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Emotional Experiences of Students in the Classroom

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ABSTRACT

In this article, we report on a multimethod qualitative study designed to explore the emotional experiences of students in the classroom setting. The purpose of the study was threefold: (1) to explore the correspondence among nonverbal expressions, subjective feelings, and physiological reactivity of students' emotions in the classroom; (2) to examine the relationship between students' emotions and their competence and value appraisals; and (3) to determine whether task difficulty matters in emotional experiences. We used multiple methods to acquire data on emotional experiences of six grade 7 students. Concurrent correspondence analyses of the emotional indices revealed that coherence between emotional response systems, although apparent, is not conclusive. The relationship between appraisals and emotions was evident, but the effect of task difficulty appears to be minimal.

Keywords: Emotional Experiences, Multimethod, Emotion Recognition, Face Detection

I. INTRODUCTION

Recently, research on emotions in education has received a great deal of attention among educational psychologists This upsurge of interest has been attributed to the recognition of emotions as important psychological constructs that foster learning and achievement . Despite a flourishing number of studies on emotion in education, there is a paucity of research on emotional components in the classroom. Emotion is a hypothetical construct composed of a number of distinct components that generally include, but are not limited to, subjective feelings (e.g., I am angry), expressive actions (e.g., brows lowered and drawn together during anger), and physiological reactions (e.g., increased heart rate when angry) (Scherer, 1996). These components act in concert to unveil the emotional experience. Thus, understanding emotional experience necessitates knowledge of the underlying emotional components as well as how they function mutually. This implies that researchers should study the distinct components as well as their coherence.

A closely related issue to the manifestations of emotions is their probable antecedents. Emotion literature highlights the viability of cognitive evaluations (appraisals) in eliciting emotions. Appraisals determine and differentiate emotional experiences (Roseman & Smith, 2001). Although there is some evidence on the associations between domain-specific appraisals (of competence and value) and domain-specific emotions in educational settings empirical work on the relations between task-specific appraisals and emotional states in the classroom is less forthcoming emotions in a temporal fashion. We sought to examine these issues in the classroom setting, using a qualitative approach.

Measurement of Emotions

One central assumption in emotion measurement is that emotions are hypothetical constructs that can be

inferred from several indicators. Such inference is typically based on, at least, subjective experience, physiological changes, and NVE accompanying the experience. Thus, understanding the psychological construct of emotion requires assessing various emotional response systems simultaneously. This is because coordinated changes across experiential, behavioral, and physiological response systems are central features of emotions. Such a multicomponential approach requires multiple assessment techniques: self-reports of subjective experience, nonverbal measures, and autonomic measures. In self-reports, the participant rates his or her phenomenal awareness of the emotions that only he or she has access to. In nonverbal measures, the researcher uses the subjects' nonverbal displays to infer a particular emotion (see Ekman & Friesen, 1975). Finally, in autonomic measures the researcher focuses on assessing changes in the autonomic nervous system during an emotional episode. To assess emotional response system coherence, data from such channels should be collected in synchrony (see Larsen & Fredrickson, 1999).

Almost all empirical tests of emotion response system coherence come from laboratory-based studies. For instance, Ekman, Friesen, and Ancoli (1980) reported correlations between facial expressions and subjective experience of specific emotions. Other studies have reported correspondence between expressive behavior and physiology were only modestly associated with subjective experience and nonverbal behavior. Although these studies and many more have evaluated emotion response coherence in laboratory settings, to the best of our knowledge, no such study has been conducted in the classroom setting.

Emotions and Appraisals in Context

Another important concern in exploring emotional experiences pertains to the determinants of emotions. The emotion literature is replete with suggestions that range from biological drives to cognitive appraisals. Nevertheless, most contemporary psychologists agree that the evaluation of an event in relation to an individual's goals and purposes are antecedents of almost all discrete emotions. In particular, appraisal theories argue that emotions result from the cognitive evaluation of events significant to the individual. Central to these theories is the importance of event judgment in context as vital for eliciting emotions. a series of math word problems in which the authors manipulated the difficulty level. As predicted, participants' objective ability in mathematics and their perceived competence in mathematics had strong effects on appraisals of challenge and the ensuing emotions.

