A Case Study of Flow Theory in Pre-Service Undergraduate Agriculture, Food and Natural Resources Education Students

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Abstract

This case study sought to descriptively explore pre-service undergraduate Agriculture, Food and Natural Resources Education (AFNRE) students' feelings, interest, mood and flow during their daily lives as college students. The purpose of this study was to validate flow theory in pre-service AFNRE students. Experiences of five pre-service undergraduates were assessed with a series of online surveys administered at Michigan State University. Sampling techniques involved a modified signal-contingent Experience Sampling Method using six measurement intervals randomly selected each day. Data were analyzed at the individual interval level (n = 114). Positive relationships between flow experiences and respondents' satisfaction suggest that learning in the context of experiential activities was important to the overall perceived experience by students. There was support that pre-service undergraduate AFNRE students had a significantly higher percentage of flow experiences while participating in an FFA Career Development Event (CDE) activity. Perceived anxiety was a significant proportion of all channels measured (54%). This research implies that AFNRE undergraduates may have positive experiences during experiential activities working with secondary students in instances even when challenge and abilities are exceeded by activities that are taking place during the course of an undergraduates' Land-Grant University experience.

Introduction

It is important for Agriculture, Food and Natural Resources Education (AFNRE) faculty to understand how future teachers learn and what are the optimal conditions for these undergraduates to develop into successful AFNRE teachers. Accordingly, the National Research Council (2009) issued a call for post-secondary curricula and teaching to utilize dynamic approaches to learning for agricultural students. Further, these approaches should leverage experiences that provide students with "real-world" interpretation of ideas, concepts and skills that will in turn create learners who are successful in their future careers. One theory that has potential to help foster these dynamic approaches is the psychological concept of flow.

Flow Theory or "flow" is defined as "the holistic sensation that people feel when they act with total involvement" (Csikszentmihalyi, 1975, p.36). Csikszentmihalyi (1975) originally identified four components that comprise flow including: 1) control of the experience; 2) attention during the experience; 3) curiosity about the experience; and 4) an intrinsic interest to perform the experience. Occurrences of flow are also defined as optimal experiences. Shernoff et al. (2003) have further defined flow theory as a symbiotic relationship between challenges and skills to meet a particular task. For example, in the instance of college students (Asakawa, 2010; Asakawa, 2004; Rogatko, 2009) and high school students (Bassi and Delle Fave, 2004; Shernoff et al., 2003) as ways to understand perceived enjoyment, interest and concentration levels of individuals during specific activities. Asakawa's research aimed at determining if college students' flow experiences led to individuals that do things for their own sake or are intrinsically motivated in their tasks (2010).

Drawing on the theoretical and empirical literature, this case study attempts to explore undergraduate pre-service AFNRE students' feelings, interest, mood and flow in their daily lives as college students in an effort to better understand opportunities when students are involved and enjoying every day experiences and how this knowledge can be leveraged to improve classroom learning. Although the context for this exploratory research is with AFNRE students, previous research suggests that the application of flow theory can be applied to additional post-secondary settings (Asakawa, 2010; Asakawa, 2004; Rogatko, 2009). Therefore, we believe this exploratory study has implications for other

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agricultural and natural resources disciplines at the post-secondary level.

The purpose of this study was to examine feelings, interest, mood and flow in pre-service undergraduate AFNRE students. This research was guided by the following research objectives:

1. Develop a methodological approach to measure flow during pre-service undergraduate AFNRE student experiences;
2. Examine relationships between undergraduate activities and frequencies of four channels (flow, anxiety, apathy and boredom); and
3. Determine if relationships exist between flow, feeling, interest and mood are framed within the context of specific AFNRE student experiences.

Flow Theory

An important principle of learning is student motivation (Newcomb et al., 2003). Flow studies explore individual's intrinsic motivation to learn (Askawa, 2010; Decloe et al., 2009; Wöran and Arnberger, 2012) and engagement in learning (Shernoff et al., 2003) based on situational involvement as a key determinant of the construct. Based on flow theory, intrinsic motivation includes the composite scores of interest, enjoyment and the inverse of wishing you were doing something else (Csikszentmihalyi and Csikszentmihalyi, 1988), whereas engagement scores are calculated based on composite scores of concentration, interest and enjoyment (Shernoff et al., 2003). The "four-channel model of flow" is based on the following assumptions: (1) flow occurs when perceived challenge and skill are above an individual's personal average; (2) anxiety occurs when perceived challenge is greater than skill; (3) boredom occurs when perceived skills exceed challenge; and (4) apathy occurs when both perceived challenge and skill are below the personal average (Csikszentmihalyi, 1997; Csikszentmihalyi and Csikszentmihalyi, 1988) (Figure 1). Flow is commonly measured using the Experience Sampling Method (ESM), a method in which participants complete a survey instrument while involved in an activity. Respondents fill out questions related to interest level, mood and challenge while engaged in the activity. Researchers caution the use of paper-pencil surveys as participant issues may arise including attrition, motivation and reactivity of participants to recollect specific features of an activity may be potential challenges related to a successful ESM study (Scollon et al., 2003). Currently, application of flow theory to agriculture, food and natural resources education has received little attention.

