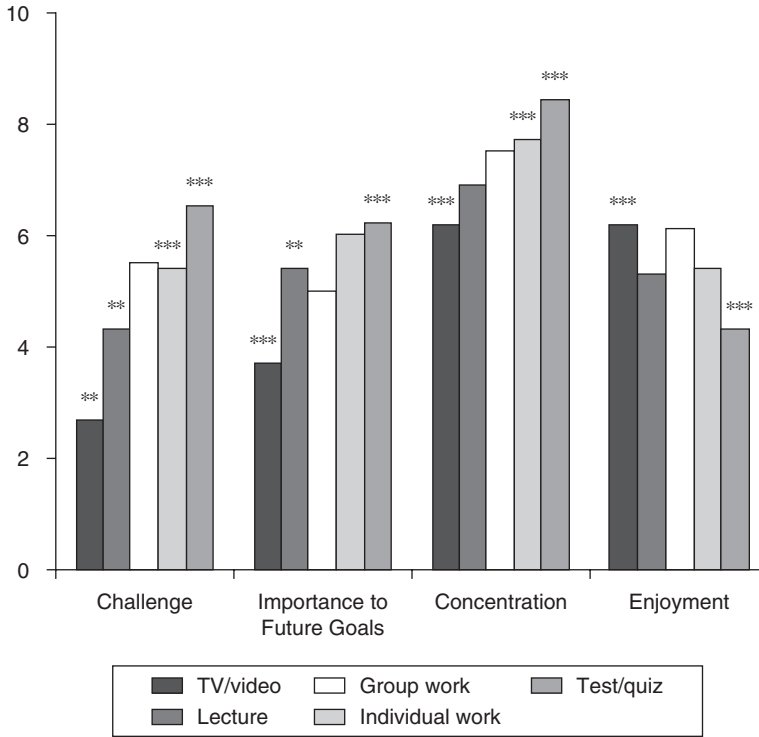
Figure 12.3   Quality of Experience in Common Classroom Activities

SOURCE: From *Becoming Adult* by Mihaly Csikszentmihalyi. Copyright © 2000 by Mihaly Csikszentmihalyi and Barbara Schneider. Reprinted by permission of Basic Books, a member of Perseus Books, L.L.C.

NOTES: * $p < .01$; *** $p < .001$. (Indicates contrast to the other activities combined.) An analysis of variance comparing mean ESM scores in the five selected classroom activities yielded the following results: for Challenge, $F = 84.77$, $p < .001$; for Importance to Future Goals, $F = 37.37$, $p < .001$; for Concentration, $F = 36.99$, $p < .001$; for Enjoyment, $F = 19.73$, $p < .001$.

In certain circumstances, however, a more "objective" description of what is going on in a classroom may be indicated in order to assess students' reactions to a given activity or instructional practice. In a study of 5th and 6th grade mathematics classrooms, Turner and colleagues (1998, Schweinle & Turner, under review) sat in on multiple meetings of a given class and used a classroom observation instrument to record teachers' and students' demeanors, classroom activities, and features of classroom discourse. In addition, the researchers administered an ESM-type form during the last five minutes of

each observed class to assess students' subjective experiences. This series of studies attempts to link students' lived experience to instructional patterns in their classrooms that would not typically be discernable from student reports of what they were doing. Turner and colleagues (1998) found that in certain classrooms involvement tended to be consistently higher than in others (indicated here by student ratings of challenges and skills being relatively high and in balance). The practices of teachers in these "high involvement classes" were then compared to practices of "low involvement teachers." Drawing upon the qualitative data gathered from observation, the researchers identified several differences in the instructional patterns of high- and low-involvement teachers. In those classes where students reported the highest levels of involvement, teachers were observed to provide more scaffolded instruction and more often used instructional practices that fostered intrinsic motivation. Teachers in the low-involvement classrooms tended to emphasize procedures (such as formatting assignments properly) more than content and used extrinsic motivation strategies such as the promise of rewards or punishment. This study demonstrates how student involvement and motivation may be linked to specific instructional practices in mathematics.

