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ABSTRACT

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Motivation and affect have mostly been studied separately, but both research and practical experience suggest that they are reciprocal features of learning experiences and should be studied together. The present research examines the relationships among cognition, motivation and affect in fifth- and sixth-grade children during mathematics classes from the perspective of flow theory. Students' reports of affect, efficacy, challenge, and importance were compared to classroom instructional methods. Results of this study demonstrate that, motivation is affectively charged and the classroom context may influence how students interpret opportunities to meet challenges and develop skills. That is, the opportunities are not merely interpreted as positive or negative motivation to learn, but also as imbued with value and social and affective significance. Further, their interpretations of challenge and skill may also change with age. Csikszentmihalyi has provided a compelling theory for incorporating affect with challenge and skill. However, the theory is not necessarily a perfect fit in the actual classroom settings, or with younger children. Classroom environments are more complex than the theory implies. Contextual information combined with self-report data can provide a richer, more complete description. This research will lead to a better understanding of how students perceived the classroom environment – incorporating both motivation and affect.

Motivational and Affective Quality of Students' Experiences in Mathematics Classrooms

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Introduction

Prior Research

Theories of motivation have devoted more attention to motivational mechanisms than to the affect associated with them.

In addition, much research in motivation and affect has focused on relatively decontextualized individual psychological processes. Yet, for children, achievement motivation and affect are contextualized and made meaningful by their experiences in the classroom.

Flow Theory

Flow theory (Csikszentmihalyi, 1975) is one of the few theories to explicitly incorporate affect. It was developed to describe the experiences of intrinsically motivated people.

According to flow theory, an activity is rewarding in relation to whether individuals find it attractive or challenging and whether they have the skills to accomplish it. Various ratios of challenges and skills are predicted to be associated with different qualities of experience (Csikszentmihalyi & Nakamura, 1989).

	Low Skill	High Skill
High Challenge	Anxiety	Flow Optimal Experience
Low Challenge	Apathy	Boredom

In Contrast

Flow theory assumes that optimal challenges produce the most positive outcomes for students, and students are motivated to engage in these activities. In contrast, Wigfield and Eccles (2001) contend that students feel more competent at and value tasks at which they think they can be successful, not necessarily optimally challenging ones. In fact, Eccles and Wigfield (1995) found that task difficulty was negatively related to both task value and ability perceptions, suggesting that students perceived challenge as a threat to their sense of competence.

Much of the research on flow theory and affect has been conducted with talented teenagers. Results may be different for students who are participating in classes that are required, rather than classes that are electives. In fact, Csikszentmihalyi and colleagues (1993) found that talented teenagers were more happy and cheerful in school settings than were non-talented teens. This would suggest that students in regular school classes, not in their talent area, might perceive the classroom environment differently.

Present Research

The present research used flow theory to examine students' reports of their motivation and affect within the context of their mathematics classrooms. We sought to answer two questions:

1. What are the conceptual relationships between motivation and affect in students' reports during mathematics instruction?

We investigated the relationship between motivation and affect as reported by students on Experience Sampling Forms developed by Csikszentmihalyi and his colleagues (ESF; Csikszentmihalyi & Larson, 1987). In particular, we wanted to discover how certain student motivational constructs, such as skill and challenge, were related to more affective components.

2. How do these patterns differ by classroom?

We calculated the challenge and skill ratios for each classroom and evaluated the mean levels of affective and motivational factors.

Method

Participants

5th and 6th grade students in mathematics classes from 3 predominantly White public elementary schools participated. We randomly selected 6 students from each of 7 classrooms (N = 42). The selected students completed an experience sampling form (ESF) after eight math classes (four in the fall and four in the winter).

Experience Sampling Method

The adapted forms contained:

- 12 semantic differential items (e.g., happy-sad, alert-sleepy) measured on a 9-point Likert scale. (See Table 1.)
- 5 motivational questions, measured on a 10-point Likert scale:

Challenge and Skill	"How challenging was math class today?"
	"How did you feel about your skills in math today?"
Importance	"Was this math class important to you?"
	"Was this math class important to others?"
Success	"Were you successful in math class today?"