Methods

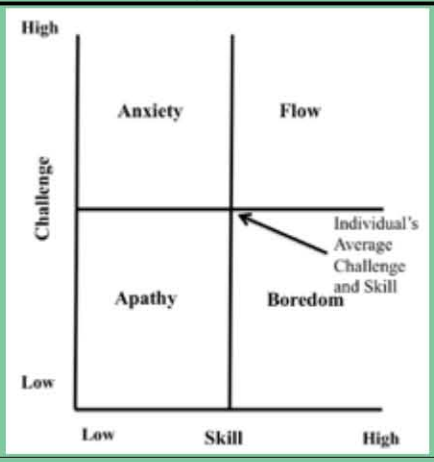
Data were collected at Michigan State University in the spring semester of 2012 in a program planning course required for all senior level pre-service AFNRE teachers. There were five pre-service AFNRE undergraduates that participated in the study. The research instrument for this study was a modified electronic version of the Experience Sampling Method (ESM) (Csikszentmihalyi and Larson, 1987; Hektner et al., 2007). Michigan State University Institutional Review Board deemed this study exempt.

This study used signal-contingent sampling (i.e., taking a survey at random times over the course of many days or weeks) and a modified ESM to capture individuals' representations of experiences as they occurred within the context of everyday life activities (Hektner et al., 2007). Participants met with the researcher prior to the study for an orientation on filling out the electronic version of the ESM. At the ESM orientation meeting, participants were e-mailed a sample Experience Sampling Form (ESF) and asked to fill out the survey to make sure that procedures were understood. Respondents utilized cellular phone technology, which signaled them six times daily for a weekly total of 30 signals to fill out the ESF. The ESF was designed to elicit information related to participants' daily location, activities and accompanying psychological states (e.g., feelings, interest, mood). Participants were e-mailed at random times between 8:00 AM to 8:00 PM daily from May 16 to May 20, 2012.

In order to obtain consistent and reliable ESM data, incomplete surveys were not included in the data set for analysis. For this study, five participants completed a total of 114 ESF's, which amounts to a response rate of 76% (6 signals a day for 5 days x 5 participants = 150 total potential responses). By comparison (Asakawa, 2004), the response rate of Japanese college students using the ESM was 73% over a similar study period. Thus, the response rate of the present study was deemed acceptable by the researchers.

Questions in the ESF measured quality of experience, which examined interest and challenge of the ESM activities using 5-point Likert scale questions from "Not at All" to "Very Much." Interest and challenge questions in the ESF measured concentration, enjoyment, activation, satisfaction, perceived control of the situ-

Figure 1.



The four-channel flow model applied to Experience Sampling Method (ESM). The origin for the optimal experience is the individual average of challenge and skills. Only when an individual is above that point does flow begin (Adapted from Csikszentmihalyi and Csikszentmihalyi, 1988; Massimini and Carli, 1988).

ation and perceived importance for the future. Mood of respondents was also measured with 5-point Likert scale items (e.g., weak-strong, sad-happy). Intrinsic motivation was calculated using the composite scores of interest, enjoyment and the inverse of wishing you were doing something else (Csikszentmihalyi and Csikszentmihalyi, 1988), whereas engagement scores were calculated based on composite scores of concentration, interest and enjoyment (Shernoff et al., 2003).

Data were analyzed using the SPSS 20.0 statistical software package. Descriptive data relating to the research objectives were analyzed to describe flow channels, feelings, interest and mood of respondents. This research used non-parametric analytical procedures due to the small number of respondents (n = 5). For the purposes of assessing four-channel flow model data, student flow survey responses were converted to Z-scores to control for individual response bias. Challenge-skill survey questions were used to determine channels (i.e., flow, anxiety, boredom and apathy) within the four-channel model (Csikszentmihalyi and Csikszentmihalyi, 1988; Massimini and Carli, 1988). Determining flow and non-flow in the original model required a literal match of challenge-skill data. Conversely, the four-channel model of flow was used to measure the balance of Z-scores for challenge-skills in each of the four channels (e.g., flow, anxiety, boredom and apathy).