In a related study, Schweinle and Turner (under review) identified teacher practices that were related to students' reports of affect, efficacy, and challenge/importance. In mathematics classrooms where teachers provided extensive feedback, students' reports were higher on all three of these factors. They found teachers' use of humor and social support to be positively related to student affect, but not to efficacy or challenge/importance. This study in particular suggests that it is important to understand how certain practices operate in conjunction with one another to impact different dimensions of students' experiences.

Uekawa and Borman (2005) combined ESM with observational data about a wide variety of features and practices in high school science and mathematics classes. Among other things, they explored how the structure of classrooms impacts student engagement (assessed using a combination of eight items on the ESF). Much to their surprise, they found that the physical seating arrangement in classrooms exerted the largest effect on engagement. In classrooms where students were seated in individual seats, engagement levels were substantially higher compared to classrooms where students were sitting with peers in clusters or around a table. Results also suggest that how seating arrangements were determined may impact engagement. In classrooms where students chose their seats, engagement was considerably lower than in classrooms where seating was assigned by the teacher. These results are important to teachers who often struggle with questions about how to best arrange classrooms to promote learning. An interesting caveat to these

findings involves cultural differences in engagement as a function of seating arrangements. The data suggest that even though Hispanic students generally tended to have the lowest engagement levels and group seating generally produced lower engagement, when Hispanic students were placed in the more collaborative learning environments facilitated by group seating their engagement level soared. These results add to a growing body of research suggesting interactions between specific cultural approaches to learning and the pedagogical practices of teachers.

Up to this point, most of the research reviewed in this chapter has explored variation in students' feelings as they relate to external dimensions such as physical location or activity. Among the many contexts that have been studied are type of work (e.g., school work vs. paid work), course subject (e.g., math vs. English), instructional method (e.g., lecture vs. group discussion), and seating arrangement (e.g., individual vs. group). Another approach is to observe how ratings of affective states change with variations in *internal,* rather than external, dimensions. For example, Shernoff and colleagues (2003) examined engagement in high school classrooms from the perspective of flow theory. They defined engagement as high concentration, interest, and enjoyment, and sought to identify the conditions in which engagement in classrooms tended to be highest. They found classroom engagement to be highest when perceived challenges and skills were high and in balance, when instruction was personally relevant, and when students felt they were in control of the learning environment.

Schweinle and Turner (2006) studied the affective experience of students from the perspective of flow theory as well. Their study differs from that of Shernoff and colleagues in several important respects. First, the population was much younger—students were in the 5th and 6th grade, while Shernoff's sample was comprised of 10th and 12th graders. Second, Schweinle's research focuses only on experience in mathematics classes while Shernoff's research examined student experience in multiple classes. Similar to Shernoff and colleagues and consistent with flow theory, Schweinle and Turner found that task relevance (called *task importance* or *value* in their research) is correlated with motivation. In contrast to flow theory however, they conclude that, at least among 5th and 6th graders in mathematics classes, challenge is perceived as a threat to students' self-efficacy and is not typically viewed as an opportunity to develop new skills. The authors speculate that children in 5th and 6th grade may have a different and more negative conception of "challenge" than older students. Perhaps to a 5th or 6th grader, "challenging" is equated with "difficult" because children at this age have not yet experienced the opportunities that optimal challenges can provide.

Comparing Students' Classroom Experiences

Until this point we have described the way different educational contexts can be compared to one another. Using the distinction made by Larson and Delespaul (1992) described in Chapter 3, these studies generally answer *questions about situations,* rather than about persons. Questions about situations are focused on comparisons made within individuals that examine different moments in time or different situations, such as how math class compares to history class, how lecture compares to class discussion, or how moments of engagement or involvement compare to less involving times. ESM can also be used to answer *questions about persons,* which involves making comparisons between groups of people who have different traits, who come from different backgrounds, or who spend their time in dramatically different ways. In educational research, questions about persons often involve comparisons of academically successful students with those who are less successful. For example, in their study of talented teenagers, Csikszentmihalyi, Rathunde, and Whalen (1993) were interested in identifying traits that distinguish talented students from their peers. They compared the daily patterns of activity and time use of talented and "average" teenagers in an attempt to "identify those daily habits that underlie the complex attentional structures that should lead to the cultivation of talent over time" (pp. 16–17). They obtained a sample of 208 9th and 10th graders who were identified by their teachers or coaches as being particularly talented in mathematics, science, music, athletics, or art. Data from this sample were compared to data obtained from "average" students from a previous study involving students from the same school who were of the same age and approximate socioeconomic background.

