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“I Was Proud of Myself That I Didn’t Give Up and I Did It”: Experiences of Pride and Triumph in Learning Science

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Abstract

The role that specific emotions, such as pride and triumph, play during instruction in science education is an under-researched field of study. Emotions are recognized as central to learning yet little is known about the way in which they are produced in naturalistic settings, how emotions relate to classroom learning during interactions, and what antecedent factors are associated with emotional experiences during instruction. Data sources for the study include emotion diaries, student written artifacts, video recordings of class interactions, and interviews. Emotions produced in the moment during classroom interactions are analyzed from video data and audio data through a novel theoretical framework related to the sociology of human emotions. These direct observations are compared with students’ recollected emotional experiences reported through emotion diaries and interviews. The study establishes links between pride and triumph within classroom interactions and instructional tasks during learning episodes in a naturalistic setting. We discuss particular classroom activities that are associated with justified feelings of pride and triumph. More specifically, classroom events associated with these emotions were related to understanding science concepts, social interactions, and achieving success on challenging tasks.

Keywords: sociology of emotion, emotion and learning, pride, triumph, emotional change, learning science, emotion diary

Learning was once constructed as a disembodied and cold cognitive process (Brown, Bransford, Ferrera, & Campione, 1982) leading some scholars to critique this emphasis and its exclusion of the role of emotion in learning science (Alsop & Watts, 2003). Consequently, researchers began focusing on emotion in science classrooms (e.g., Zembylas, 2004) and, more recently, studying the connections between emotions and science learning outcomes (Heddy & Sinatra, 2013). In their controlled experimental study of undergraduate psychology students, Heddy and Sinatra (2013) reported increases in the emotional *enjoyment* that complemented positive learning outcomes related to an instructional treatment on the topic of evolution. Psychological frameworks on emotion and high-inference survey instruments were used to measure emotions and learning outcomes in their study. The authors suggested that future studies should include video methods echoing the recent call from Pekrun and Linnenbrink-Garcia (2014) for more studies to adopt exploratory, idiographic, and qualitative approaches to investigating emotions during instruction.

Whereas recent micro-sociological studies in science education have begun to reveal the role of emotions in influencing teachers’ practice (e.g., Ritchie et al., 2013) and how students respond to teacher emotional expressions during middle school science lessons (Tobin, et al., 2013), this field of inquiry generally remains underrepresented in the science education research field (Fortus, 2014). This is an important line of inquiry because theoretically emotions are both an outcome and an ingredient of human interaction and cognition that drive future actions (Collins, 2004; Turner, 2007) such as students’ choices in adopting science symbols and terminology or identifying themselves as members of science-classroom communities (Milne & Otieno, 2007; Olitsky, 2007).

We attend to the need for understanding the role emotions play in learning science in our study of an eighth-grade class. By drawing on sociological frameworks of emotion and combining student self-reported emotions with direct observations of emotional body movements during classroom interactions, we relate emotional experiences with student learning and understanding of energy concepts. We also report the interactions and range of emotions that preceded feelings of pride and triumph. The less inferential methods of investigating emotion used in this study extend previous research by Milne & Otieno (2007) and Olitsky (2007), who focused on more general states of emotional arousal called emotional energy by investigating how specific emotions (e.g., pride, triumph, irritation) impact learning science. After articulating the theoretical framework for the study in the next section, we then review educational research focused on pride.

Sociological Tools for Exploring Emotions During Classroom Interactions

Our study is informed by theoretical perspectives from the sociology of emotions (Turner, 2007). Within this framework, emotions are multidimensional phenomena that include a combination of physiological changes, emotion labels (e.g., anger, happiness), expressive body movements, and appraisals of situational contexts and cues (Thoits, 1989). This theory acknowledges the evolutionary origins of four¹ primary emotions that are represented by the following emotional labels: *aversion-fear*, *assertion-anger*, *disappointment-sadness*, and *satisfaction-happiness*. Such emotion labels are cultural phenomena. Along with other elements of human conduct (e.g., gestures, vocalizations, and physiological and cognitive processes), emotion labels represent different types of emotional experiences. Emotions are also considered to be embedded in every level of culture and society including the macro- (e.g., educational system), meso- (e.g., classroom), and micro- (e.g., individual interaction) levels. The focus of this study is at the interface of meso-level (classroom) and micro-levels (individual/small group) because emotions such as pride are transitive feelings (Davidson, 2012) produced in the moment during classroom interactions. Emotional displays by individuals can affect other students and even the class as a whole. Reciprocally, the class can impact the feelings experienced by an individual.

Pride and Triumph- Sociological Perspectives

According to Turner's classification of emotions, pride and triumph are first-order elaborations resulting from the combination of primary emotions. Pride results from the combination between satisfaction-happiness and aversion-fear, whereas triumph emerges from a mixture of satisfaction-happiness with assertion-anger. Within sociological frameworks (e.g., Cooley, 1992; Scheff, 1990), pride and shame (or embarrassment [Retzinger, 1991]) are two related emotions associated with self-approval: "the person who feels [pride] is assured that he stands well with others whose opinion he cares for" (Cooley 1992, p. 232). To feel pride, the individual must see himself or herself in the mirror or "looking glass" (p. 184) provided by the gestures and expressions of others. Within this context, pride is the emotion experienced by an individual who feels energized by the group whereas shame is the emotion experienced when the individual feels depleted by the group (Collins, 2004).

Social norms within any group provide individuals with information about appropriate or inappropriate displays of their feelings. Classrooms are relevant social reference groups for students, which have internal group structure (e.g., social status hierarchies) and particular norms and values (Holodynski & Kronast, 2009). Students who are exposed to experiences of exclusion or belongingness also experience feelings of shame or

¹ Turner (2007) reviewed a wide-range of emotion classification systems from different disciplinary fields. His four primary emotion labels represent categories for which there is consensus among most scholars. Other classification schemes, such as Ekman's (2007), add two or more other emotions to this list as primary emotions (e.g., surprise and disgust).

pride depending on the extent to which their actions reflect the norms and values of the group. Students may need to develop competence in regulating their emotional expressions to counter potential conflict between the peer group norm and the teacher's norms. For example, students may show disdain for peers who display pride publicly because classmates may read this display as a move by the proud student to a superior social status within the class.

Triumph has not been extensively featured in sociological work on emotions. Before this research, Matsumoto and Hwang (2012) were the only researchers to have explored triumph in any systematic way, albeit in the context of Judo matches rather than learning science in classrooms. They posited that triumph may be an emotion associated with victory during agonistic encounters that signals the status of the victor socially by augmenting the result of their achievement, intimidating others, enhancing the individual's feelings of power, preparing for future confrontations, and asserting dominance over others beyond the context of the initial contest. Due to the limited research on this emotion, it is not possible to suggest which of these aspects of triumph are relevant or applicable to naturalistic classroom situations.

Explaining the Elicitation of Emotions During Interactions

Seventeen principles are used to explain the kinds of social situations that lead to emotional experiences of different intensities and different types in Turner's (2007) theory. For example, the first principle states that an individual will feel low-intensity positive emotions when expectations of *self*, *other*, or *situation* are met. If the individual had some fear initially of these expectations being met, then they will experience more intense variants and elaborations of positive emotions.

Academic contexts involve social interactions that elicit emotional responses from students and teachers. Turner's theory is useful for investigating emotions produced in school settings because it draws on interaction ritual theory (Collins, 2004) to explain the production of emotions during interpersonal encounters. In this context, *rituals* are forms of encounters in which the attention of the group has a single point of focus which can include an object, a symbol, or an idea. Perspectives on interaction rituals (IR) contribute explanations about the production of emotions, including pride, during moment-by-moment transactions in the classroom. An IR is successful when individuals share experiences of the same transient emotions (e.g., pride) with others involved in the interaction.

The production of emotions other than pride has been reported previously during IR in learning and teaching episodes (Ritchie et al., 2013). Emotional exchanges were identified in which student actions did not follow a procedure for a laboratory activity that was specified by the teacher. The teacher initially experienced negative emotions in these instances but he later experienced positive emotions because the students had made an interesting observation. He then redirected the rest of the class to follow the same approach that was taken by the students who deviated from the set protocol. The study highlighted the kinds of emotional transactions that can occur between students and teachers in naturalistic settings. The results of Ritchie et al.'s (2013) study reinforce Collins's (2004) assertion that emotions are associated with IR in classroom settings.

Social Rules about Emotions

Feeling rules (Hochschild, 1979) and *display rules* (Ekman, 2007) are two ways of describing the implicit or explicit norms and values that lead individuals to adopt emotion regulation techniques. Although emotions are transient feelings that can trigger unconscious displays of our inner states, over time we learn to control the outward expression of certain emotions to adhere to social expectations. The conventions for appropriate displays of feelings are important to our study because high-school-aged students have learnt substantive social rules about emotional displays both in their homes and at school (Holodynski & Kronast, 2009). Although interaction participants may experience the full range of emotions across a range of settings, these emotions may not be made public due to the participants'

implicit or explicit understandings of feeling rules. A unique event would need to occur for peers to accept, albeit temporarily, a particular emotional display that violates the social norm.

Emotion and Social Status

Individuals can gain higher social status if others value the individual's presentation of Self (Scheff, 1990). Such gains in status can occur when interaction participants display valued resources—skills or knowledge—during encounters (Turner, 2007). This is particularly relevant to academic contexts where students can gain knowledge during learning experiences, as well as higher social status as an *academically capable student*. Successful interactions that can lead to experiences of particular emotions and emotional energy (e.g., a longer-lasting feeling) for individual students are related to classroom transactions between classroom participants when there is an exchange involving stocks of science knowledge. Presenting a favorable version of Self by presenting the accepted form of knowledge during transactions produces feelings of pride; failure to do so results in feelings of shame (Scheff, 1990).