The Present Study

The purpose of this study was threefold. The first purpose was to explore the correspondence among subjective feelings, NVE of emotions, and associated physiological reactions (HRC) in the classroom setting. We assessed emotions in the mathematics classroom simultaneously across multiple response modalities. To add the temporal dimension to reports of subjective experience, we used video stimulated recall interview. We asked the participants about their emotions while they were watching video recordings of their earlier activities. Due to the limited evidence on the coherence of various indices of emotion and on some indices of emotions themselves, we focused on a select number of emotions for which there is evidence of NVE (i.e., anger, anxiety, boredom, enjoyment, pride, and shame). As previous laboratory studies have demonstrated cohesion of emotional response systems we expected concurrent emotional response domain changes.

The second purpose of the study was to examine the relationship between students' emotions and their competence and value appraisals. Although there are several possible explications of presumed cognitive antecedents of emotions in the literature we focused on two expectancy-value constructs to delineate our scope (i.e., competence and task value – hereafter referred to as appraisals). Several models in the academic setting (e.g., Adaptable Learning Model, Boekaerts, 1992, and Control-Value Theory of Achievement Emotions, posit competence and value appraisals as important antecedents of emotional experiences. To evaluate how these competence and value appraisals relate to emotions, we focused on emotions that students dominantly experienced. In

search of parsimony, we focused on the six discrete emotions.

The third purpose was to determine whether patterns of emotional experiences in the classroom depend on task difficulty and participants' ability. Based on previous literature, we varied the difficulty of tasks and selected students based on their prior achievement as a proxy for individual differences.

II. Method

Participants and Setting

We used a multiple case study design (Yin, 1994) as this technique allows detailed analysis of a limited number of cases. In order to examine the variability of emotional experiences by individual ability level, we selected six junior secondary school students of different achievement levels. Two of the participants were low achievers (Andrew and Daniel), two medium (Anke and Dirk), and two high (Klara and Marja), based on teacher's judgment. The students were selected from three separate classes. The sample was split equally by gender and the participants were between 12 and 13 years.

Teachers of the classrooms to which the six participants belonged prepared easy, moderate, and difficult tasks based on their textbook. The tasks involved tabulation, angle measurement, and the application of the Cartesian coordinate system. In the tabulation task, the students had to complete several frequency tables. In the angle measurement task, they had to measure angles of various sizes using a protractor. In the coordinate system task, they had to indicate several prehistoric fortresses on an archeological excavation map, given ordered pairs of numbers.

Nonverbal Coding Scheme

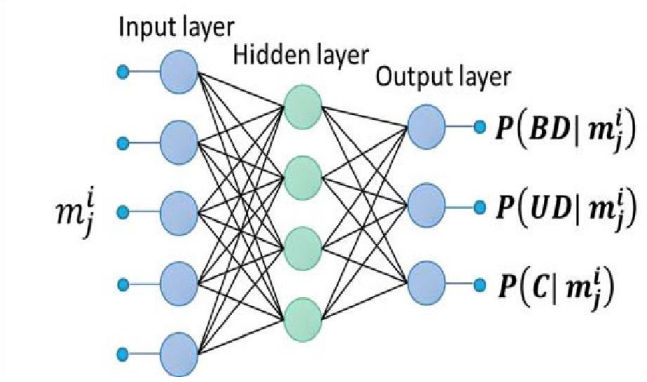
Participants' NVE of emotions (anger, anxiety, boredom, enjoyment, pride, and shame) were coded based on works of several researchers in the emotion literature. Anger, anxiety, and enjoyment were coded using Ekman and Friesen's (1975) guide to facial expressions and using photographs of emotion prototypes. Recent representative pictures by Ekman (2003) were also used. Boredom was coded by examining its features in the extant literature (e.g., Sundberg, 1994). Pride and shame were coded using Tracy and Robins' (2004) coding scheme.

Each emotion was coded based on defining NVE on a dichotomous scale (no display vs. clear display). Thus for all emotions, specific NVE were used instead of action units (i.e., how musculature action is related to facial displays). For instance, the expression of anger may involve lips pressed against lip, eyes staring in hard fashion, eye bulging in appearance, wrinkling in the chin, brows lowered and drawn together, vertical wrinkles between brows, and an open or unopened mouth. Similarly, pride was coded using head tilted back/up, smile, one or both arms from the body, one or both hands in fists, hands on hips, punching motion chest expanded, and torso pushed out or leaning back. Expression of these emotions need not involve all of these features. Pride can be recognized reliably from head tilted back/up, smile, and one or both arms from the body (Tracy & Robins, 2004). Eisenberg and colleagues have used this procedure in several of their studies on discrete emotions. Using the coding scheme, each participants' emotion for each problem-solving session was coded separately. The principal investigator and an assistant did the coding. Each coding procedure included the identification of features of NVE displayed, plus judgment of this expression as indicating the discrete emotion under consideration within every 30 s interval of each video segmentReliability estimates for each coding task were as follows: (a) 0.92 for anger, (b) 0.87 for anxiety, (c) 0.88 for boredom, (d) 0.87 for enjoyment, (e) 0.86 for pride, and (f) 0.78 for shame.