In terms of time use, Csikszentmihalyi and colleagues found that talented students spent significantly more time engaged in classwork when they were in school, but did not spend any more time studying outside of school than their average peers. It appears then, that the talented teens were able to work more efficiently both in and out of class. Talented teenagers spent less time working at paid jobs and less time socializing than average teenagers. In their free time, they spent more time involved in various structured activities related to art and hobbies compared to average students. Key differences in time use among talented and average teenagers are presented in Table 12. 2. Talented and average teens also differed in their patterns of companionship. The talented adolescents spent more time alone and more time alone with their parents (without siblings present) than average teens. The two groups did not differ with respect to the amount of time spent with friends, though

aspects of daily life. Across all activities, talented teenagers had significantly lower moods than average students on a number of measures (e.g., happy, cheerful, alert, strong). This might be an indication that average students are simply less self-critical or that the pressure talented students feel may cause a generally more depressed mood. When *Z*-scores were used to examine the relative quality of experience in specific activities, the talented and average students' reports were more similar than different, but there were a few notable exceptions. First, the talented teenagers felt relatively happier and more cheerful in productive activities like classwork and studying. Their experience in these activities was not often positive, but was usually less negative than that of average students. In such productive activities, talented teens also reported much higher levels of concentration. They reported feeling significantly less unhappy and more motivated than average teenagers when they were alone, presumably because they were able to be more engaged in solitude than average students. While the experience of solitude is negative for most adolescents, the ability to make good use of time in solitude is an important asset, as it can be a time to develop skills and identify challenges. This research suggests that how one uses solitary time is an important factor in the development of talent.

To understand more fully how talent is developed and sustained, Csikszentmihalyi and his colleagues followed up on their talented sample two years after the original data collection. At this time they assessed students' commitment to their talent: students who reported daily engagement in some activity related to their talent were categorized as committed. The researchers then examined the ESM reports of committed and uncommitted students obtained in the first data collection, two years prior. Such analyses are designed to identify the experiential predictors of commitment to a talent area. They found that compared to uncommitted students, committed students in math, science, music, and art felt more positive affect, greater potency, and greater intrinsic motivation while they were engaged in their talent. Committed students also more often described their talent-related activities as being simultaneously highly involving and highly important to their future goals. The uncommitted students in the arts reported that they were often highly involved in their talent-related activities, but these activities were perceived as unimportant to future goals. Students uncommitted in science and math showed the opposite pattern: two years earlier, when doing science or math they thought what they were doing was important but not enjoyable or involving.

Committed and uncommitted students were also compared in the relationship between perceived challenges and skills when they were doing activities related to their talent. According to flow theory, perceiving high skills

and challenges are psychological preconditions for flow experiences. The researchers wanted to see whether committed and uncommitted students differed in the frequency with which the potential for a flow experience occurred in their area of talent. They found that committed students reported more often than uncommitted students that they felt high challenges and high skills in their talent activities (see Figure 12.4). Compared to committed students, uncommitted students felt more often that their talent-related activities were characterized by high levels of challenge but low levels of skill. The comparisons of committed and uncommitted students just described all point toward the same conclusion—in order for students to continue in a particular interest, it is important that activities related to that interest be engaging and personally relevant and that they provide opportunities to exercise skills in a challenging context.

