An exploratory study of middle school students’ sensemaking in a collaborative game design educational project

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ABSTRACT
The purpose of this study is to understand collaborative sensemaking processes among middle school students in a discovery based hybrid e-learning environment. Our exploratory study reports interview findings on student experiences, and contributes to our ongoing investigation of this complex social learning system. This paper is also an effort to extend the understanding of Dervin’s (1992) sensemaking model to incorporate collaborative knowledge building and associated information behaviors. Our preliminary findings identify and discuss several situations, gaps and collaborative sensemaking strategies.

Keywords
sensemaking, collaboration, guided discovery-based learning, game design, information-seeking

INTRODUCTION
Sensemaking is addressed in different research areas, including information science, communication, education, organizational studies and human-computer interaction (Paul & Morris, 2009). According to Dervin (1992), sensemaking refers to “a theoretic net, a set of assumptions and propositions, and a set of methods which have been developed to study the making of sense that people do in their everyday experience” (p.52). Dervin (1992) emphasizes the understanding of how an individual perceives a gap, how one defines the gap and what strategies are applied to bridge the gap. However, her model doesn’t explain how sensemaking happens during a collaborative process of co-constructing. Collaborative sensemaking is not included in the definition of collaborative information seeking. For example, Foster (2006) defines collaborative information seeking as “the study of the systems and practices that enable individuals to collaborate during the seeking, searching, and retrieval of information” without acknowledging how individuals make sense personally of the information and/or process (p. 330).

We situate our study in the context of a “guided discovery-based” hybrid e-learning environment to bring together the concepts of sensemaking and collaboration. This guided discovery-based learning environment provides students space and autonomy to engage in self-driven learning. The educational game design program being investigated is offered in several states in the U.S. by a non-profit organization in NYC. The task for the students is to design and program Flash games in order to provide experience that develops their digital literacy and builds awareness and expertise in STEM. Students use a range of resources in a learning management system, in order to collaborate, share files, and gain information that supplements in-class instruction.

The purpose of this study is to begin to investigate how students make meaning together in the course of accomplishing their game design projects. Understanding the ways of sensemaking among students in this hybrid e-learning environment may inform information system designs in educational and other professional domains.

RESEARCH QUESTION
In what ways do students work in teams to make sense of problematic situations that they encounter in this guided discovery-based game design program?

METHOD
In this study, we conducted two rounds of semi-structured interviews among 18 teams of 6th to 9th graders. For the analysis, we were informed by the open, axial, and selective coding sequences of Corbin and Strauss (1990), although these sequences were not followed strictly. Initial coding was conducted to discover major trends and themes and a second, more selective round of coding was completed to reveal more granular themes. Further based on identified categories, latent content analysis is applied. According to Julien (2008), latent content analysis “a way of reducing data and making sense of them—of deriving meaning” (p.121). Thus, for each selected excerpt, subjective interpretations are used to understand the meaning behind transcribed students’ utterance.

FINDINGS
Several situations and gaps are identified in which students self-report applying sensemaking strategies and practices collaboratively. The situations are categorized into two major themes: learning and collaboration management. For each situation, the result is organized and presented following Dervin’s (1992) sensemaking triangle “situation-gap-use” (p.69).
Knowledge building related situations
These situations occur when students engage in collaborative game design and programming in Flash.

- **Learning flash**
  In the situation of learning game programming in flash, our findings suggest that students make sense collaboratively via the means of constructing knowledge and information artifacts together. One student expressed “if student 1 is finished and like I need help she basically knows what to do, so she’ll just tell me to go to this like to this page and go get the code and put the instance name.” Students identify the difficulty of learning flash; however, they demonstrate their positive attitudes and responsibilities of shaping and constructing in response to the gap generated by technology (Boczkowski, 2004).

- **Constructing artifacts**
  In the process of creating flash games, some students report difficulties encountered and they indicate that group collective thoughts are helpful in making sense of problematic situations. The following instance of collaborative sensemaking was captured in the interviews. Student 1: “here. (leaning over to student 2’s computer and grab the mouse that student 1 is using)” Student 3: “that’s going to be hard to do.” Student 2: “it’s not a problem, we can just exit that out and don’t save it... just exit out.” Student 3: “we can get back on it.” Student 1: “yeah because I still got the flash drive still in it.”

- **Designing game topic**
  Students collaboratively make sense of social issues (e.g., teen pregnancy) based on experiences they share in real life and reflect their viewpoints and thoughts in constructing their information artifacts. In turn, the information artifacts reinforce their thoughts and convey meanings to others as well. Student 1: “But me and student 2, mine was teen pregnancy and so was hers so we grouped up and we thought that like we see that every day in our community and we want to make a change. We don’t want more girls to drop out because of pregnancy.”

Project management related situations
Students engaging in the process of accomplishing their central learning tasks collaboratively also learn desirable project management skills at workplace. Students discuss collaborative sensemaking as occurring in teamwork and project management, in the interviews.

- **Merging game file attributes**
  Some students report having developed their own collaborative practice procedures when merging game files that had been created as delegated tasks. For instance, teams note assigning different computers for different tasks; using one student’s wiki account for file management. One student stated: “well what we do is usually...she logs in as me cause I keep all my stuff there. I save it first and then she saves it then we just kinda like...” then her teammate continued “and then I’ll work from there.” On the other hand, some students don’t reflect to find a solution and initiate a sensemaking process of their situations together with their team members. Rather these students experience a “suspension of sense making” (Verschaffel, Greer & De Corte, 2000).

- **Time management**
  Students also indicate their collaborative sensemaking by constructing a shared plan as response to institutional constraints. Student 2: “we are about to miss...” Student 1: “uh” Student 2: “but then we’ll be done and then we will be combining files” Student 1: “we will work on that pretty soon, give it about two days” Student 2: “yea” Student 1: “and I have to do the little details” Student 2: “I assume that we’re not going to probably have half of this stuff what we are telling, but we are trying to include all of it, but we are probably not gonna have all of it” Student 1: “we probably can’t get it finished this year. But if they have it next year, we can do more.” In this excerpt, both students are undergoing collaborative sensemaking process to raise a shared awareness of what they can accomplish before the deadline.

- **Division of labor**
  In the situation of delegating roles and work, collaborative sensemaking often involves negotiating and even argument among team members. For instance one student stated “we just talked it out... we are honest with each other, so say somebody performs something better than somebody, we will tell them...” Negotiation skills play a critical role in collaborative sensemaking process and a lack of negotiation skills may lead to the failure of collaborative sensemaking processes to lead to a final, complete game and thus achievement of program learning objectives.

DISCUSSION
Students’ self-reports demonstrate how sensemaking unfolds collaboratively. Students are knowledgeable and capable actors, who continuously construct knowledge and information artifacts and make sense of encountered discontinuities. Through the production and reproduction of collaborative sensemaking strategies, new practices are being developed and enter back into the cycle.

CONCLUSION
Derived from the theoretical framework of Dervin’s sensemaking theory, we examined students’ collaborative activities in the context of this guided discovery-based game design project. Based on our qualitative study, we identified two major situations in which collaborative sensemaking occurs: knowledge building related situations, and situations pertinent to group work management. Within each situation, gaps and corresponding collaborative sensemaking strategies were reflected in student self-reports. For future studies in understanding collaborative sensemaking, we will engage ethnographic observations to
increase the level of interpretation and validity and quality of data.

ACKNOWLEDGMENTS
We would like to thank the World Wide Workshop for their active involvement in a design-based research collaborative partnership with the authors. We would also like to thank the Institute for Museum and Library Services for their funding support of this project.

REFERENCES