Mood Detection

Using MS, we could predict the probabilities of different moods (i.e. BD, Control and UD) based on the change of facial expression in the video segment. For detecting the mood of one subject, an ANN-based method is employed. The probability vector corresponding to video segment is estimated by each ANN as feature representation. Next, we multiplied those probability vectors over twelve AUs for determine the mood of the subject.

The structure of the ANN model contains three one-vs-all (i.e. BD vs not BD, Control vs not Control and UD vs not UD) ANNs. So three mood probabilities of the video segment are predicted and form a probability vector.



Procedure of Data Collection

After we received parental consent, we videotaped the participants in their classrooms while they were solving actual mathematical problems in their regular lesson. This was to acquaint the learners with the presence of video camera, use of HR monitors, and presence strangers in the classroom. Previous studies have recommended the use of trial sessions to rule out the possibility of the effect of video camera and other equipment on participants' reactions.

On our second visit, we started the actual "experiment". First, the participants put on the heart rate monitors before the class began. Then the teacher informed the class that they would work on various problems of varying difficulty for the next 2–3 weeks. Then the teacher along with us distributed the "easy" math problems to the whole class. Subsequently, the teacher asked students to skim over the tasks and as soon as they completed that, we administered the Appraisal Questionnaire. After this, the students were requested to work on the problems. Following the onset of the problem-solving session the video cameras were directed to the participants and filming started. After the day's lesson was ended, the stimulated recall interview was conducted with the videotaped participants in a nearby room. In the other two lessons in which medium and difficult tasks were provided, the same procedure was repeated.

III. Results

To evaluate correspondence between the emotional response systems, we utilized concurrent cross-method analysis whereby the three data sources were examined simultaneously using the 5-min video segments as a reference frame. The interview responses were judged as lying at the beginning, middle, or end of the segment. To ensure a fairly realistic test of emotion response system coherence, the frequency of NVE of specific emotions in all the 5-min video segments was divided by the frequency of the participants' stimulated recall interview responses for that particular emotion. Similarly, a heart rate change during all specific moments in which an emotion was expressed nonverbally was divided by the frequency of the NVE. Intuitively, an exact correspondence is apparent only if the ratios are equal to one. For instance, the participants mentioned experiencing anger 42 times, whereas, they expressed anger nonverbally 21 times. Using the 21 NVE as a frame of reference, the students' heart rates changed significantly in 16 of the 21 data points. Thus, the data were analyzed using a 5-min video segment for the interview, a 30 s nonverbal coding, and a 5 s heart rate recording for each of the individual cases. This simultaneous analysis of various data sources helped us to capture a relatively real time picture of students' emotional experiences. It should be noted that we used idiographic case-based analysis, so that within-individual variations in response systems could be evaluated.

To analyze appraisal-emotion relationships, we utilized students' responses to the stimulated recall interview only. This is mainly because we wanted to focus more on the participants' subjective reports to make self-reported appraisals comparable. We suspected that tasks of varying difficulty might implicate different appraisal patterns for different individuals. Hence, we used the frequency count of the six discrete emotions the participants reported under the three task difficulty conditions and examined their competence and value appraisals in each task. We opted to use the most frequent emotion the participants reported to have experienced in each task, to examine the most common emotions of individual students under each task condition. The assumption

that guided this analysis was that the students' appraisals at the beginning of the task elicit emotions experienced during the task completion and that the most dominant emotion is the one that is most likely affected by the appraisals. Due to the voluminous data, we present the results briefly using a question-and-answer format proposed by Yin (1994).

Do Emotional Response Systems Correspond?