There are, of course, characteristics other than academic success to define and compare groups of students in educational research. Most of the studies
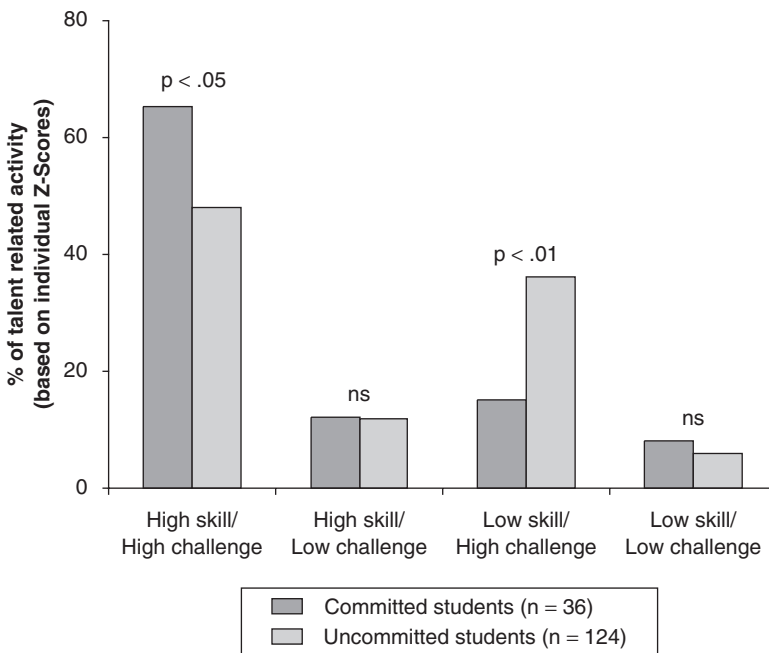
Figure 12.4   Comparison of Committed and Uncommitted Students on Levels of Skills and Challenges in Talent Work

SOURCE: Csikszentmihalyi, Rathunde, and Whalen, 1993. *Talented teenagers*. Copyright 1993. Reprinted with the permission of Cambridge University Press.

reviewed in this chapter explore how the findings vary by gender, race, ethnicity, or socioeconomic background. In some cases these factors are simply treated as statistical controls, while in other cases issues of gender, race, or socioeconomic resources are central to the research question. Looking across these studies, the findings regarding gender, race, ethnicity, and SES are too varied and complex to be adequately described, but some are taken up in the chapters regarding gender (Chapter 8) and culture (Chapter 11). As a method, ESM is capable of illuminating very subtle variations in the classroom experiences of students from different cultural backgrounds or with different resources available to them. To illustrate this, we present results from two studies of adolescent engagement. The first is Yair's (2000) study of adolescent engagement in which he identified "social differentials" in the effects of instruction on student engagement. While instructional strategies had independent effects on engagement (discussed earlier in this chapter) results indicated that Hispanic students were highly sensitive to variation in instructional strategies. Hispanic students reported extremely low rates of engagement when instruction was of low quality but became highly engaged when the quality instruction was high (defined as challenging, academically demanding, and relevant). African American students, on the other hand, were least likely to respond to instructional variation: their rates of engagement were generally low regardless of whether the instruction was of high or low quality. Using a different measure of engagement, Shernoff and colleagues (2005) report ethnic variation in engagement that is contradictory to Yair's findings. Their research indicates that African American high school students experience high levels of school engagement relative to their peers, and that their engagement increases dramatically as their in-school activities become more focused on academic content.

ESM has also been used to illuminate subtle variations in the self-talk of students and their classroom behavior. In a study conducted by Manning (1990), a variation of ESM was used to analyze and relate teacher ratings of student behavior and the self-talk of children in grades two through five. The results of this study suggest that students rated "excellent" in classroom behavior by their classroom teachers used significantly less negative self-talk than did average and poorly rated students when working on independent assignments. Success in academics (IQ scores and academic achievement) was in fact more positively correlated with neutral, task relevant self-talk. Correlations were also found between students rated as poor in classroom behavior, low in IQ scores and academic achievement, and negative self-talk, which may negatively affect learner progress. Further research in this area may result in the development of new instructional strategies that lend themselves to more success-oriented learning environments.

