

Productive Anger? Changing Systems Understanding due to Negative Emotions

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Abstract: There is growing interest in the role that emotion plays on learning. Research has revealed that negative emotions sometimes positively effect learning; however, most of these studies focus on individual learning situations. In this pilot study, we explore how anger during collaborative learning affects students' discussion and learning. Result indicate that negative emotions could facilitate potentially productive shifts in student discussion.

Introduction

There is growing interest in the role that emotion plays on learning (Pekrun & Stephens, 2010). While negative emotions (e.g., anxiety, fear, frustration, anger, boredom, and embarrassment) have been shown to have an impact on learning, not all of them have been negative (Rowe et al., 2014; White, 2013; Pekrun & Stephens, 2010). For instance, anger can derive from interruptions of perceived goals, creating a motivation to overcome obstacles. Anger can result in increased attention to goals, others' actions, higher levels of physiological activity (e.g., increased heart rate, breathing) and aggression. However, research on the effects of negative emotions on learning is mostly related to test anxiety and boredom, and there is a lack of research on the effects of other negative emotions on learning (Pekrun & Perry, 2014). In particular, most studies focus on individual learning situations, and research on the effects of negative emotions on collaborative learning is less known. As a pilot study, we explore how anger during collaborative learning affects students' discussion and learning.

Methods

Simulation and study design

City Settlers is a whole-room immersive simulation, in which the room “becomes” (through collective imagination) a fictional shared planet on which groups of participants develop their cities. In *City Settlers*, each group can freely set their goals with given city metrics (e.g., pollution, population, and happiness) and develop strategies to achieve their goals. Four types of resources (e.g., Gold, Steel, Food, and Cotton) and three types of buildings (e.g., Factory, Farm, and Park) are available to players. Buildings are acquired through bidding – a blind auction system on a marketplace which generates random buildings to be acquired and used by the cities for their chosen goals. While students are trying to understand complex interrelationships for their city to prosper, groups inevitably cause pollution (all the buildings except parks generate pollution). If a city's pollution level reaches a certain level, the pollution spreads to nearby cities (i.e., those physically close in the room itself). We expect this unexpected problem (rising pollution caused by neighboring cities) will cause emotional changes in students, especially anger, and allow us to track how the students' group discourse is changing.

The participants were 10 middle school students recruited from a summer camp, in the mid-western United States. Seven girls and three boys of different ethnicities were distributed randomly into four groups, introduced to the simulation, and asked to start playing. They played the simulation over 1.5 hours. As qualitative exploratory analysis is considered an effective approach for developing insights into the range and phenomenology of an individual's emotion (Pekrun et al., 2002), we video recorded all four groups' game playing with the goal of identifying anger and changing discourse. As a preliminary study and with the page limitation, we focus on one group (consisting of three girls) that consistently worked on the simulation.

Coding scheme

To determine when the group of students expressed anger, we adapted Shaver and colleagues' (1987) definition that anger happens when people judge that the situation is illegitimate, wrong, or unfair. This sometimes occurred through raised voices, yelling, or screaming. In addition, to determine changes in their discussions, we also developed a coding scheme for the types of discussion enacted (Table 1). The three authors were all involved in coding and agreement was checked across 25% of the total coded turns and were found to have an agreement rate of 88%, 85%, 82% respectively (1st - 2ed; 1st - 3rd; 2nd - 3rd).

Table 1: Discussion type codes and examples

Code	Definition	Sample dialog from
What to buy	Talking about which building they want to buy.	"I want to buy a factory"
What to run	Talking about what building they want to run for the current round.	"We should stop running this park"
What to trade	Talking about what resources they want to trade with other groups.	"We'll give you anything for food"
Game state	Talking about their city status including the metrics, resources, and buildings.	"Our happiness is so low"
Other group	Talking about anything related to other groups.	"They are polluting us"
Causal	Talking about what causes what.	"If we don't buy a park, our happiness will drop"

Findings

Students exhibited angry episodes when pollution suddenly increased (a by-product of building too many factories and farms) and caused their city's happiness to decline. After noticing that pollution came from another group's city, individuals showed a hostile attitude toward that city (e.g., [Yelling] Red city! Stop it! Stop polluting us!). The results of comparing the discussion codes before and after students start to get angry reveal some interesting contrasts (Table 2). Before becoming angry, more than 50% of the discussion codes were about "What to buy" and "What to trade". However, after a group was coded as angry, there was a notable increase in "Game state" and "Other group" codes, whereas "What to buy" and "What to trade" codes considerably decreased.

Table 2: Discussion type code count before and after angry

Code	Before angry	After angry
What to buy	32%	19%
What to run	3%	3%
What to trade	20%	11%
Game state	35%	43%
Other group	6%	16%
Causal	5%	8%

Discussion

We acknowledge that there could be other variables (e.g., time, other emotions) that we didn't control which likely affected students' discussion type. However, as a preliminary examination of how students' anger could affect their collaborative and strategic discussions, this work lays a foundation for future elaborative research regarding how "negative" emotions could facilitate potentially productive shifts in student discussion. The increase in the "Game state" code and "Other group" code and the decrease in the "What to buy" and "What to trade" code after students become angry, may indicate students tried to understand and analyze the complex situation and establish strategies based on the city's needs, rather than focusing on immediate short-term goals (e.g., buying a building).

References

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