Introduction
Enrollments in computer science programs are declining, especially for women and minorities, while demand for IT jobs is increasing. Game2Learn targets novice students by presenting computing concepts in a less intimidating setting, while leveraging the interactivity and motivation of games (Garris, 2002).

Several games have already been developed; however, the games were disjointed and there was no formal delivery system. Capella’s Song is a online meta-game that will provide a common link for Game2Learn games while also maintaining detailed statistics on the student’s overall progress. Team-based motivation will encourage students to do extra homework.

Background
The PUMP Algebra Tutor (PAT) is an intelligent tutoring system that teaches algebra. PAT offers constant feedback and help; and tracks student progress using skill-meters. Capella’s Song allows the student to reflect on their progress with use of PAT-style skill advancement.

Whyville is a web-based cooperative learning game that teaches a variety of subjects. Players complete mini-games to earn currency that can be used to customize their character’s appearance. Capella’s Song will allow character customization by using in-game currency in a way similar to Whyville.

Research
Capella’s Song needed a way to communicate with all of the Game2Learn mini-games; previous games logged students by writing to a flat text file. These files were difficult to interpret and required a specialized text parser for each game’s logs.

To remedy this, I developed a standardized XML log format. Game2Learn games can now record each activity, what topic it covers, and its cognitive domain level; based on Bloom’s Taxonomy of educational objectives. The logs also provide useful information like interaction timestamps and position information.

The Capella’s Song game world is represented as a 2D map. Small pictures on the map represent missions and towns. Selecting a mission will launch a mini-game in a separate window. Addition of new content is made easy with a Capella’s Song map editing tool.
Impact

Future Game2Learn games will share the same logging format; this will help not only the developers, as there are many examples, but also allow bootstrapping of the data. We will be able to see common mistakes and identify problems.

Incorporation of Bloom’s Taxonomy will encourage Game2Learn developers to think about the pedagogy used in their games. It will also allow us to compare the game’s tasks to real world problems.

The Capella’s Song meta-game serves as a content delivery system. Players can download and play all of the games online. By making the Game2Learn games more readily available we can increase the student’s exposure to valuable learning tools.

Run-time compilation has limitless opportunities for Game2Learn games and introduction of traditional assignments will insure the students get real coding practice.

Conclusions

Microsoft’s gaming development IDE, XNA, and Visual C# are well suited for creating educational video games.

From past projects we have learned that educational video games need to be designed with a solid pedagogical foundation in order to be effective; and that game players are motivated by feedback and skill progression. Judging the success or failure of an educational game requires detailed logs and data mining. XML proves to be the ideal format because of its standardization and ease of parsing.

An online meta-game is a good delivery system for educational games. Collaborative learning is a powerful educational tool and the online nature of Capella’s Song will permit group work. We hope that students will not mind doing more homework because they will be more engaged.

To increase exposure, educational games must be readily available to students and educators. Including traditional homework assignments as part of the Capella’s Song meta-game will increase the acceptance of Game2Learn as part of a computer science curriculum.

Future Work

Future Game2Learn developers should consider what topic and Bloom level their games will incorporate before development. These games should take advantage of run-time compilation to provide students with interactive problems that use real programming languages.

An intelligent tutoring system should be created to parse student game logs and suggest help. This system should also suggest what games the student should play based on what Bloom level the student is on for each topic.

A study should be performed on a CS1 course. The students in this class should play Capella’s Song instead of traditional homework.

I predict that students will be more engaged in the coursework and learn the same, if not more, than in a traditional CS1 class; the retention rates of the students in these classes should also be monitored.