Observers distributed the ESF forms during the last five minutes of math class. Each of the students completed a form on each of 4 days in the fall and winter. One teacher was only available in the winter, so the 6 students in her room contributed 24 forms. Additionally, 37 observations were omitted from analyses due to missing values, resulting in a final N = 275.

Results

What are the conceptual relationships between motivation and affect?

Table 1
Factor Analysis of Items on Experience Sampling Form

Items	Factor 1 Affect	Factor 2 Efficacy	Factor 3 Challenge/ Importance
Alert – Sleepy	0.64		
Cheerful – Crabby	0.85		
Clear – Confused	0.47	0.51	
Cooperative – Competitive	0.49		
Excited – Bored	0.68		
Part of the Group – Lonely	0.62		
Happy – Sad	0.84		
Involved – Uninvolved	0.49		
Open – Closed	0.73		
Proud – Ashamed	0.64	0.36	
Relaxed – Uptight	0.48		
Strong – Weak	0.63	0.47	
Skills in math today		0.75	
Successful in math class today		0.7	
Challenge of this math class			0.6
Importance of this math class to you			0.85
Importance of math class to others			0.7

Table 2
Correlations Between Items and Factors

	Factor 1: Affect	Factor 2: Efficacy
Challenge		-.25***
Importance to Self	.24***	.15*
Importance to Others	.16***	.30**

Throughout the paper, *** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .10$

Summary of Results

- Students' reports of experiences in math class loaded on three factors: Affect, Efficacy, Challenge/Importance.
- Some items loaded both on Affect and Efficacy, suggesting that perceptions of efficacy are affectively laden.
- Challenge loaded with task importance suggesting that students may place more value on tasks that are more challenging.
- "Importance to others" accounted for about 80% of total variance on Factor 3. Challenge may not be as strong an influence on students' motivation as task importance.

Motivational Role of Challenge:

- Contrary to predictions of flow theory, challenge was perceived as a threat to efficacy. This is similar to the results of Wigfield and Eccles (2001).
- Students likely exhibit greater success and more performance accomplishments from tasks that are less challenging.

How do these patterns differ by classroom?

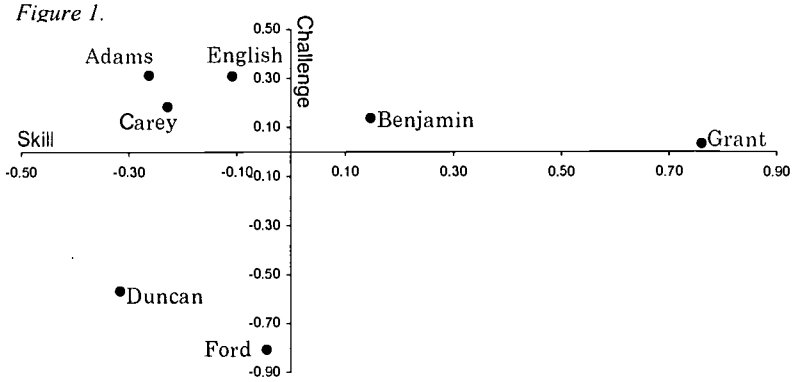
First, we categorized classes by their ratio of perceived challenges and skills (Figure 1). Reports were standardized and the item means for each classroom were graphed.

Notice that two classrooms fell within the flow quadrant (Benjamin and Grant), but Grant could easily be classified as boredom because reported skills far outweighed the challenges.

Two classrooms fell in the apathy quadrant (Duncan and Ford).