Lisa Johnson (2004) used ESM to study engagement in the context of two very different American high schools. She compared the classroom experiences of students in an alternative public high school to a sample of comparable students in a traditional public high school. The alternative high school was structured to implement a democratic and egalitarian school philosophy that is presumed to facilitate student engagement in education. Students in the two samples differed substantially in both their time use in the classroom and their levels of engagement in academic activities. Students in the alternative school spent much more time involved in academic activities outside of the school's campus, and their classroom time was dominated by interactive instructional formats like discussion and debate. Students in the traditional school spent much more time in passive activities like lecture. While students in the two samples did not differ from one another in their average levels of engagement outside of school, the traditional school students generally reported lower academic engagement than students in the alternative school. Interestingly, students in the alternative school reported high levels of engagement even during those relatively rare occasions when they were being lectured to, suggesting that if used in the right context, lecture can be engaging for students.

Rathunde and Csikszentmihalyi conducted an ESM study in which they compared the experience of students in traditional public middle schools to students in a Montessori school. While students in each type of school did not differ from one another in their subjective experience of nonschool activities, several differences emerged in their experiences of school. Montessori students had greater affect, energy, intrinsic motivation, flow, and undivided interest (the combination of intrinsic motivation and importance) when participating in academic work at school. Relative to Montessori students, students in the traditional middle school reported that their schoolwork was of greater future importance, but these reports were also accompanied by low levels of intrinsic motivation. The authors argue that these differences are at least partly attributable to systematic differences in educational practices (Rathunde & Csikszenthmihalyi, 2005a). In an examination of the social environment in each of these school types, they found that Montessori students had more positive perceptions of their school environment, their teachers, and their classmates. These results might be reflective of different school organizational structures: Montessori students were more often engaged in collaborative work, individual work, and school-related tasks, while traditional students spent more school time on social and leisure activities and in more passive instructional formats like lecture (Rathunde & Csikszentmihalyi, 2005b).

After-School Programs

A small amount of ESM research has focused on the internal experience of students in after-school programs. Rather than signaling students across all activities, the research reviewed here only sampled activities that occurred after school. This line of inquiry focuses on student engagement in after-school programs and makes comparisons between the internal experience of students in these programs and their internal experience while engaged in other out-of-school activities, such as homework. Results indicate that early adolescents involved in school-based after-school programs reported higher levels of intrinsic motivation, positive affect, and concentrated effort during participation (Vandell, Shernoff, Pierce, Bolt, Dadisman, & Brown, 2005). When not participating in an after-school programs, early adolescents who were enrolled in programs were more likely to report socializing with peers, while subjects who were not enrolled in after-school programs were more likely to spend time watching TV or eating in the afternoons. Students in the same study reported that unsupervised time doing homework and socializing with peers was characterized by low levels of intrinsic motivation and intensity when compared to organized activities with adults or when supervised with peers. These findings suggest that adult-supervised activities may better support positive youth development and contradict claims that programs emphasizing homework serve to promote higher academic achievement.

Studies of Adult Learners

The majority of ESM studies with educational implications have involved samples of children and adolescents. There are, however, a few in which the experience of adult learners was examined. In a follow-up to the Sloan Study of Youth and Adolescents, Schneider (personal communication, 2003) recruited approximately 60 of the original participants (college age at the time of the follow-up) to again participate in the ESM. This study provides a rare look into the daily experiences of college students. Clearly, the pattern of habits laid down in middle and high school are still evident in young adulthood. Those who liked to study at age 14 are still the ones who devote much of their time to study. Such dimensions of experience as self-esteem, happiness, concentration, and so on are remarkably stable nine years later.