The sociological framework on emotions presented in this study allows us to investigate experiences of pride and triumph during classroom interactions as complex phenomena that are related to social interactions and exchanges of knowledge or concepts during learning.

Pride in Academic Settings

As empirical and systematic studies of triumph in educational settings were not identified in the literature, the ensuing discussion focuses on pride. Furthermore, due to a lack of studies adopting the same theoretical framework on emotions as this study, we focus our review on the available literature on pride in educational contexts.

Pride is classified in some general educational research as one of the *academic emotions* (Pekrun, Goetz, Titz, & Perry, 2002) or *achievement emotions* (Elliot & Pekrun, 2007) that involves self-evaluation in relation to academic success. An individual's internal standards and judgments are also important for their experiences of pride. Pride can be felt retrospectively when one evaluates a successful outcome relating to an academic activity such as an assessment task (Elliot & Pekrun, 2007). People who enter achievement settings with the hope of success and wanting to feel pride adopt self-regulatory forms of conduct aimed at achieving positive outcomes. Individuals demonstrating these self-regulatory habits are more likely to have a mastery-focus than a performance-focus (e.g., focusing on higher grades) in their approach to tasks. Additionally, students may attribute success to their global selves, leading to hubris, or to specific conditions and tasks, leading to authentic pride (Tracy, Weidman, Cheng, & Martons, 2014). The attribution of feeling pride is significant because authentic pride is regarded as an adaptive emotion that leads to achievement and motivation, task focus, and task orientation. In contrast, hubris is considered to be maladaptive because it is related to narcissism and associated disorders and is considered to be socially undesirable (Oades-Sese, Matthews, Lewis, 2014). Moreover, positive emotions, and pride more specifically, have been linked to intrinsic motivation for learning and interest for students across all ages of schooling (Pekrun et al., 2002). It is important to understand how pride relates to particular science learning experiences and classroom interactions because it is not possible to generalize the findings about antecedents of pride (or other emotions) generated by studies in different subjects (e.g., Latin, mathematics [Goetz, Pekrun, Hall & Haag, 2006]).

Pride and Triumph in Science Education

In one study, twelfth-grade students who wrote narratives about socio-scientific issues related to biosecurity experienced pride, strength, determination, interest, and alertness (Tomas & Ritchie 2012). These emotions were related to student interest levels and achieving success at writing narratives in science as evidenced by interview and questionnaire data sources. Pride was the strongest emotion related to successful story writing.

Although triumph was not described as an emotion and was not the focus of a study conducted by Tobin, et al., 2013, these authors described gestures such as fist-pumps and fingers pointed in the air to signal “I’m number one” as triumphant displays in a study of middle school students’ science learning. Students who produced the gestures had received a high five from their teacher after they presented their work to the class. Previously, one student had been involved in a negative interaction with his peers for which the teacher reprimanded him. The teacher’s high five was an attempt to repair the relationship with the student but also served as acknowledgement for his groups’ successful presentation. At that time, no specific attempt was made to code the gestures in terms of emotional expressions recognized in literature on emotional displays (e.g., Matsumoto & Hwang, 2012) or to theorize the emotion *triumph* to any extent, as this was not a major focus of that work. Tobin, et al.’s study represents the only study identified in education literature that mentions triumph.

Study Context

Our study took place in an eighth-grade science class in a large co-educational high-school situated in South-East Queensland, Australia. The student population was of average to above-average socioeconomic status, and the school had excellent facilities. Students (29 total; 15 males, 14 females), their families, and the teacher provided consent to participate in the study. All students came from English-speaking backgrounds. The female teacher, aged between 25-30, was also from an English-speaking background. Thirteen one-hour science lessons were observed during one 10-week period, which constituted a “school term.”

Classroom Learning Experiences in an Energy Unit

The students were studying an energy unit that included concepts such as forms of energy (e.g., kinetic, potential, heat, light), transfers and transformations of energy, and energy production (e.g., supply of electricity through power stations). A different approach to learning about energy was adopted by the teachers as part of the research project. The researchers provided a *BioStory* (Ritchie & Tomas, 2013) as a key element of the learning experiences, which the teachers also used in two of the assessment tasks for the unit. BioStories are hybrid forms of writing in which scientific genres are merged with narrative genres. In this case, *Shipwrecked* was the name of the story. The scenario involved a family stranded on an island after their boat had been wrecked during a storm. A 14-year-old girl, the main protagonist of the story, used her knowledge of energy concepts to devise ways of using materials from the shipwreck to generate electricity for powering a radio and cooking fish with steam. We provided students with this initial stem of the storyline. They then were invited to complete the narrative by using their knowledge of energy concepts to power the radio and to cook the fish. The teachers divided the story into two parts for the assessment tasks; the first part was completed in the middle of the term and the second part was undertaken at the end of the term.

In addition to the story, the energy unit included an initial laboratory activity in which students explored different devices that involve energy changes (e.g., hair-dryers). Throughout the term, the teacher also conducted teacher/student demonstrations in which laboratory materials were used to present energy concepts, lessons involving direct-teaching about energy concepts, and question-and-answer sessions about energy concepts. We came to refer to the last form of activity as question-and-answer (Q & A) rituals. The reason for this classification was that the activities followed an Initiate-Respond-Evaluate structure of focused interaction between the teacher and students, they elicited the same emotions from students over time, and the interactions and emotions were reproduced during multiple iterations of the ritual (Collins, 2004).

Identifying and Analyzing Emotions in Classrooms

This study draws on microsociological perspectives of interactions (Collins, 2004; Scheff, 1990) to investigate emotions produced during face-to-face encounters and from

student self-reports. These perspectives focus on the micro-details of interactions through the use of multiple data sources as recommended by Tobin and Ritchie (2012). Micro-sociological methodology seeks to develop understandings about the way in which face-to-face interactions inter-relate with meso-levels of social structure. An example of this in our study involves the investigation of possible interplay between individual emotions (i.e., micro-phenomena) with respect to the conduct of the class (i.e., meso-phenomena). Two research questions were developed as classroom events unfolded during the period of study:

- 1) What kinds of classroom activities are associated with students' feelings of pride and triumph when learning science?
- 2) How are different emotions, classroom activities, and social interactions interrelated with students' feelings of pride and triumph when learning science?

Accessing Emotional Experiences: Data Sources and Analyses

Our multiple data sources included emotion diaries (see Zembylas, 2002), video recordings of class interactions, and interviews with students. Student artifacts such as responses to assessment tasks provided further evidence of their understanding of science concepts and changes in their conceptual understanding over time. Analysis of data obtained from emotion diaries was the entry point for the study. The diaries provided meso-level data for establishing general patterns within the class, consistent with interpretive research design (Erickson, 1986). This was then followed either by analysis of video data or the use of interviews depending on particular classroom events that related to answering our research questions.

Emotion Diaries

Given that a large corpus of data about micro-social encounters was collected through the use of video-ethnographic methods, we used emotion diaries as heuristic devices to help us in the identification of lessons and lesson segments that were important to the production of students' emotional experiences. Emotion diaries were adapted from those used by Zembylas (2002) in his ethnographic study of an elementary science teacher. Our diaries required students to indicate which emotion labels out of a list of ten² (five positive: happiness, joy, pride, enthusiasm, wonder; and five negative: frustration, anger/irritation, disgust, anxiety, sadness, embarrassment) they associated with learning experiences during each lesson. Students also annotated which aspects of the lesson they associated with each emotion label. The diaries were administered at the end of each lesson. Students' annotations directed us to particular classroom events for closer scrutiny and later microanalysis of video clips of students' in-the-moment emotional experiences; annotations also served to stimulate student recall of emotional experiences during interviews. For example, if students commented that they felt proud when working with their peers, student groups were identified in the video data to search for contextual cues about their emotions based on their interactions, facial expressions, gestures, and vocalizations.

Before administering the diaries, Alberto (i.e., the first author) met with the class at the beginning of the term. He explained how students could recognize their own emotions, what was meant by the different emotional labels on the diary, and how students should annotate their experiences of these emotions. In this way, the likelihood that students and Alberto had a shared understanding of the emotion label, and how the diary should be annotated, was enhanced. Students were also instructed to report only those emotions that were associated with the lesson; consequently, all emotional self-reports from students were related to classroom episodes rather than extraneous factors. Access to other emotions

²A team of experts within our broader funded research program selected these 10 emotions from a larger set of emotions obtained from two validated questionnaires: the PANAS scale (Watson, Clark, & Tellegen, 1988) and the AEQ (Pekrun et al., 2002). The team ensured that all primary emotions based on Turner's scheme, with the exception of surprise, were covered in the final set. Surprise was excluded in favor of other emotion labels that were considered to be of interest to the researchers.

experienced by the students, for example due to personal issues, was beyond the scope of the study and would have required a different form of ethical clearance. It was for this reason that we focused students on reporting emotional experiences related to the immediate learning context. We collaboratively coded the diary responses into categories related to experiences of pride and triumph. These categories are reported in the findings.