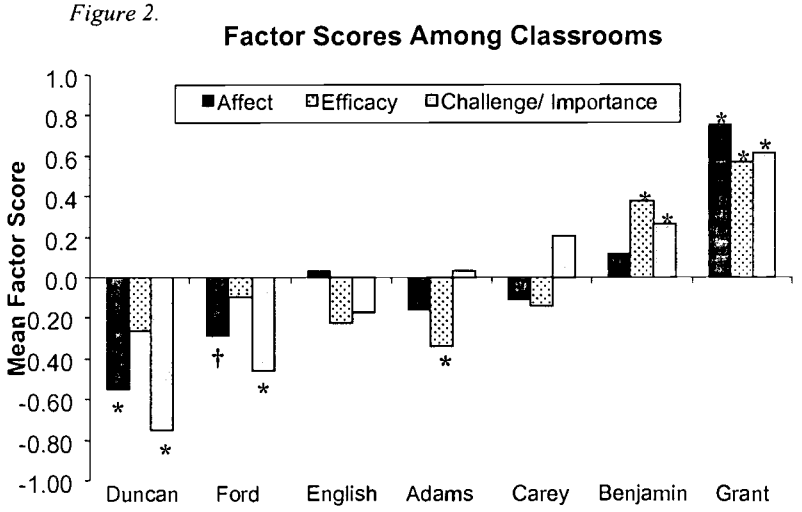
Three classrooms fell within the anxiety quadrant (Adams, English, and Carey).

Figure 1.



Then, we examined the pattern of student's reported motivation and affect in each classroom. Figure 2 represents mean factor scores for each classroom.

Figure 2.



Challenge	Low	Low	High	High	---	---	---
Important	Low	Low	Low	---	High	High	High
Impt. to Others	Low	Low	---	Low	---	High	High

Note: "High" means the standardized score was significantly above average, "Low" is below average ($p < .05$).

Summary of Results

- Affect and Efficacy were highest in classrooms classified in flow.
- Affect was lowest in classrooms classified in apathy.
- The lowest reports of Efficacy were in the class with the highest challenge, and skills that were lower than the challenge (Adams).
- Classes in the flow quadrant reported the highest levels of task importance. Those in apathy, reported the lowest levels of task importance.
- Contrary to predictions of flow theory, the most positive reports were from a classroom where reported challenge was slightly above average, but students felt their skills far outweighed the task challenges (Grant).

Conclusions

- Motivation and affect are experienced together.
- There is an interactive nature of affect, efficacy, and task importance. All three constructs seemed related to each other.
- Challenge is only indirectly related to affect.
- Efficacy is influenced by the challenge/skill ratio. If challenges are too high or too low, then Efficacy is also low. This argues for provision of moderate challenge in the classroom.

Two results contradicted Flow theory:

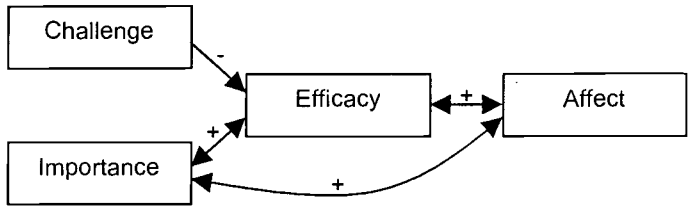
- Challenge was perceived as threat to student efficacy.
- The most positive experience was reported in a classroom in which skills far outweighed challenges.

Why?

- It might be related to development. The students in this sample were younger than the samples typically used by Csikszentmihalyi and his colleagues. They might not have experienced the opportunities that optimal challenges can offer. They might have a more negative conception of challenge than older students. In their experience, challenge may be related more to evaluation situations in the classroom than to the desire to improve in an area of interest.
- These were typical students, not talented teenagers working in their talent areas. Past research has shown that challenge is most desirable when one is working in an area of interest or talent (e.g., Csikszentmihalyi et al, 1993; Csikszentmihalyi, Larson & Prescott, 1977).
- Math class was a required activity. The meaning of "moderate difficulty" may vary based on whether one is engaged in a freely chosen or a required activity.
- When in a required academic course, students may feel most efficacious when they know they can easily accomplish the task, even with little effort, rather than when they must more fully utilize their skills to accomplish a challenging task. Further, higher efficacy is related to higher positive affect, so, the most positive experiences in these situations might not be the result of high challenge with accompanying high skills (moderate difficulty), but high skills and lower challenges.
- We are not suggesting that teachers provide only work that students can easily accomplish. Additional research (Schweinle, Turner, and Meyer, 2002) has shown that teachers can provide moderate challenge (that requires students to fully utilize and improve their skills) while supporting efficacy and positive affect.

Future Research

- This research suggests a possible model for student motivation, especially upper elementary students. Future research will seek to further support, build upon, and confirm this proposed model.