The four-channels of anxiety, apathy, boredom and flow were coded into interval variables that measure the level of challenge and skill, as well as associated indicators of interest and mood. Using individual challenge and skill ratings for each of the activities measured (i.e., At Class, At Home, On Campus, Traveling, FFA Activity, Other): (1) boredom was observed when an individuals perceived skill exceeded challenge; (2) anxiety was observed when perceived challenge exceeded skill; (3) apathy was observed when both measures were below the individuals average; and (4) flow was observed when both challenge and skill were above the groups average over the entire experience. In this study, flow was measured by the quotient of challenge to skill levels perceived by respondents in the electronic ESF Survey (Figure 1). Average challenge and skill levels among respondents were calculated as the intersection of the four constructs in determining whether flow was occurring or not and at what level (Figure 1).

Results and Discussion

Of the activities measured during this study, the percentages of time spent during activities indicated by respondents included: 1) at home (33.3%); other activities not represented (32.5%); in class (17.5%); involved in a FFA activity (8.8%); traveling (4.4%); and on campus (3.5%) (Table 1).

There were 17 occurrences of boredom, 17 occurrences of flow, 19 occurrences of apathy and 61 occurrences of anxiety with the five respondents in the study during the week recorded (Table 1). When signaled 80% percent of respondents indicated that they were in the anxiety channel during various classroom settings. However, when signaled while participating in an FFA activity 50% of respondents indicated being in the state of flow.

Ratings of interest, feeling and mood constructs indicated that respondents perceived control, personal expectations, concentration on the activity, happiness and relaxation higher than other characteristics measured (Table 2). Participants in the study rated "Paradox of Control" (M = 3.6, SD = 1.1), "Own Expectations" (M = 3.6, SD = 0.9) and "Concentration on Task at Hand" (M = 3.5, SD = 1.0) higher than any other ESM interest and feeling constructs (Table 2). Therefore, respondents reported moderate levels of feeling as though they were in control, having high expectations for themselves and concentrating on the activity when measured.

Reported correlations in Table 3 are constructs of flow. Noted results include strong positive Pearson correlation ($r > 0.80$) relationships between Interest in the Activity and Intrinsic Motivation ($r = 0.81$, $p < 0.01$); Intrinsic Motivation and Enjoyment of the Activity ($r = 0.91$, $p < 0.01$); Interest in the Activity and Engagement

Table 1. Frequency of flow theory channels of undergraduate pre-service educator during a one-week Experience Sampling Method (ESM) experience from May 16 to May 20, 2012 (n = 114 responses).

Measurement Stage	Flow	Anxiety	Boredom	Apathy
In Class	1 (5.0%)	16 (80.0%)	3 (15.0%)	0 (0.0%)
At Home	2 (5.3%)	22 (57.9%)	4 (10.5%)	10 (26.3%)
On Campus	0 (0.0%)	1 (25.0%)	2 (50.0%)	1 (25.0%)
Traveling	1 (20.0%)	1 (20.0%)	0 (0.0%)	3 (60.0%)
Involved in an FFA Activity	5 (50.0%)	2 (20.0%)	1 (10.0%)	2 (20.0%)
Other (not specified)	8 (21.6%)	19 (51.4%)	7 (18.9%)	3 (8.1%)
Total Frequency	17	61	17	19

Note: Data is from *Crafting Teaching Practices* a 400-level course with five students taught in the 2012 fall semester at Michigan State University.

Table 2. Undergraduate pre-service Agriculture, Food, and Natural Resources (AFNR) educator descriptive statistics during a one-week ESM experience from May 16 to May 20, 2012 (n = 114 responses).

	Mean	S.D.
Interst and Feeling Constructs		
Self-Improvement	3.3	1.1
Intrinsic Motivation	3.2	1.0
Engagement	3..4	0.8
Merging of Action and Awareness	3.3	1.1
Concentration on Task at Hand	3.5	1.0
Peer and Family Expectations	3.1	1.0
Own Expectations	3.6	0.9
Paradox of Control	3.6	0.9
Mood Constructs		
Happy	3.4	1.0
Relaxed	3.4	0.9
Sociable	3.4	1.0
Excited	3.3	0.9

Note: Data is from *Crafting Teaching Practices* a 400-level course with five students taught in the 2012 fall semester at Michigan State University. Respondents were asked to rate (1 – Not at All to 5 – Very Much) their experiences of interest, feeling, and mood constructs as relationships to flow.

Table 3. Undergraduate pre-service Agriculture, Food, and Natural Resources (AFNR) educator Pearson correlations between flow, feeling, and interest constructs during a one-week Experience Sampling Method (ESM) experience from May 16 to May 20, 2012 (n = 114 responses).