Video data

Recordings of classroom interactions were made using three video cameras, two in stationary positions facing the students and one used by Alberto to roam around the classroom. Videos were replayed multiple times to identify students' emotional expressions. Because the emotion diaries were distributed at the end of each lesson, this required students to recall their experiences over a period of one hour. A limitation of this method was that students could forget some emotional experiences that the researchers identified as salient to answering the research questions for the study. The video data were useful in identifying emotions experienced by students that were not reported in their diaries. For the purposes of this article, our video data focused on the experiences of four students, Alan, Suzi, Peter, and Nathan (all pseudonyms), because these students were the only ones who displayed publicly their feelings of pride and triumph during classroom interactions. This made it possible to compare micro-analyses of emotions with meso-analyses based on the emotion diary and interview data.

Micro-analysis of video and audio data. Three forms of microanalysis of video data and audio data supported claims about the expression of emotions initially identified through the diaries. The first form of microanalysis involved determining emotional displays by using facial expression analysis (Ekman, 2007). We independently coded gestures and facial expressions and then compared our codings until we reached full agreement on the emotion label used to represent the expression. The second form of micro-analysis involved the classification of gestures to identify bodily expressions of pride (see Nelson & Russell, 2011; Tracy & Robins, 2004) and triumph (see Matsumoto & Hwang, 2012). The third form of microanalysis involved the identification of emotions from student vocalizations (Juslin & Scherer, 2008). When salient video episodes were identified, they were microanalyzed using the software PRAAT (<http://www.fon.hum.uva.nl/praat/>) to identify features of vocalizations that indicated emotional expressions (for details on this method see Tobin & Ritchie, 2012).

Interviews

Seven rounds of semi-structured interviews were conducted throughout the term to capture the perspectives of all students in the class about their emotional experiences. All interviews were video and audio recorded. Emotion diaries and, at times, short video clips of classroom episodes were used to stimulate students' recollections of classroom interactions and their emotional experiences. Typically, interviews began with broad questions related to emotion diary responses or video clips. For example, students were asked to explain what they had reported in their diary for a particular lesson that was of interest to us. When salient classroom episodes in the video data were identified from the emotion diaries, interviews were conducted initially with specific students about these episodes (Alan, Suzi, Nathan and Peter). Students were asked to watch the clips and then pause and explain what was observed. As themes began to emerge, subsequent interviews were conducted throughout the term, including interviews with the remaining students in the class about these themes. For example, initial interviews suggested that students felt pride during achievement in assessment tasks. In the interviews, students were asked, "How do you feel when you achieve success in an assessment task?" Such questions meant that students were not asked directly about pride. This approach allowed us to compare the experiences of pride for the focus students with the perceptions of students from the whole class without conditioning their responses. Student groups for the interviews consisted of 5-6 students with approximately equal numbers (two or three) of males and females, and a combination of students who reported pride in their emotion diaries and those who did not. Interview responses were coded collaboratively to develop categories of student responses.

Student artifacts

Students' written responses to classroom assessment tasks were collected and analyzed to check their understanding of energy concepts. This enabled us to establish connections between emotions and learning science concepts. Through content analysis of the Shipwrecked stories (the main assessment task for the term), we ascertained the students' understanding of science concepts. Because the stories were written at the middle and at the end of the term they could be compared with students' understandings of the science concepts that were externalized during lesson interactions captured on video and determined through interviews conducted earlier in the term.

The Emergence of Pride During Learning About Energy

We present analyses to support three claims related to student perspectives about their experiences of pride:

- 1) Challenging science activities were associated with justified feelings of pride
- 2) Negative emotions transformed into pride when students achieved understanding of science concepts
- 3) Pride displays were produced when students self-confirmed their understanding of science concepts after succeeding in challenging assessment tasks

We begin the next section relating to Claim 1 by presenting the major categories of classroom activities that produced feelings of pride at the meso-level (i.e., whole-class) based on emotion diary responses and interview data. Then we scrutinize these general categories through detailed micro-level analyses of video data focusing on in-the-moment expressions of pride and triumph through discussion of claims 2 and 3. Claim 2 establishes the role of various aspects of classroom interactions and emotions that were antecedents of pride, as well as the changes in emotions and related changes to students' understanding of science concepts. In Claim 3, the role of challenging assessment tasks is explored in relation to displays of pride. Emotional changes related to a student confirming her understanding of science concepts with peers are reported.

Claim 1 – Challenging Science Activities were Associated with Justified Feelings of Pride

In this first claim we establish that students in this class reported similar reasons for their experiences of pride. Student emotional reports from emotion diaries and interviews were used to develop the general category for pride-eliciting classroom events referred to as *achieving challenges*.

Achieving challenges. There were 63 comments from student diaries and interviews about experiences of pride after achieving success in challenging science tasks. Challenging tasks included assessment tasks and classroom activities such as answering science questions. Happiness and joy were two other emotions associated with achievement of success in science-assessment tasks or completing science activities. The comments used by students to explain their feelings of happiness and joy revealed that these emotions were mostly associated with having completed a task or having achieved a good grade in an assessment task. In contrast to these emotional experiences, pride was reported uniquely when classroom activities and assessment tasks were perceived to be challenging.

Sub-categories of *achieving challenges*. Within the pride category of *achieving challenges*, there were three sub-categories that included *completing an activity successfully* (30 comments, 47.6%), *answering science questions* correctly (e.g., teacher question, assessment tasks; 18 comments, 28.6%), and instances where students related their feelings of pride to *understanding science concepts* or *demonstrating their understanding* (e.g., by answering something correctly or by solving a difficult problem; 15 comments, 23.8%). Often, these sub-categories referred to interrelated classroom experiences. For example, completing

a classroom activity successfully sometimes involved the demonstration of science understanding in the presence of the class.

In the first sub-category *completing an activity*, students related their feelings of pride to accomplishment in a task, such as succeeding in an experiment, which had proven to be challenging for them. The latter two sub-categories for feelings of pride (i.e., *answering questions* and *understanding science concepts*) indicated a relationship between pride and understanding or knowing science concepts. These two categories are also interrelated because one way in which students demonstrated their understanding of science concepts publicly was through answering the teacher's questions during a lesson. However, there were other student reports of pride in the diaries, such as when students answered questions on worksheets during independent work which did not involve the demonstration of their knowledge to their peers or teacher. The importance of these two sub-categories for students in relation to public display of their knowledge was captured in the following quotation from one student's emotion diary entry:

I like it when *no one has his or her hand up* [to answer a question] and you are the only one with your hand up then *you get it right* and you are like *the only one who knows*. (Student diary response, emphasis added)

The quotation illustrates that if a student was able to display knowledge that others could not provide in front of peers and teacher, this warranted feelings of pride. Our findings are supported by previous research from psychological frameworks (for summaries see Oades-Sese, Matthews, & Lewis, 2014; Pekrun et al., 2002). This suggests that students' feelings of pride identified in our study may be transferred to other educational contexts and levels of schooling.

Justified pride. As discussed in the preceding section, students commonly reported that they experienced pride when no other student could answer a question or if they were the first to answer a question correctly. Such situations gave them "bragging rights" and made them "feel like a boss" (Student responses, Interview 3). The students' responses during interviews indicated that pride displays or personal feelings of pride were justified in these cases. These explanations are consistent with the meaning of the word pride that is related to conferring a higher status (Matsumoto & Hwang, 2012; Tracy & Robins, 2004) to oneself (superiority- "feel like a boss") and communicating this to others through gestures and vocalizations (e.g., bragging). These interview data also suggested that the *feeling rules* (Hochschild, 1979) relevant to this class permitted public emotional expressions of pride in the classroom when students answered questions correctly or achieved success in other challenging tasks in accordance with the sub-categories of pride.

Overt and covert pride. Emotion diaries and interviews yielded understandings about the ways in which students in this class interpreted events and their associated feelings of pride. This provided general perspectives on pride within the culture of the classroom based on *post hoc* ways of exploring student emotions. These reflective self-reports represented both *overt* and *covert* cases of students' experiences of pride. That is, students may have experienced feelings of pride at a level that was not shared with others through emotional displays or vocalizations, referred to as *covert pride*. Covert pride was accessible only through the emotion diaries and interviews. In contrast, *overt pride* referred to cases that involved a public gestural and/or vocal display. Through classroom observations of visible emotions displayed by the four focus students in the study (Alan, Suzi, Nathan & Peter), we became aware of specific interactions and other emotions as antecedents of pride as reported through claims 2 and 3.

Claim 2 – Negative Emotions Transformed into Pride when Students Achieved Understanding of Science Concepts

Out of the 13 hours of video recordings, only four students (Alan, Suzi, Nathan & Peter) expressed pride and triumph publicly through gestures and vocalizations during the

study period. We begin by focusing on one student's (Alan) negative emotional experiences which transformed into displays of pride and triumph. The changes in Alan's emotions paralleled changes in his understanding of energy concepts. Although Alan was one of four students who displayed his feelings in class, his experiences were not isolated. There were 15 reports from the class, based on the diary and interview data, which related feelings of pride to understanding of science concepts or to public demonstrations of this understanding.

As we show later, a surprising result was that Alan's and other students' emotional gestures also indicated feelings of *triumph*. This emotion was not reported in the literature on academic emotions. For this reason, our analyses also focused on students' triumphant gestures and vocalizations. Details of the production of a range of negative emotions are presented and then we report how these feelings were resolved into pride and triumph.