- Future research will further explore the relationship between motivation and affect and determine whether motivation and affect should be investigated separately, as complementary constructs, or whether they should be features of a single theory.

- Future research will investigate the role of teacher instruction in creating a motivational and affective climate and the relationship between this climate and student reports.

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Additional Results

Mean standardized scores and significance tests.

Teacher	Variable	Mean	Std Dev	t Value	
Benjamin	Clear	0.42	0.60	4.59	*
	Cooperate	0.31	0.65	3.10	*
	Important	0.38	0.70	3.57	*
	Important to others	0.38	0.75	3.27	*
	Involved	0.23	0.74	2.04	*
	Open	0.25	0.58	2.79	*
	Relaxed	0.51	0.47	7.15	*
	Strong	0.42	0.58	4.76	*
	Success	0.48	0.64	4.89	*
Grant	Alert	0.61	0.47	8.79	*
	Cheerful	0.80	0.56	9.54	*
	Clear	0.44	0.58	5.08	*
	Cooperative	0.67	0.31	14.54	*
	Excited	0.83	0.49	11.37	*
	Part of the group	0.75	0.41	12.23	*
	Happy	0.80	0.58	9.33	*
	Important	0.81	0.93	5.84	*
	Important to others	0.97	0.77	8.40	*
	Involved	0.75	0.33	15.30	*
	Open	0.68	0.36	12.47	*
	Proud	0.81	0.72	7.49	*
	Relaxed	0.55	0.65	5.69	*
	Skill	0.76	0.54	9.39	*
	Strong	0.61	0.73	5.55	*
	Success	0.68	0.40	11.34	*

Teacher	Variable	Mean	Std Dev	t Value	
Ford	Challenge	-0.81	0.87	-4.07	*
	Clear	-0.42	1.04	-1.78	†
	Cooperate	-0.31	0.74	-1.81	†
	Excited	-0.36	0.90	-1.8	†
	Happy	-0.33	0.74	-1.95	†
	Important	-0.40	0.75	-2.31	*
	Important to others	-0.57	0.70	-3.51	*
	Involved	-0.46	1.12	-1.85	†
	Proud	-0.42	0.92	-2.05	†

Teacher	Variable	Mean	Std Dev	t Value	
English	Alert	0.42	0.62	4.40	*
	Challenge	0.31	0.95	2.09	*
	Part of the group	0.24	0.78	1.96	†
	Important	-0.35	0.94	-2.39	*
	Open	0.31	0.67	3.00	*
	Success	-0.32	1.04	-2.01	†
Adams	Alert	-0.26	0.97	-1.71	†
	Challenge	0.31	0.69	2.84	*
	Clear	-0.35	0.94	-2.33	*
	Happy	-0.25	0.92	-1.72	†
	Important to others	-0.16	0.54	-1.85	†
	Skill	-0.26	0.79	-2.11	*
	Strong	-0.37	0.88	-2.64	*
	Success	-0.35	0.71	-3.08	*
Carey	Important	0.24	0.91	1.80	†
	Involved	0.22	0.69	2.14	*

Teacher	Variable	Mean	Std Dev	t Value	
Duncan	Alert	-0.44	1.18	-2.51	*
	Challenge	-0.57	0.91	-4.18	*
	Cheerful	-0.45	1.00	-3.01	*
	Clear	-0.37	1.19	-2.10	*
	Cooperative	-0.54	1.13	-3.20	*
	Excited	-0.32	1.10	-1.94	†
	Part of the group	-0.72	1.33	-3.67	*
	Happy	-0.50	0.97	-3.45	*
	Important	-0.84	0.94	-5.95	*
	Important to others	-0.82	1.00	-5.50	*
	Involved	-1.02	1.14	-6.08	*
	Open	-0.81	1.36	-4.03	*
	Proud	-0.25	0.99	-1.70	†
	Relaxed	-0.87	1.15	-5.07	*
	Skill	-0.32	1.02	-2.08	*
	Strong	-0.44	1.14	-2.60	*
	Success	-0.36	1.09	-2.18	*

Note: In the interest of space, only significant results are reported. * $p < .05$, † $p < .10$; because we are primarily interested in describing classrooms rather than in strict statistical significance, we used a significance level of .10.

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