

# Bridging School and Home: Students' Engagement with Technology-Rich Activities

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**Abstract:** This poster describes ongoing work that examines students use of a computer-based learning environment designed to bridge school and out-of-school learning contexts by incorporating affordances of both formal and informal learning settings. Data presented illustrate sixth grade students' use of online chat in class and at home and present an initial examination of chat interactions (in both mixed-gender and single-gender peer groups) while their agents are involved in a competitive game.

Teachable Agents (TA), an interactive computer-based learning environment (LE) called was created to promote the development of higher-order cognitive skills for problem solving in science and math (Biswas et al., 2005). Within TA students teach computer agent through well-structured visual representations that help to shape and organize student thinking. The TA environment, when combined with adequate scaffolding and feedback can provide educational opportunities for students to develop metacognitive skills and thereby improve their subsequent learning. To leverage the cognitive and social aspects of learning, several novel technological tools and features have been developed to help both teachers and students to monitor learning and to facilitate more use of TAs in the classroom and at home. TA presents students with opportunities to engage with formal classroom content in an environment that presents students with features of informal learning settings including an agent-based game context and support for distributed collaboration (chat).

One of the goals of moving the TA environment to out-of-school settings was to create an application that can help shift the standard "practice" model of homework into one that prepares students to learn when they come to class the next day. Using an online application in this TA environment, named the Triple-A Game Show, students can "play" and chat together while completing homework in preparation for the next day. Students can log on from home or school. Students teach their agent and customize its look. Their agents then participate in a game show with other students' agents online. The game host asks agents to answer questions and the agents show their thinking. Within the game show, as well as embedded throughout the LE, a chat feature was available to students (see Figure 1).

*Study Objectives.* Study One was undertaken to examine the degree to which students used the online chat feature to discuss assignment content (science content) and to examine any general use patterns occurring at home and school. The objective of Study Two is to examine the interactions between boys and girls (in both mixed-gender and single gender peer groups) while playing the gameshow.

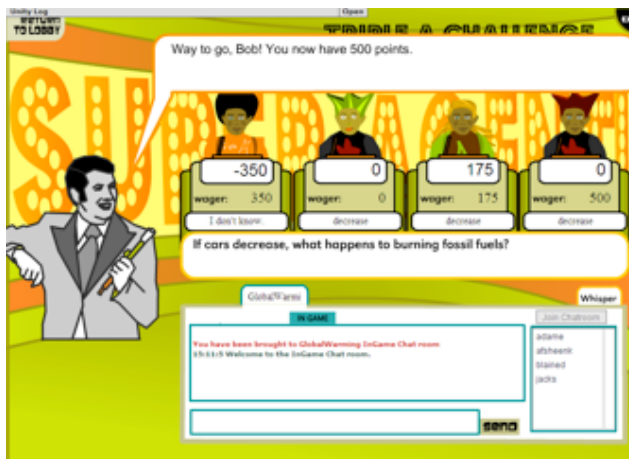


Figure 1. Screenshot of TA Gameshow.

## Study One: Analyzing Chat Patterns at Home and At School

The chat data analyzed here were collected as part of a larger study that took place at a suburban middle-school in early 2007; fifty-eight sixth-grade students participated in a three-week global warming instructional unit. The chat feature embedded within the TA environment allowed for three basic levels of conversation privacy among the participants. The first level, a lobby, is a public space that allowed for all participants to view all the text that was entered within the space. The second level (the game show feature of the environment) is a semi-public space that allowed for a fixed number of participants playing the same game to enter and to view all text entered by other students in this space. The third level, whisper, allowed for two students to instant message each other; only these two students could view the text. All of the text entered into these spaces was recorded, with informed consent from students and their guardians. Students engaged in a total of 24 chat sessions; 14 of the sessions took place in students' science class and 10 sessions took place during out-of-school hours.

The decision to parse chat logs into interactions was informed by the nature of chat dialogue which tends to contain many inter-line references where at times content is only interpretable in relation to other lines of text. Additionally, researchers' intention was to capture the extent to which the chat feature engendered discussion among students. An iterative comparative approach--in which coders frequently engaged in extended comparisons of data within and across the chat logs to develop understandings of the relationships between the data was used (Strauss & Corbin, 1994). This approach allowed the analysis team to create a typology of the chat interactions among the students and to begin to analyze their communicative aspects. Chat logs were first analyzed for content related to three primary types of content (i.e., domain knowledge and task goals (subject); the learning environment's general technical functionality (technology); and the specific functionality of the game feature in the TA environment (game)). Interactions that did not include talk related to these three types of content were deemed irrelevant, and not coded. Relevant interactions were then coded along several dimensions (results not presented here due to space) including major functions of chat (i.e., evaluative; directive; descriptive; and help seeking and giving). Also noted within each of these interactions was the students' setting (i.e., school or out-of-school), each of the participants involved (which ranged in number from 1 to 7), the level of privacy in which the text appeared (i.e., lobby, game show, or whisper), and the number of total lines of text entered across an interaction's participants.