Negative emotions emerge. Our detailed micro-analyses focus on Alan's initial experiences of embarrassment, disappointment, and irritation during a question-and-answer (Q & A) ritual. In the first lesson of the term, the class was engaged in a series of laboratory activities through which they explored energy changes at a series of workstations. Devices such as electric fans, solar powered cars, and tuning forks were set up at workstations around the laboratory with sets of instructions on how to operate the equipment. At each station, the students explored the energy changes associated with the devices that involved transfers and transformations of energy (Neumann, Viering, Boone, & Fischer, 2013). As they moved between workstations, students recorded their predictions and observations about the kinds of energy changes that occurred. For the duration of the activities, there were multiple instances when Alan expressed happiness/joy through laughter and smiling. Similarly, most students reported experiencing multiple positive emotions in their emotion diaries at the end of the lesson (the highest number of positive emotions during the study period). Once the activities were completed, the students returned to their classroom and the teacher discussed their ideas about energy changes through the Q & A ritual.

Against the backdrop of collective effervescence and positive emotional energy during the workstation activity, it was surprising to find that Alan had reported only negative emotions in his diary at the end of the lesson. These negative emotions were all related to an episode that took place during the Q & A ritual. Alan was the first student to offer an answer to the teacher's question about the kinds of energy changes that were involved in the first workstation. As noted in Claim 1, peers conferred high social status to students in this class if they displayed valuable science knowledge by being the first to answer questions correctly or if they were the only student who could answer a difficult question correctly. When students' expectation states were met, this led to feelings and expressions of justified pride based on the class' feeling rules. In contrast, a failure to meet these expectations can result in feelings of shame or embarrassment as theorized by sociological perspectives on emotion (Turner, 2007).

The question that Alan had attempted to answer was related to the energy changes involved in the operation of a hair-dryer. The functioning of the hair-dryer was one of the more challenging processes to explain because changes between multiple energy types (e.g., electrical potential to heat and sound) were involved. The energy changes typically associated with the device are called *transformations* of energy (Neumann, et al., 2013) in an eighth-grade science-learning context. Alan had responded by stating that the energy changes involved were *transfers* of energy. This implied that the same type of energy, such as electrical energy, was exchanged within the device. The teacher asked him to elaborate his response and in turn 4 of fragment 1, we see Alan's elaboration. The teacher initially reacted with a positive sounding "mhm" (turn 5) seemingly giving off a positive sanction to the answer. She then began to build on the response by contributing further examples of the forms of energy that were produced and finally posing a further question to Alan at the end of turn 7.

Fragment 1 Energy Changes Q & A Ritual

Turn Speaker Transcript

- 4 Alan It went it went from electrical potential energy to potential=
potential=
- 5 Teacher =mhm
- 6 Alan =To wind
- 7 Teacher Ex((ce/a-)) it did and wind and a few other things heat and sound [which one are you talking about]
- 8 Alan [I never I never included]heat sound and light with it those are invalid
- 9 Teacher So Alan, if it went from electrical ((potential energy)) to heat, sound, kinetic is it a transfe:r or a transformation?
- 10 Alan (0.9) Transfer because it's the same object (2)((class laugh))

The transcript conventions used to mark up fragments are presented in Appendix A. In turn 7, the teacher had started to utter either the word 'excellent' or 'exactly' that she used typically to provide positive sanctions for student responses in this class. However, she cut short her utterance (i.e., Ex((ce/a-))), as she noticed that Alan's response was incomplete compared with what she had expected. She completed his response in turn 7 by adding other forms of energy to the answer and finished off by asking Alan a new question. Her new question was seeking clarification about which of the forms of energy that were produced were related to his response of *transfer*; this caused hesitation for Alan as evidenced by his reaction in turn 8. He positioned himself in opposition to the teacher when he claimed that her suggestions were "invalid" forms of energy. The teacher responded by asking him to clarify the changes to which he was referring (turn 9) casting doubt over the correctness of his response. The doubt is evident in the way that she emphasized "So Alan" in turn 9 and the rhetorical nature of her question to which she knew the answer. The latching turns at talk (turns 4-6 & 9-10), denoted by the "=" symbol, indicated the normal turn-taking between student and teacher that were typical of Initiate-Respond-Evaluate patterns of classroom talk.

The teacher's emphasis in turn 9 on the word transfe:r by stressing the end of the word and stretching the vowel sound prompted Alan to hold his ground in turn 10 rather than reconsidering his position as might be expected with someone who was less committed to an answer. Alan's response indicated that his views about energy changes, at this point, were not consistent with accepted science explanations of the phenomenon. When forms of energy are converted to different types, such as electrical potential energy being inputted into a device and sound being produced, they are considered to be transformations of energy (Neumann et al., 2013). If the same type of energy is exchanged from one object to another, then this is referred to as a transfer of energy. Alan's response indicated that he was using the word *transfer* to mean that the energy remained with the same object as he explained in turn 10.

Embarrassment and disappointment. The class laughed at Alan's response in turn 10. In his emotion diary and during a stimulated recall interview, Alan explained that he felt embarrassment at this point. The class' laughter served as a negative sanction and his feelings of embarrassment were consistent with loss of social status (Scheff, 1990) that was associated with not displaying the right kind of knowledge. In fragment 1, Alan had taken the line initially that he was offering a correct answer. By taking such a line, he later (turns 8-10) positioned himself in the interaction as being correct and the teacher as being incorrect. The teacher's rhetorical question in turn 9 indicated her realization that Alan's understanding was not consistent with the canonical view of energy transformations. During subsequent exchanges to those in fragment 1, Alan and the teacher interjected into one another's turns at talk and they co-produced an adversarial argumentative structure of interaction (Retzinger, 1991). The teacher ended the exchange by stating that most of what Alan had said was correct, but disagreed with his use of the terms "transfer" and "transformation." During the interview,

Alan declared he now felt disappointment, along with his embarrassment, due to the negative sanction from his teacher. His declaration was consistent with the video clip that showed his slumped posture with his gaze turning down, typical when an individual has experienced embarrassment or shame.

Irritation. As the class interactions continued, Alan's emotions changed from embarrassment and disappointment to irritation. At the same time, his conceptual understanding of energy remained unchanged. The teacher asked other students to provide definitions for the *transformation of energy*. This diminished Alan's relative social status because others now gained higher status and positive emotional energy through positive sanctions from the teacher for having the right answers. The end of these exchanges was captured in fragment 2 where the teacher positively sanctioned a student's correct explanation with the utterance of "Good" in turn 27. The teacher then asked another student to answer the original hair-dryer question at the end of turn 27.

Fragment 2 Alan becomes irritated

| Turn | Speaker | Transcript |
|------|-----------|--|
| 27 | Teacher | Good. It's when one form of energy gets transformed or turns to another. Okay so therefore if we had electrical energy with the hair dryer it then created heat sound and kinetic, what is it Student 1 and wind |
| 28 | Student 1 | Transfer ((self-corrects)) [transform |
| 29 | Class | [Transfo:::rm((several students correct Student 1)) |
| 30 | Teacher | It transforms [it's transformation. |
| 31 | Nathan | [Yeh Student 1(.) /?/ ((points to Student 1 and claps)) |
| 32 | Alan | <<f>ExActly (0.2) it's <<f>trAnsfer ((raised voice and moves in his seat. Extends his right arm towards Student 1 in a pointing gesture. Arms open wide while emphasizing with his hands)) |

Student 1 began to utter the word "transfer" but quickly self-corrected by immediately saying "transformation" in turn 28. This prompted Alan to become involved in the discussion once again (turn 32). He registered student 1's initial response of "transfer" after the positive sanction in turn 31 from Nathan who clapped, pointed, and mentioned student 1's name. Alan called out "Exactly, it's transfer" and gestured emphatically with his arms outstretched, palms open and facing out towards student 1 in turn 32. His utterance and the associated gestures served as an attempt to present once again a defense for his original argument from fragment 1. That is, by saying "Exactly" Alan was referring to the student's initial utterance of *transfer* before she had self-corrected.

Evidence of Alan's irritation during this instant, as reported in an interview and in his diary, was supplemented with prosodic analyses (for further discussion of this analysis see also Bellocchi, 2014). Analyses of the individual words "exactly" and "transfer," and analysis of the whole phrase, "<<f>ExActly (0.2) it's <<f>trAnsfer," were consistent with vocalizations of the emotion anger (see Appendix B; Juslin & Scherer, 2008). Alan emphasized the two vowels "E" and "A" in "exactly" and uttered this part of the word loudly as denoted by the <<f> symbol. He also paused emphatically for two-tenths of a second before stressing the vowel sounds in "transfer," represented by the uppercase "A" and underlining. The fundamental frequency of his voice (F_0) reached 366.69 Hz, which was substantially higher than the F_0 (199.9 Hz) for the same utterance spoken in a neutral voice. The F_0 SD (121.21 Hz) and intensity of his voice (75.52 dB) were also higher than the neutral utterance values (F_0 SD= 12.79 Hz; Intensity= 54.07 dB). Even though he raised his voice

when he produced this utterance relative to normal speech, it was not at the levels that would be expected for more intense variants of anger such as *rage*. This analysis supported his self-identification of irritation, which is a low-intensity variant of the primary emotion *assertion-anger* (Turner, 2007).

Fragment 2 captures another emotional change for Alan as he shifts from feeling embarrassed and disappointed (in fragment 1) to feeling irritated. Irritation is a slightly more intense negative emotion when compared with disappointment and embarrassment. This higher level of negative valence is related to a moment when Alan's understanding remained unchanged as evidenced by his defensive stance (Exactly it's transfer) towards his original answer. He is focusing on winning the argument during these exchanges rather than embracing the teacher's or his peers' explanations that could have led to a change in his understanding of the concepts.