Variables	1	2	3	4	5	6	7	8
Flow Channel	-							
Interest in the Activity	.07	-						
Control of the Situation	.26**	.65**	-					
Concentration on the Task	-.10	.31**	.24**	-				
Learning or Getting Better	-.27**	.47**	.34**	.50**	-			
Continuing the Activity in the Future	.15	.54**	.65**	.21*	.33**	-		
Intrinsic Motivation	.26**	.81**	.68**	.16	.17	.57**	-	
Engagement	.13	.90**	.73**	.57**	.48**	.60**	.83**	_
Enjoyment of the Activity	.31**	.74**	.76**	.10	.19*	.60**	.91**	.83**

*$p < .05$. **$p < .01$. Note: Data is from *Crafting Teaching Practices* a 400-level course with five students taught in the 2012 fall semester at Michigan State University.

($r = 0.90$, $p < 0.01$); Intrinsic Motivation and Engagement ($r = 0.83$, $p < 0.01$); and Engagement and Enjoyment of the Activity ($r = 0.83$, $p < 0.01$) (Table 3). These results indicate that subjects, who participated in activities just for the sake of doing them, were also likely to have strong interest, enjoyment and be engaged in those same activities. Additionally, respondents who were highly engaged in an activity were also likely to be very interested and enjoy the activity.

Summary

It is important to not only understand that how students learn is also dependent on their feelings, interest and mood that they bring into a learning environment. Results indicated that there is predictive value to those subjects and their feelings, interests and mood over the course of a one-week measurement period. Findings of this study illustrate utility in our methodological approach for measuring and understanding pre-service undergraduate AFNRE students and constructs of flow during daily activities and specific events associated with their chosen professional career goals. Further, results indicated that respondents who were participating in an FFA-related activity were more likely to be in flow than any of the other channels. This research supports the results of Downey (2012) that experiential learning provides positive learning outcomes for students. Interestingly, there was a high incidence of perceived anxiety by undergraduate respondents during the week that data was collected. Fifty-four percent of responses indicated that subjects were in the anxiety channel when in class, at home, on campus, traveling, or involved in another activity. This result supports the notion that being an undergraduate student is an anxiety-filled time in one's life and that providing learner-centered activities during instruction may provide relief from those anxious moments.

Second, application of flow theory and methods to pre-service undergraduate teacher education provides noteworthy insights about student interest in AFNRE curricula, as flow theory is clearly applicable to undergraduate education (Asakawa, 2010; Asakawa, 2004, Rogatko, 2009). In post-secondary AFNRE instruction, FFA is considered to be one of three integral features of programmatic learning along with classroom and laboratory instruction and Supervised Agricultural Experience (SAE) (Phipps et al., 2008). The researchers suggest the possibility of applying measurement tools herein to the remaining two components of a program not measured in this study. This may include flow measurements during various forms of classroom and laboratory learning including: lecture, discussion and hands-on application. Additionally, measurement should occur during SAE visits where pre-service undergraduate students would act in an advisory capacity to secondary students and their individualized projects. Research suggests that promoting a wide range of experiential activities in post-secondary instruction would encourage student engagement in various learning activities such as FFA and SAE and become more involved in those experiences (Phipps et al., 2008). Use of social-psychological indicators has been cited as a potential opportunity to better understand educational experiences of undergraduates (Asakawa, 2010; Asakawa, 2004) and as a result, leading to enhanced student learning.

Methods proved in this study are applicable to the case of pre-service undergraduate AFNRE students in the context of a one-week measurement period and provide an opportunity for investigation through further research studies. Although measuring flow constructs in undergraduate experiences is limited, research suggests that concepts related to flow were likely to occur during learning activities (Asakawa, 2010; Asakawa, 2004; Bassi and Delle Fave, 2004; Rogatko, 2009). We recommend implementation of this methodological approach within other agriculture and natural resources courses in an effort to better understand experiential learning and constructs of flow that may provide insight into learning by undergraduate students in the CANR.

In practice, this study suggests that post-secondary AFNRE faculty should consider employment of experiential activities as part of classroom instruction as a way to stimulate learning among pre-service undergraduate AFNRE students. Providing AFNRE undergraduates with learner-centered experiences where students are working with secondary AFNRE students in the form of FFA activities provided flow channel experiences, whereas traditional classroom experiences were non-flow channel experiences (e.g., apathy, anxiety, or boredom). Therefore, it may be beneficial for faculty to include significant experiential activities as a function of classroom learning (e.g., SAE visits, leadership activities, judging experiences, field experiences).

Procedures and methods in this study may be adapted to other disciplines, however caution should be used. This was an exploratory study with sample size ($n = 5$) as a major limitation to this study that precluded particular statistical procedures to compare

relationships between background and demographics and ESM data (Hektner et al., 2007). However, despite this limitation, the results of this study confirm other flow theory validation studies conducted with undergraduate populations and merit further implementation and study.

Methodological approaches of this study proved a successful way to measure respondent feelings, interest, mood, challenge, skill and flow during one week at a Land-Grant University. This research provides a framework for application in other agriculture and natural resource undergraduate programs.

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