Jennifer Crocker and colleagues (2002, 2003) have studied contingencies of self-worth among college students using a variant of ESM in which participants answer daily questionnaires on the World Wide Web. In one study

the researchers found self-worth to be contingent upon academic achievement among samples of engineering and psychology majors. More specifically, they found that self-esteem, affect, and one's identification with their major increased on days students received high grades and decreased on days students received low grades (Crocker, Karpinski, Quinn, & Chase, 2003). In another study, Crocker and colleagues (2002) studied college seniors applying to graduate school and charted students' self-worth as it fluctuated with acceptance and rejection from graduate programs. They found that some students' self-esteem was heavily based on academic competence while others' was not. Compared to students whose self-esteem was less contingent on academic competence, students whose self-esteem was more heavily based on academic competence had greater increases in self-esteem on days when they were accepted into graduate programs and had greater decreases in self-esteem on days when they received rejection letters.

In another study of adults, Hermanson (1996) studied self-directed learning among adult students. She found that adults typically define "learning" as those everyday experiences from which they get to better understand the personalities and motivations of other people or of themselves. Thus defined, a great deal of such learning is reported to take place every day and is one of the most enjoyable moments in people's lives.

ESM has great potential as a tool for understanding the experiences of adult learners. Very few ESM studies have examined the educational experiences of adult learners, and we view this as another area ripe for future research using the method.

The Experience of Teachers

While it is important for students to be involved in their own learning processes, the responsibility for learning does not fall entirely on the student. Teachers are important figures in a child's development and play a crucial role not only in what a child learns, but in how she feels about learning, how she approaches learning, and what types of goals she sets for herself in the future. To truly understand the educational process, it is just as important to consider the experience of teachers as that of learners. While there have been many ESM studies focused on students' experiences, only a few have focused on the experiences of teachers. In a unique study of high school mathematics and science classrooms, DiBianca (2000) signaled both students and teachers in classrooms. He found that teachers more often chose instructional formats in which they determined the pace of the class (e.g., lecture, demonstration, review of homework problems) over more interactive, student-paced instructional

formats like computer work, lab activities, and student presentations. Moreover, teachers reported significantly higher levels of engagement when using instructional formats in which they determined the pace of class.

By contrast, students reported higher levels of engagement in more interactive, challenging, student-paced instructional formats. Overall, DiBianca found that teacher engagement showed little impact in determining student engagement. While it appears logical that teachers might be more engaged when they are wholly responsible for creating and delivering a lesson, one might question teachers' choice of instructional format because what is engaging to teachers does not appear to be engaging to students. This research illuminates an all too frequent disjunction in classroom perceptions, where a teacher's comments indicate that "things were going well," while student comments reveal overwhelming boredom and disinterest.

In addition to studies conducted with teachers, some ESM research also recognizes the important role of the principal in school settings. Prior studies of the effective instructional leadership of principals have primarily been descriptive in nature and limited in generalizability. ESM has been used to refine the approach to this study of effective instructional leadership. In a study of 81 Chicago area principals, Scott, Ahadi, and Krug (1990) hypothesized that expert principals would be more likely to perceive their actions as global strategies rather than low level descriptive activities. Principals were beeped 25 times over the course of a typical week between the hours of 7:00 a.m. and 9:00 p.m. Rather than filling out the typical ESF, a Principal Activity Sampling Form (PASF) was designed that included questions about the principal's interpretation of their activities in terms of five empirically defined domains of instructional leadership. These domains include defining mission, managing curriculum, supervising teaching, monitoring student progress, and promoting school climate. This modified ESF was used in conjunction with an Instructional Leadership Inventory, which consists of 48 items that measure the aforementioned domains of instructional leadership. The findings of this study indicate that principals consistently participate in similar activities regardless of their levels of leadership effectiveness. How these individuals differ lies in the way they ascribe meaning to these activities. For example, an effective principal is more likely to view a task such as monitoring the lunchroom as an opportunity to promote instructional climate. An ineffective principal may simply view this activity as "monitoring the lunchroom" or as a distraction from more important activities. Therefore, it appears that more effective instructional leaders use these activities to implement global strategies or higher-level goals such as "creating excitement about teaching or learning." This research illustrates the power of ESM to detect how global approaches rather than concrete behaviors define effective instructional leadership.