As the interactions progressed further, Alan referred to a homework video in which the concepts of transfer and transformation of energy had been explained to defend his position. A student then turned to Alan and explained that in the video an example was given of a man kicking a ball. When kicking a ball, a *transfer* of kinetic energy occurs as the action of the man's leg (i.e., a kick) propels the ball (kinetic energy). The teacher gave off a positive sanction to this explanation by saying "Good" and reiterating the student's response leading to another emotional change for Alan.

Surprise. At this point in the interactions, Alan experienced an epiphany as he realized he had been previously confused about the terms *transfer* and *transformation* during the exchanges related to fragments 1 and 2. He offered his own explanation of these energy changes to which the teacher responded with the positive sanction "That's right." Alan reacted to this with the following utterance: "A:::h I got it all mixed u:::p." The content of this utterance ("mixed up") and the stretching of the vowel sounds indicated his surprise as he now understood that his earlier views were not consistent with scientific perspectives of energy changes that the teacher and students in the class had tried to explain to him.

Alan's emotions had now changed from irritation during the earlier interactions to a state of surprise (i.e., realization, not startled). As he completed his utterance by stretching the vowel sound in the word "up," his lower jaw dropped open and his mouth made a circular shape. His facial expression was consistent with low-intensity surprise because it involved only one part of the face (the jaw) and did not involve extensive opening of the eyes (Ekman, 2007). The changes in emotional states discussed so far coincided with Alan's evolving understanding about transfer and transformation of energy. By no longer focusing on holding his ground in the argument, Alan's emotions changed from negative (embarrassment, disappointment, irritation) to positive (surprise), and his understanding changed concomitantly. Before exploring how this episode led to the final emotional change that resulted in feelings of pride and triumph, we present data to substantiate further the claim that Alan's understanding of transfer and transformation of energy had changed and that this change was sustained for the remainder of the school term.

Transformed understanding. To confirm Alan's understanding, two interviews were conducted with him immediately following the workstation lesson. His assessment artifacts, collected by the teacher later in the term, were also analyzed to identify evidence of any lasting changes in his understanding. During the interview, Alan correctly explained the transformation of energy through an example of the chemical potential energy in food being converted to kinetic energy for human body actions. He then exemplified energy transfer as seen in turns 10 and 12 of Extract 1.

Extract 1 Interview Transcript- Alan's Understanding About Energy Changes

| Turn | Speaker | Transcript |
|------|---------|--|
| 10 | Alan | Aah yeah it's like someone is just kicking a ball like from a kinetic energy and from your leg into the ball |

- 11 Alberto What about another example of that
- 12 Alan Aah maybe like like flipping a pancake from your hand into the pan into the pancake It like the kinetic energy from the pan goes into the pancake so like goes up in the air

Alan was prompted to give a second example in turn 11 because the one that he used in turn 10 was the same as the example given in class. He offered correctly the example of flipping a pancake to explain energy transfer in the turn 12 response. He also proposed a second example of energy transformation later in the interview by describing the energy changes in a wind turbine.

Alan's assessment task, the *Shipwrecked* story, which was completed later in the school term, contained evidence of the sustained change in his understanding of the energy concepts beyond the workstation lesson. In his story, Alan proposed that the hot rocks (geothermal energy) on the island could help to steam fish. He explained that heat energy would be transferred between the objects. This was indicated by the underlined word in the following excerpt from his story: "The heat w[ould] transfer from the rocks, into the boiling water, into the steam and then into the fish. All the particles in the fish w[ould] vibrate themselves, making it hot" (*Shipwrecked Story*, Part A, Alan). This extract from Alan's story indicated his understanding that the same form of energy, heat, would be exchanged between (i.e., transfer) the different materials—water, pot, steam, and fish as indicated by the phrase "into the" in his story. His response also demonstrated his correct understanding that these energy changes involved transfers of energy. Alan's explanation was consistent with canonical science explanations for heat transfer as it applied in this context. Furthermore, his reference to the movement of particles resulting in heat showed that his depth of understanding of the concept of heat energy was also more developed than simply being able to identify whether an energy change involved a transfer or a transformation of energy.

In the second part of the story, Alan planned to immerse the turbine into a flowing stream so that "we c[ould] direct water to hit the blades, using the kinetic energy to make the blades spin." He then stated that this kinetic energy would be converted to electrical potential energy in the radio battery:

I will connect one of my cords [electrical conductors] to the wind generator and the battery so the electricity is passing through the cord into the battery, transforming the energy into chemical potential. (*Shipwrecked story* Part A, Alan)

Alan identified correctly a transformation of electrical energy into chemical potential energy in the battery, as indicated by the underlined word. He then demonstrated the canonical science view of transformation of energy through the phrase "turn it into electrical and sound" because "turn it" implied a change of energy type rather than a transfer of energy. The data from his story support the claim that Alan's understanding about transfer and transformation of energy had changed and the moment when this change had occurred was captured through analysis of fragments 1-2. His changed understanding now made way for feelings of pride and triumph.

The emergence of pride and triumph. Despite the negative emotions experienced by Alan during the interactions related to fragments 1-2, he continued to answer questions later in the workstation lesson and during the remainder of the ten-week school term. Video analysis of subsequent interactions in the workstation lesson revealed that he used a one-armed, fist-pump gesture (see figure 1) to display his feelings when correctly answering other questions, especially questions where the correct answer involved a "transfer" of energy. The vocalization "Yesss" sometimes accompanied this arm gesture that also included a grimacing facial expression.



Figure 1. Allan's emotional display of triumph

We could not identify any empirical studies that explain the fist-pump gesture despite its social ubiquity, for example, among sports stars and athletes. Tennis players are often seen fist-pumping when they win a difficult point in a match. Such celebrations are associated with victory (or an agonistic encounter) and the relevant emotional labels are *pride* and *triumph* (Matsumoto & Hwang, 2012). We verified this classification through our own analysis of several hundred contemporary Google™ images for these gestures across a range of sporting and non-sporting contexts. This analysis proceeded by using a range of search terms including *fist-pump*, *pride/proud* or *triumph/triumphant*, *success*, *achievement*, *winning*, and *victory*. We collaboratively analyzed the images retrieved through these searches for gestures and facial expressions produced by a range of people in different contexts. This included images of athletes during real sporting events, school and university graduates, and other less common scenarios such as personal photographs and advertisements. These images were compared with the gestures and facial expressions in the research literature (Matsumoto & Hwang, 2012; Tracy & Robins, 2004) and the images in our study to arrive at a consensus on the emotions represented. The results of that analysis confirmed that the emotional labels in the English language currently used for the fist-pump gesture are associated with *triumph*, and to a lesser extent *pride*, in relation to success, achievement, winning, and victory.

The combination of Alan's fist-pump gesture, grimacing facial expression, and vocalization (uttering "Yesss") relating to figure 1 are supported by Turner's (2007) theoretical classification of triumph as a first-order elaboration of satisfaction-happiness (the utterance "Yesss") combined with a lesser amount of assertiveness-anger (fist-pump + grimace). In this instance however, the antecedent emotions of triumph included embarrassment, disappointment, irritation, and surprise. Our evidence suggests that more complex combinations of emotions can also serve as antecedents to feelings of triumph than the examples involving just two primary emotions (satisfaction-happiness and assertive-anger) as suggested in Turner's (2007) theorization. Furthermore, these findings extend previous questionnaire-based research which reported that pride (as well as enjoyment, and hope) was induced by positive events (Pekrun et al., 2002). By observing actual classroom interactions involving Alan over longer timeframes than those measured with questionnaires, we have found that other negative emotions and negative experiences are antecedents of pride and triumph.

In subsequent lesson episodes, Alan produced the display shown in Figure 2 when answering questions correctly.



Figure 2. Pride or triumph display

The gesture shown in figure 2 was consistent with the class' reports during interviews that pride-eliciting events were associated with challenging science questions and demonstrating science knowledge (see Claim 1). The gestural components of this display include an upright posture, arms outstretched upwards, head tilted up with a slight smile (not shown in the frame captured in figure 2). These actions have been classified variably as gestures related to experiences of triumph (Matsumoto & Hwang, 2012) and pride (Tracy & Robins, 2004).

Expressions of triumph and pride may serve to establish dominance as a way of achieving a high social status. In their experimental study of observer perceptions of gestures produced in judo contests, Matsumoto and Hwang (2012) speculated that triumph and pride might be expressed differentially depending on the factors that trigger these feelings. For example, pride may occur after general achievement of a task whereas triumph may be more specific to agonistic encounters. In contrast to this perspective, Alan's triumph and pride displays were associated with achievement of success rather than with an agonistic encounter in the form of a competition suggesting a different set of eliciting conditions from those proposed by Matsumoto & Hwang (2012).

Apart from Matsumoto and Hwang's study of triumph displays related to judo contests, no studies have investigated the role of triumph in learning. Our empirical findings in a naturalistic setting suggest that pride and triumph can co-occur. We also found evidence that they can closely follow one another, for example, when Alan followed gestures like the one in figure 2 with a double fist-pump during a subsequent lesson. Our observations indicate that pride and triumph are closely linked at times and it may be inadequate to theorize these as different emotions. The results are supported by Matsumoto and Hwang's proposal that they are inter-related emotions.