Analysis of correspondence between the NVE, the HRC, and the participants' own interview responses on experiencing the emotions showed that emotional response coherence is not conclusive. Table 1 presents a summary of the correspondence evaluation. Only 50% of the students' reported anger was expressed nonverbally and 76% of the expressed anger showed corresponding HRC. For anxiety and boredom, the figure was relatively lower. About 40% of both emotions reported were associated with accompanying NVE, and 73% and 66% of expressed anxiety and boredom, respectively, had corresponding HRC. Although students reported enjoyment as the third most frequent discrete emotion, only 29% of the reported

Table 1. Frequency of interview responses (IR), nonverbal expressions (NVE), and corresponding heart rate changes (HRC)

				Frequency ratio	
Emotion	IR	NVE	HRC	NVE/IR	HRC/NVE
Anger	42	21	16	0.50	0.76
Anxiety	67	26	19	0.38	0.73
Boredom	15	6	4	0.40	0.66
Enjoyment	31	9	6	0.29	0.66
Pride	21	4	4	0.19	1.0
Shame	7	2	2	0.28	1.0

IV. Discussion

The first objective of this study was to explore correspondence between emotional response systems for the selected emotions (anger, anxiety, boredom, enjoyment, pride, and shame). The results revealed that the NVE of anger, anxiety, and enjoyment were found to be somewhat coherent with HRC and with students' own retrospective confirmation of experiencing the emotions concurrently. When such coherences are evident, they bear some consistency with previous laboratory-based studies (e.g., Ekman et al., 1980; Ekman et al., 1983). For instance, Ekman et al. (1980) found moderate to high correlations between aggregated facial expressions and self-reports of emotions of anger, sadness, and happiness.

Nonverbal expressions of boredom, pride, and shame seldom corresponded concurrently with the students' interview responses. In particular, the instances in which the students expressed pride and shame were few, but the few NVE corresponded well with HRC. The students' lack of expression of the emotions of pride and shame could be explained in a number of ways. The experience and expressions of these emotions require three important cognitive skills: individuals must know standards and rules, have a sense of self, and be able to evaluate the self in terms of those standards (Lewis, 2000; Tracy & Robins, 2004). It is very unlikely to assume that the participants have not developed a sense of self. However, it is highly probable that the students may not have established standards in this particular study. Pride and shame result from success or failure in meeting self-set standards. The participants in this study may not definitely know whether that standard was met or not when asked to report on the emotions and therefore the expression and experience of the emotions could be less likely. Yet another explanation is that reporting one's own emotions could be embarrassing, particularly in contexts like this one. Overall, the results of the present analysis provide tentative support to the emotional response coherence implied in most theories of emotion. Nevertheless, even in laboratory settings, only a limited number of studies have been able to demonstrate converging evidence on experience of emotions (see Levenson, 2003; Mauss et al., 2005). Moreover, there is no definitive result in the literature regarding emotionspecific autonomic patterning (see Cacioppo et al., 2000 for a review).

The second objective of this study was to investigate how the participants' "online" appraisals would be related to their emotional experiences. The results suggest that simple linear functions are not apt to explain the relations. Appraisals of competence and value seem to function in an interactive manner. This provides some support for the control-value theory of academic emotions (Pekrun, 2006) that proposes a

multiplicative effect of expectancy and value variables in instigating emotions. A closer examination of the dominant emotions each student experienced and their corresponding appraisals suggests that low perceived competence and low perceived value of the task may instigate anger and/or anxiety, whereas low value and high competence appraisals may lead to boredom. On the other hand, high competence and high value appraisals may instigate enjoyment. High perceived competence implies the belief that the individual can control the activity at hand and the high value implies the In spite of these limitations, the findings of the current study have important implications for classroom teaching and learning processes. The findings show that there is some correspondence between emotional response systems in the classroom context. According to several emotion theorists (e.g., Scherer, 1996), synchronization of the emotional response systems mobilizes an organism's resources to face a significant challenge. Hence, a coordinated emotional response system may help students to either approach or avoid classroom tasks. Moreover, students' NVE allow teachers to infer students' subjective experiences and action tendencies. These subsequently determine the interaction between the teacher and the students. Therefore, teachers must be alert to their students' NVE, which may tell them about the students' feelings. Our findings also suggest that attending to students' competence and value appraisals in the classroom may aid in enhancing the experience of adaptive emotions. The combination of higher competence and value appraisals is generally associated with enjoyment. Teachers may provide learners with a variety of activities that are within the range of the students' ability. Such activities are likely to enhance students' perception of competence as well as their perception of the value of math, which subsequently influence their emotions and their performance.

V. Conclusion

In conclusion, the multimethod approach suggests that converging evidence from multiple methods may improve researchers' understanding of the elusive construct of emotion. Thus, there is a need to move from single method to multimethods and from retrospective self-reports to online assessments.

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