Results indicate that out-of-school settings engender more discussion overall from students (i.e., more interactions). These interactions included more students and were longer indicating that not only are students discussing more, there are different, more desirable patterns of interaction produced in the out-of-school setting. A total of 1483 relevant interactions were identified. Within each of these relevant interactions, 1021 of interactions occurred out-of-school, and 463 of interactions occurred in school. Across all of the chat logs, 19.4% of the 19,941 lines of text were deemed a part of a content relevant interaction, a higher percentage of which were produced out-of-school (30.5% vs. 18% in school). An average of 1.9 students participated in each interaction across all 24 chat sessions. The number of participants per interaction was significantly higher when students were out-of-school than in school ( $p=0.015$ ). Overall, 1.5 students participated in each school interaction, and 2.1 students participated in each out-of-school interaction. Finally, students' interactions tended to be longer when they were not in school ( $p=0.162$ ); there was a greater number of relevant lines of text per interaction when students were out of school.

## Study Two: Interactions During Competition

Study Two comprised a secondary analysis of the interactions identified in Study One. Interactions were analyzed for comments that were: competitive/aggressive (any talk of who will win, who will lose, top scores, challenging other students, bragging about scores; can contain aggressive, intimidating tone and/or words), teasing (any instances where students are made fun of for their status within games), self-deprecation (any belittling remarks directed toward themselves), and encouraging/complimenting (any kind of encouraging talk, could be complementary of work done or standing within game). Interactions containing comments that met the definitions above were given one or more codes to capture the presence of any of the kinds of talk defined above. A total of 419 interactions took place while the students were playing the game show, 242 (58%) of which fit into the aforementioned categories.

Talk amongst boy-only and girl-only interactions is very different in tone (see Table 1 below). Although competitive talk is expected to occur, when boys played games with other boys, almost five times as many competitive or aggressive interactions took place than when girls played games with other girls. Examples of the single gender boy statements include: "u goin down", "prepare to lose", and "on the contrary. it is you who dies". In addition, interactions containing teasing occurred more often in boy-only interactions than in girl-only interactions. Examples of teasing statements in interactions include: "your name and background suck" and "lol [you're in] last place". Meanwhile, self-deprecating comments occur twice as often among girl-

only interactions than boy-only interactions and encouraging comments were identified in more than twice as many girl-only interactions than boy-only interactions. Examples of self-deprecating statements made by girls include: “i better not screw up again”, “my person is stupid [student talking about her agent]”, and “i suck”.

When boys and girls interact, girls actively participate in aggressive discussions. Boys made the majority of teasing statements within these interactions, however, and they continue to make far fewer self-deprecating comments than girls (see Table 2 below).

Of all the interactions taking place via the whisper function (N=35), 86% are girl-only, 8.6 % are boy-only, and 5.4% are mixed-gender. The whisper feature provides a private place for students to talk and share evaluations of themselves or their ability in science without outside viewers and comments; this appears to be an especially appealing feature for girls.

**Table 1. Interactions by Category and Gender Composition**

<b>Interaction Categories</b>	<b>Single-Gender Boys</b>	<b>Single-Gender Girls</b>	<b>Mixed Gender</b>	<b>Total (n=419)</b>
Competitive/Aggressive	61 (14.5%)	13 (3.1%)	39 (9.3%)	113
Teasing	20 (4.8%)	3 (0.7%)	19 (4.5%)	42
Self-deprecation	9 (2.1%)	17 (4%)	10 (2.3%)	36
Encouraging/Complementing	6 (1.4%)	14 (3.3%)	6 (1.4%)	26

**Table 2. Percent of comments made by boys and girls in mixed-gender interactions**

<b>Type of Comment</b>	<b>Boys</b>	<b>Girls</b>
Competitive Statements (N=204 across 39 interactions)	52%	48%
Put Down Statements (N=54 across 19 interactions)	70%	30%
Self-Deprecating Statements (N=18 across 10 interactions)	28%	72%

## Conclusions

These results are preliminary and ongoing analyses include linking individual students’ participation in the chat sessions to classroom achievement. Additionally, analysis of the function of students’ contributions to interactions (or moves) described above (evaluative; directive; descriptive; and help seeking and giving) is ongoing; this analysis is based upon a sequential analysis technique which many researchers argue is necessary in order to understand how students are making meaning of knowledge representations embedded in the environment, discussion, and science concepts that are being coordinated in activity (Suthers et. al., 2007).

There are three important aspects of this work. First, in designing engaging computer-based technologies that connect school to out-of-school settings via the web and then examining the influence of setting on patterns of students use, this research contributes to a growing literature on how to leverage aspects of formal and informal learning contexts including extended, more inclusive interactions out-of-school. Second, the context of the study has implications for researchers interested in embedding game-type activities in educational materials with a goal to increase student engagement. Specifically, Study Two documents chat comments that point to different patterns among boys and girls engagement that have implications for how designers conceive of individual students’ motivation. As games and online learning environments continue to be part of science instruction, an increased awareness of the dynamics that are structuring students’ participation in technology-based activities can benefit teacher, designers and developers as they seek to create safe, engaging spaces for all students. Third, this emerging research illustrates how chat supports students’ collaboration as part of their use of a complex science learning environment.

## References

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