DATA GAMES—TOOLS AND MATERIALS FOR LEARNING DATA MODELING

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OVERVIEW

Students playing computer games generate large quantities of rich, interesting, highly variable data that mostly evaporates into the ether when the game ends. What if in a classroom setting, data from games students played remained accessible to them for analysis? In software and curriculum materials being developed by the Data Games project at UMass Amherst and KCP Technologies with support from the National Science Foundation, data generated by students playing computer games form the raw material for mathematics classroom activities. Students play a short video game, analyze the game data, conjecture improved strategies, and test their strategies in another round of the game. The video games are embedded in *TinkerPlots* and *Fathom*, two data analysis learning environments widely used in grades 5–8 and 8–14 respectively. The game data appear in graphs in real time, allowing several cycles of strategy improvement in a short time.

RESEARCH QUESTIONS

- Students' conceptions of data that come from games: To what extent do students view the data as the result of a production process and does this conception have the same sort of affordances as repeated-measures contexts for interpreting data in terms of signal and noise?
- Data structures: How do students view data, especially when they encounter data that do not fit into rows and columns (e.g. a binary tree of choices in a game)? What data structures are appropriate to introduce in middle school and, similarly, in secondary school? What type of user interface might mediate students' interactions with these data structures so that the structures are not barriers to data exploration and modeling?
- Data visualization of large data sets: How do students' understandings, interpretations, and interactions with data change as a function of the size of the data set? What are the affordances of the various enhanced visualizations we develop in helping students explore and analyze data, especially large amounts of data?
- Collaborative learning and data sharing: To what extent do the mechanisms the project builds for web-enabled collaboration and data sharing enhance classroom activities? What are the strengths and weaknesses of these mechanisms?

MATHEMATICS CLASSROOM ACTIVITIES

Data Games will create and test ten activities for use in middle school mathematics and ten more for use in secondary mathematics classrooms. Each activity: lasts from one to five class periods; begins with brief play of a computer game embedded in Fathom or TinkerPlots; focuses on analysis of the data produced by playing the game with the goal of producing a data model of game play that can improve game strategy; builds mathematical and/or data analytic understanding through the data modeling.

SOFTWARE

Data Games will result in new versions of Fathom and TinkerPlots that: handle embedded Flash components and receive data and other information from them; allow data structures other than row-by-column; provide new visualization techniques driven by data modeling of game data but suitable for many other kinds of data as well; make it possible for students to share game data and collaborate on data projects.

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