Collaborating to succeed. During another lesson, Alan completed a gesture similar to the one in figure 2 before he turned to a friend to his left and exchanged a "high five." The two students used the high five to confer collegiality because they had collaborated to answer a question earlier in the lesson. The high five served as a display of this *togetherness in arriving at a correct answer* as they celebrated their victory. Moments earlier, Nathan—a third classmate who sat in front of Alan—had also collaborated with the other two students. Nathan produced an intense double fist pump with a grimace when he had discovered that his

answer was correct. His triumphant gesture shortly preceded Alan's pride and triumph displays related to figure 2. These exchanges represented an intact social bond between these students that was related to their emotional experiences. The more expansive gesture by Alan, with his arms raised above his head, showed an intensification of emotion when compared with Nathan's fist pump.

Nathan's gesture, in combination with the high five between the other two students, establishes the collaborative dimension of pride and triumph in this particular case. It also suggests a relationship between pride and triumph, student collaboration, and knowing and learning science. This episode provides evidence that the *exchange* of science concepts, or symbols, between students when collaborating on science questions can lead to feelings of pride and triumph as a result of positive sanctions for their group efforts and through peer sanctioning. The interactions also produce strong social bonds (evidenced by the exchange of gestures and mutual focus of attention on one another) once social recognition of the right kind of science knowledge is confirmed. The students' experiences of pride that were related to solidarity, or strong social bonds, are supported by previous research that has established similar connections in contexts outside of education (see Scheff, 1990). Our study extends this earlier work by also relating triumph to demonstrations of solidarity. The collective display of emotions in relation to understanding science concepts is a novel finding in relation to the arousal of pride and triumph in academic settings.

Alan's subsequent reports and displays of pride and triumph during the study period were related further to classroom episodes where he achieved success on assessment tasks or answered questions correctly during lessons. As he displayed science knowledge in these subsequent lessons, he also reclaimed a high social status that was manifested through his emotional displays. The emotional display in figure 2 was one of several examples of similar actions that occurred in such cases. Later in the term, his gestures became more emphatic and expansive when he answered questions correctly. The intensification of his gestures was indicative of more intense experiences of pride and triumph. This was significant because, as he persevered with classroom interactions, his stock of science knowledge increased (e.g., answering questions correctly more frequently later in the term). He also possessed more of the knowledge valued by the class, which was associated with more intense experiences of pride and triumph. His emotional displays were not met with negative sanctions from the class throughout the study period. This reinforces the data from interviews presented in Claim 1 where it was established that the *feeling rules* in this class permitted displays of pride (and triumph) when students answered questions correctly in class.

Contradictions. Two students who did not report pride through the emotion diaries in our study did not see science as their "strong subject." During an interview, they were asked whether they genuinely did not experience pride in science or whether they had simply forgotten to report this emotion. The students confirmed that they did not experience the emotion because they did not experience success in science very often. As one student explained in the interview "I never really answer stuff [in science]... in music I understand a lot more... I feel a bit more pride when I accomplish a task [in music]." The student clarified that she did feel pride in other subjects where she accomplished tasks well, indicating that the lack of pride self-report in science was not due to personal factors but rather due to the amount of science knowledge to which the student had access. For students like this one, it was not possible to experience pride in science class unless they first acquired the science knowledge that was necessary for exchanges during classroom transactions which in turn resulted in increased social status or status as an insider of the science class community.

Claim 3 – Pride Displays were Produced when Students Self-Confirmed Their Understanding of Science Concepts After Succeeding in Challenging Assessment Tasks

During interviews, students reported that the *Shipwrecked* story was a new form of assessment task which they found difficult. It has been reported previously that students find hybridized writing activities challenging (Ritchie & Tomas, 2013). The first component of the

Shipwrecked assessment task required students to create a flow diagram showing the energy changes that would occur when the protagonist of the story powered a battery and cooked fish with steam. In addition to finding this task challenging, students reported feelings of anxiety and frustration that are typical of academic assessment situations (e.g., Pekrun et al., 2002). The following interview quotation from one student, Peter, illustrated the sentiment:

I always get anxious before tests and stuff you know like ... what's gonna [going to] be on the test coz [because] we didn't really know this time but ... I found it a bit hard at first because I really didn't know what was going on ... I couldn't see how everything [materials from the shipwreck and island] related to each other and how the wind generator without any wind could get a radio working. (Peter, Interview 2)

Peter confirmed that the assessment task was challenging when he stated that he could not understand initially how the different materials in the storyline (e.g., the wind generator) could be used to power a radio. Other students also reported frustration as they grappled with using the different materials to generate electricity in their stories. The difficulty of the task was also evident from the number of questions fielded by the teacher in a short span of time. Within 7 minutes and 40 seconds of administering the task, students asked 20 questions and the teacher eventually clarified some of the individual questions with the whole class. After the students had completed the assessment task and submitted their responses, the teacher acknowledged the level of challenge of the task:

Can I just say that was a very ... difficult task and some of your persistence impressed me, okay... So well done. (Teacher comment, lesson 2)

This comment served as a positive sanction (*impressed me*, emphasis on *well done* as indicated by the underlining) for all students in the class. The nature of the challenge inherent in the assessment task was evident in the opening line. The teacher's comment was a significant eliciting factor for students' subsequent feelings of pride and triumph because positive sanctions arouse positive emotions (Turner, 2007).

Students did experience positive emotions, including pride, during the *Shipwrecked* task. For example, Peter reported in his emotion diary that he felt happiness, joy, enthusiasm, and pride at the end of the assessment lesson. Completing the task successfully aroused happiness, and this, combined with Peter's initial experience of task anxiety (a variant of aversion-fear), produced pride (Turner, 2007). In this case, the emotion diary revealed that four positive emotions were experienced, suggesting that emotion-eliciting events may sometimes be appraised retrospectively through highly nuanced processes in self-report instruments like the diaries. This leads to the reporting of several related emotions, especially when measured over long timeframes such as a whole lesson.

Another event that produced pride and triumph was identified following Suzi's expression of mild sadness (evidenced by downturned corners of mouth in figure 3a; Ekman, 2007) and registration of anxiety in her emotion diary after completing an assessment task.



Figure 3a. Sadness

Figure 3b. Triumph

Figure 3c. Pride

The facial expression in figure 3a lasted for approximately 16 minutes. This was coupled with other gestures such as Suzi holding her face and head between her hands during this time. Emotional expressions with long durations such as this were indicative of a negative *mood* having developed rather than indicating shorter-duration transient emotions (Davidson, 2012). After completing the assessment task, Suzi checked her response by using the notes on her computer and the Internet. When she identified that her response was correct, she shared this fact with Alan. In figure 3b, Suzi received a positive sanction from Alan in recognition of her correct answer. Suzi began a double fist pump gesture while wearing a slight frown (figure 3b), indicating triumph (see Claim 2). As she raised both hands Alan began to smile in the next 0.1 second. He then sanctioned her response as seen in figure 3b by holding up his index finger suggesting “you’re number one.” This happened within the next 0.1 second as Suzi completed the fist pump shown in figure 3c.

As Alan gestured “number one” and Suzi performed the fist pump, she also tilted her head sideways and produced a slight smile in figure 3c. The head tilt combined with a slight smile was indicative of pride (Nelson & Russell, 2011). The timing of Alan’s “number one” gesture and Suzi’s smile and fist pump show high levels of synchrony that are key ingredients for the formation of strong social bonds during interaction rituals (Collins, 2004). Suzi experienced pride at the end of these interactions due to the formation of a social bond with Alan, the synchrony of their gestures, and the exchange of positive sanctions (Scheff, 1990). This evidence extended Tomas and Ritchie’s (2012) study in which students reported pride when the teacher sanctioned their assessment responses by stating that their responses were “impressive.” Suzi first confirmed her own understanding, produced the triumph gesture, and then shared her achievement with Alan. After Alan’s positive sanction, she then produced the head tilt and smile that indicated her pride.

An important factor in explaining Suzi’s emotions after verifying her own responses to the assessment task was that her initial negative emotions became a longer-lasting mood of negative valence. This negative mood was an antecedent condition to the final feelings of triumph and pride. Whereas Turner (2007) theorized pride and triumph as first-order elaborations of other primary emotions, our evidence suggested that moods could also provide antecedent conditions that combined with primary positive emotions (e.g., satisfaction-happiness) to produce pride and triumph.

Suzi’s initial experiences of anxiety are also important to her subsequent feelings of pride. Anxiety is a low-intensity variant of aversion-fear—the primary negative emotion that combines with satisfaction-happiness to produce pride. The analyses and results presented here are unique with respect to emotions in academic settings because they connect triumph with success in an assessment task and demonstrate that moods and emotions can combine to produce pride and triumph. An increase in social status is conferred through positive peer sanctioning due to students’ success with the assessment task. The combination of these

antecedent social factors, the antecedent emotions, and mood preceded Suzi's feelings of pride and triumph related to her correct response to the assessment task.

Summary. The evidence presented in Claim 3 supports the assertion that students perceive being successful on challenging assessment tasks as leading to a higher status as a *capable science student* in the class. Feelings of pride and triumph can be displayed in these situations according to the norms or feeling rules for this class (see Claim 1). This assertion is further supported by the theorization of pride and triumph as status emotions that are experienced when an individual is victorious during a challenge (Matsumoto & Hwang, 2012; Scheff, 1990; Tracy, Weidman, Cheng, & Martons, 2014).

During interviews, students stated that it was embarrassing to appear unintelligent in front of their peers; it was highly desirable to demonstrate their understanding of science concepts in the classroom forum. The right kind of science knowledge and symbols needed to be demonstrated to confer higher social status as illustrated through Suzi's case and Alan's case (see Claim 2). When students achieved this, it was justifiable for them to display their pride and triumph in front of their peers. Suzi's experiences provided evidence that a connection exists between students' self-verification of conceptual understanding and feelings of *triumph*. When a positive sanction from her peer was received, this then led to displays of pride. The results presented in Claim 3 extended the findings from Claim 2 because they demonstrated that when an individual student confirmed his/her understanding of science concepts, this led to expressions and feelings of pride and triumph. When these expressions and feelings were shared with a peer (Alan), this then led to expressions of pride.

Emotional Change: Perspectives on Learning and Understanding Science

Learning in academic contexts, and cognition in general, has been considered as a *cold* process (e.g., Brown, Bransford, Ferrera, Campione, 1982). This perspective is relevant here due to the lack of emphasis on emotion research in science education. Apart from some notable naturalistic studies in science education research (e.g., Ritchie et al., 2013; Ritchie & Tomas, 2013; Tobin, et al., 2013), research in educational psychology has not focused extensively on the multiple contextual factors that elicit discrete emotions during classroom interactions. The present study has addressed this gap by identifying the interplay between classroom tasks, interactional factors, and other emotions that are antecedents of pride and triumph specifically. Through Peter, Nathan, Suzi, and Alan's classroom experiences, it became clear that learning and cognition are *hot* or highly emotional processes.

We extended Tobin, et al., (2013) and Tomas & Ritchie's (2012) studies by outlining the interactional processes of the classroom that were associated with pride and triumph and understanding of science concepts. In relation to Tomas & Ritchie's (2012) study, pride was associated with achieving success at writing narratives about Biosecurity based on interview and questionnaire data. Our results, based on direct observations of the classroom, emotion diaries, and interviews, show that pride and triumph are also associated with students' changed or confirmed understanding of energy concepts. At times, feelings of pride and triumph are preceded by negative emotions, for example, when students do not hold canonical views of science concepts. Linking triumph to learning science is a novel contribution made by our study. Gestures referred to as "triumphant" were reported by Tobin, et al. (2013). Our study extends this work by reporting other negative emotions that were antecedents of triumph and also by providing theorization of triumph based on Turner's (2007) framework and micro-analytical perspectives on coding this emotion that were not reported previously in relation to learning science or in general educational research on emotion.

Based on student reports and classroom observations, pride and triumph are inter-related with conceptual understanding, student collaboration, social status within the class, and achieving at challenging tasks. The main categories of classroom activities that elicited pride and triumph were assessment tasks and answering questions. Both activities aroused these emotions when the level of challenge was high. It was important to students that they achieved at challenging tasks because this led to experiences of pride and triumph that were

considered to be justified by the peer group as revealed through interviews. These findings provided insights into the feeling rules that students in this class had developed for these emotions as they related to academic tasks.

A number of emotional antecedents of pride and triumph were related to classroom tasks and interactions. Anxiety, embarrassment, disappointment, irritation, surprise, and a negative mood (sadness) preceded feelings of pride and triumph. Sometimes individuals experienced these feelings when they failed to answer questions correctly or in failing to achieve on an assessment task. At other times, the class' reaction to incorrect answers by students or the teacher's negative sanctions were the factors that elicited negative emotions according to student reports. When exchanges and classroom activities were resolved in a positive way at some later stage feelings of pride and triumph ensued for the students at the center of the interactions.

Most significantly, this study has demonstrated that non-canonical understanding of science concepts was maintained during adversarial argumentation, and negative emotions were also produced during the associated interactions. When these negative emotions gave way to a positive emotion (e.g., surprise), and the argumentation structure of interactions ceased, this gave way to transformed understanding of the science concepts. These emotional and conceptual changes were followed by displays and feelings of pride and triumph. This was an important set of findings that established interconnections between emotional changes during instruction, concomitant changes in understanding of science concepts, along with changes in classroom interactions. Later we suggest a number of future research directions that could combine the investigation of emotional change with conceptual change within single studies.

In demonstrating the complex interplay between antecedent emotions and other factors related to experiences of pride and triumph, the study extends previous research that has focused only on pride in isolation from associated emotional antecedents (Elliot & Pekrun, 2007; Pekrun et al., 2002). Previous research has posited single factors (e.g., achievement, social acclaim, level of task challenge) in relative isolation or paired combinations as elicitors of pride. We have reported the complex synergy between various factors that included social interactions and emotions of negative and positive valences as precursors to feelings of pride and triumph. This suggests that simple models that are focused on a small sub-set of variables are not adequate for explaining the production of emotion and learning in naturalistic academic contexts.

Social Dimensions Related to Pride and Triumph

Social factors in the classroom such as the high esteem ascribed to individuals who can answer challenging questions correctly were both an elicitor of pride and triumph as well as a gauge for determining if a display of these emotions was warranted. These social factors, as well as various positive and negative emotions, interacted when the correct knowledge of science concepts was exchanged for a higher social status. This trade of knowledge and status was important for the learners in this study. Clearly, the role of emotion in learning is highly nuanced, and we have reported a number of social factors that interact to produce pride and triumph during instruction. These included the justification of the public display of pride or triumph due to possession of the valued stocks of knowledge in challenging situations, peer collaboration to answer questions, and teacher and peer sanctioning of student responses to questions.

A simplistic focus on emotional displays or self-reports of pride and triumph could lead practitioners and researchers to dismiss them as signs of hubris in students. On the contrary, our results have shown that the emotional displays of pride and triumph were direct indications of students' understanding of science concepts for those students who displayed their emotions publicly and those who reported them in emotion diaries or interviews. Emotional gestures, facial expressions, and vocalizations paralleled students' developing understandings of science concepts during the course of classroom instruction. More

specifically, changes in emotional expressions such as shifts from irritated vocalizations to facial and vocal expression of surprise that were later followed by pride and triumph displays (e.g., Claim 2) could help teachers and researchers identify the emotional and learning trajectories of their students in-the-moment.

Collaborative feelings of pride and triumph. The collaborative nature of learning was not a focus of previous studies on experiences of pride or triumph. The results from our study suggest that pride is not only relevant for individual students as they achieve success in difficult tasks, but it also plays a role in strengthening the social bonds between students after successful collaboration on tasks through the exchange of science knowledge or in acknowledgment of the academic achievement of a peer (see Claims 2 & 3). Positive emotional displays between peers could prove to be useful indicators for teachers about the more general state of the emotional climate in their classrooms. They could also serve as an indicator of student motivation and engagement with tasks, since emotional experiences that lead to social bonding are likely to drive participants to seek out future encounters with similar characteristics (Collins, 2004).

Sanctioning by the teacher and peers was a key element associated with feelings and displays of pride and triumph when the student group demonstrated understanding of canonical science. This element of classroom interactions was important because it was cited by students as one of the reasons for experiencing these positive emotions. Such interactional elements of classroom learning contribute significantly to creating positive classroom emotional climates, student engagement, and for stimulating the motivation to learn (Meyer & Turner, 2006). Our results contribute to the kinds of nuanced understandings about the interplay between peer and teacher sanctions, negative and positive emotions, and science knowledge as eliciting factors for feelings of pride and triumph in naturalistic settings. The study goes some way to addressing the need for a better understanding of the role of emotional valences in science education research (Sinatra, Broughton, & Lombardi, 2014). The eliciting factors for the initial negative emotions ranged from assessment anxiety at the individual level, to interactions that produced irritation directed at peers or the teacher, to embarrassment in front of peers and the teacher. This points to multiple initiating conditions for subsequent feelings of pride and triumph that are more contextually rich than current explanations that focus on non-emotional factors such as achievement, challenge, or success (Elliot & Pekrun, 2007; Matsumoto & Hwang, 2012).

Possibilities for Refining Sociological Theory and Research on Emotions

Suzi and Alan's cases raise questions about current conceptualizations that treat pride and triumph as first-order elaborations of other primary emotions (Turner, 2007). Our results show that several specific negative and positive emotions (see Claims 2 & 3) may precede experiences of pride and triumph. Some of these preceding emotions were variations on intensities of primary emotions (e.g., irritation, anxiety). Antecedent conditions for emotional experiences add a temporal dimension to experiences of first-order elaborations of emotions. This temporality is implied in Turner's theory. For example, in outlining principles one and eight he states that people have certain outlooks about situations that are either met or not met during face-to-face transactions and that these pre-conditions lead to feelings of positive or negative emotions depending on the outcome of the interactions. Could a greater emphasis on the temporality of interactions and antecedent emotions that precede experiences of first-order elaborations help to refine future theoretical arguments?

Another question emerging from our research follows our observation that Suzi experienced negative moods prior to her expression of pride and triumph. Could the inclusion of moods in current theorizations of first-order elaborations of emotions provide another avenue for conceptual refinement?

Turner's theorization of first-order elaborations of primary emotions was developed from Plutchik's (1980) earlier investigations and theorizations of the way that primary emotions combined to give more complex emotional experiences or first-order elaborations,

as Turner refers to them. The methods used in Plutchik's work relied on college students' responses to paper and pencil instruments asking participants to rate which resulting emotions were produced from combinations of other primary emotions provided by the researcher. Symptomatic of this method was a lack of empirical evidence that emotion experiences (as opposed to emotional labels) actually combine to produce the resultant emotions in the way that Plutchik's scheme suggested. The temporality of feelings of pride and triumph with respect to other emotions and eliciting factors such as social interactions offers a possible refinement to Plutchik's suggestion that primary emotions mix like primary colors of paints. We found that pride and triumph sometimes emerged after a long sequence of complex interactions (see Claims 2 & 3). The antecedent emotions to pride and triumph could be experienced minutes before or over longer timescales (e.g., a lesson or even a term). This means that pride and triumph could be produced after a complex set of interactions over a considerable period of time.

Our finding that the same kinds of learning experiences (i.e., challenging tasks) and types of classroom interactions triggered in-the-moment feelings of both pride *and triumph* for students is also novel. This finding expanded our understandings about the related roles of pride and triumph during classroom social interactions focused on challenging tasks and students' understandings of science concepts. Micro-analysis of classroom episodes focusing on case-study students revealed that the combination of peer, Self, and teacher sanctions, level of challenge of a task, as well as a range of antecedent emotions were all important factors that eventually led to experiences of pride and triumph. Our on-going research is seeking to understand better a more complete range of classroom activities (e.g., science inquiry) that are associated with pride, triumph, and other emotions alongside students' understanding of concepts. We seek to evolve further our knowledge about the emotional changes and changes in students' science understandings.

Limitations

The naturalistic nature of this study meant that we could only report those emotional displays that were made public by students during interactions. In this way, it was not possible to extend the detailed micro-analyses of overt and covert pride and triumph beyond the four students who used gestures and vocalizations to express their emotions. Interviewing all students in the class enabled us to ascertain how they felt in circumstances related to those that elicited pride for the four overt cases. The emotion diaries also provided another method for determining more common patterns across the class. Our approach provided a high degree of ecological validity in our data sources, but for readers who are interested in statistical generalizability of results a different approach would be necessary where larger populations and greater use of high-inference instruments like surveys would be required. The dominance of survey and interview-based methods in research on emotions in education led Pekrun and Linnenbrink-Garcia (2014) to encourage researchers to adopt alternative research designs like the one we used. Widespread use of nomothetic methods is not advisable based on their suggestions for the directions that research on emotion should take. One solution would be to combine survey methods with direct observations in a single study.

Combining multiple methods to access emotional experiences was a major strength of our study. If we had relied on students' gestures and vocalizations alone, we would not have developed the broader understandings about emotions within the class that were made possible through diaries and interview data. Alternatively, without direct observations we would not have developed the depth of understanding about emotions that was achieved in the study.

Future Directions

The field of emotions research in science education is beginning to expand with complementary approaches to the ones used in this study emerging continually. Studies are

contributing understandings about the influence of emotions during interactions on learning science and teaching science (see Ritchie et al., 2013; Tobin, et al., 2013). Internationally, science education researchers and practitioners are concerned about student attitudes, interest, and motivation for studying science, both to improve the general scientific literacy of the populace and for maintaining a steady supply of scientists to sustain the profession (Fortus, 2014). Future studies could adopt the same methods used in ours to investigate how other emotions relate to classroom learning events and under what conditions specific types of emotions are elicited. Understanding which specific emotions are elicited during different science topics and within different classroom social milieu would offer more contextualized information about the role played by emotions in learning experiences including, as we have reported, students' understanding of science concepts. Our findings suggest that it could be possible in future work to investigate students' conceptual change alongside their emotional changes, either through a naturalistic research design like ours or by using standard instruments applied in pre- and post-test conditions to measure changes in conceptual learning combined with video recordings of classroom interactions.

A different line of research could focus on how students manage and resolve potential feelings such as anger, frustration, and irritation that may be aroused during extended inquiry projects. It is also necessary to understand what happens when emotions like these, which can lead to unpleasant experiences, are not managed and what effect this has on longer-term engagement with science, the extent to which students identify with science communities, and how these and other emotions impact on the choice to study science beyond high school. Addressing topics such as these could help us to understand better how student interest, attitudes and beliefs are shaped during micro-social processes of classroom interactions. This research would benefit teachers because outcomes from these sorts of inquiries could provide information about the types of interactions that foster learning through emotional attunement with students. Teachers could also learn to read the emotions of students and choose a set of actions designed to ameliorate unproductive feelings. Also necessary are studies that include students from a range of cultural backgrounds where the rules of emotional expression and the emotion labels are different from those relevant to English-speaking countries. Different cultural contexts would help in understanding whether the social rules of classrooms permit different emotional displays. Comparisons between studies conducted in different countries could help us to understand whether macro-social phenomena, such as cultural norms and policies, impact the emotions experienced and displayed by learners and how this relates to science learning outcomes.

Another approach could involve intervention studies designed for teachers and students who want to ameliorate detrimental classroom conditions by adopting strategies to assist with emotion regulation through activities such as meditation and breathing exercises. For example, excess displays of *rage* are likely to be undesirable in classrooms and teachers and students could learn how to manage these feelings to avoid any unwanted consequences resulting from an open expression of this and other unpleasant emotions. In studies of this type it would be important not to pathologize students' or teachers' emotions by conveying a belief, for example, that sensations of rage, anger and irritation imply that the individual has a problem or that these emotions should not be experienced. The focus should remain educational and centered on empowering people to choose to control their emotions if they wish to do so.

In our study, a repair ritual initiated by the teacher followed the interactions during the Q&A ritual that led Alan to feel embarrassed, disappointed, and irritated initially. This repair occurred when the teacher stated that she agreed with most of what Alan had said except for one element. This diplomatic response ensured that the social bonds between Alan and the teacher could be preserved over time, as evidenced by Alan's willingness to respond to her questions in subsequent lessons. Although a number of studies in science education that draw on interaction ritual theory have reported aspects of social bonds and collective solidarity in science classrooms (see Ritchie et al., 2013; Olitsky, 2007), these elements of

interpersonal attunement were not foregrounded in any one of those studies. Future research attention could be directed at the contribution made by different emotions to social-bond formation, disruption and maintenance in science education contexts. Emphasizing aspects of Durkheim's (1915/1964) original conceptualization of social bonds, supplemented by subsequent developments in the work of Scheff (1990), would assist in establishing their importance to the generation of concepts in science classroom. Empirical studies drawing on these theoretical perspectives could extend our current findings which establish links between student emotions and understanding of science concepts by elaborating the role that social bonds and group solidarity have to play with students' participation in science and willingness to appropriate science terminology and concepts.

Until now, studies of classroom interaction rituals in science education have reported a single form of ritual called a *first-order interaction* (Collins, 2004). These rituals occur when science symbols (e.g., concepts, materials, practices) are circulated for the first time and emotions become attached to them. An interesting line of research would be to explore second- and third-order rituals. Second-order rituals occur when an individual meets with a different group of people in a different location and shares the same symbols that were developed during the first-order rituals. A more challenging investigation would be to study third-order rituals that involve the circulation of symbols through introspection by individuals. Dissemination of symbols by individuals in second- and third-order rituals evidences the value that individuals place on those symbols. This could be important for understanding student engagement and participation in science beyond formal school settings as well as their perseverance with science learning tasks and projects.

A final direction for future investigations could be to ask students to report their emotions through open-ended diaries that do not provide predetermined emotion labels chosen by researchers. Although the use of emotion diaries was a positive feature of our study, it meant that we could only learn about the ten emotion labels that were provided for the students. Care was taken to establish a shared understanding with the class about these emotion labels, but this does not provide understandings about the students' "emotional culture" by allowing them to express themselves through their own words. An alternative approach in future could involve removing the emotion labels from the diary and allowing students to state their emotions in their own words. This approach could generate a different set of understandings than those produced by our study such as learning about the variety in student emotional vocabulary and how aware students are of their feelings. Students' self-generated emotion labels could be compared to established emotion classification systems in the literature, and this comparison would enable new connections to be made between emotions and science learning experiences extending beyond those we have reported in this study.

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Appendix A

Transcript Conventions based on Roth and Hsu (2010).

| Symbol | Meaning |
|----------------|--|
| ::: | Colons are used to indicate prolonged sound with each colon representing 0.1 second |
| (0.9) | A Number in single parentheses indicates the time, in seconds, of a pause in speech |
| [text] | Brackets indicate the start and end points of overlapping speech |
| = | Equal mark indicates the break and subsequent continuation of a single utterance |
| ((text)) | Text in double parentheses indicate annotation of non-verbal activity |
| (.) | Period inside single parentheses indicates a brief pause, usually less than 0.2 seconds. |
| <u>ExActly</u> | Capital letters show emphasized syllables |
| <<f> | “forte”, louder than usual |

Appendix B

Analysis of “Exactly it’s transfer” phrase for Irritation and Comparison to Literature Values

| Parameters | Exactly it’s Transfer | Literature Values | Control Transfer ³ |
|-------------------------|-----------------------|-------------------|-------------------------------|
| | | Cold Anger | |
| | | Scherer (2003) | |
| F ₀ (Hz) | 366.68 | ✓ | 199.85 |
| F ₀ SD (Hz) | 121.21 | Not specified | 12.79 |
| Min F ₀ (Hz) | 133.42 | Not specified | 169.58 |
| Max F ₀ (Hz) | 517.65 | Not specified | 223.23 |
| F ₁ (Hz) | 777.27 | ✓ | 751.36 |
| F ₁ BW(Hz) | 119.20 | ✓ | 716.96 |
| F ₂ (Hz) | 1838.39 | ✓ | 1912.21 |
| Intensity (dB) | 72.52 | ✓ | 54.07 |
| SR | 2.52 | Not specified | 2.82 |
| Jitter (%) | 4.62 | Not specified | 1.70 |

³ To add further support to his self-report of irritation we asked Alan to read a story script that contained the same phrases that he uttered during fragment 2 and the ensuing discussions. He read the story script in a neutral voice so that we could compare his vocalizations in the video segment of the classroom episode to the neutral utterances in order to reinforce his self-reports of emotion during the interview and in the emotions diary.