Human Computing Interaction: Blended Learning with Culturally Situated Design Tools

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ABSTRACT
Culturally Situated Design Tools, CSDT, allow students and teachers to explore mathematics and computer science with depth and care, using cultural artifacts from specific times, places, and cultures. Currently there is a large disparity of minorities with interests in mathematics and computer science fields. The use of CSDTs allows classrooms to target these disparities by using a unique approach. This will be explored using an intricate game system in order to teach fundamental subjects of Computer Science. The tool is designed to teach Abstraction. In the current version of the tool, it uses a set of scenarios and tools to explain the overarching themes of abstraction. In this paper, we scrutinize the use of the video game-like system and the ability to create a system of familiarity while also adding a more juvenile element. This should encourage students to actively become involved in the project while simultaneously learning this and any future course material.

Categories and Subject Descriptors

H.5.3 [**Group and Organization Interfaces**]: Collaborative Computing- Computer-supported cooperative work.

General Terms
Human Factors; Performance; Design

Keywords
abstraction, blended learning, video games, user interface

1. INTRODUCTION
Computer Science is often regarded as an extremely daunting field. Often due to this inherent complexity, especially within the age groups of K-12, there is a relative correlation between assumptions that are made of this field and a desire to go into it. Furthermore, it is acknowledged that often minorities groups, which includes women, are less likely to venture forth into Computer Science at a collegiate level, often due to cultural stimuli.

Due to these evident disparities, a wide range of tools and classroom models were developed in-order to counteract these problems. The CDST project is specifically designed to create a multitude of models and tool sets for varying classroom environments. While there are other examples utilizing blended learning in classrooms, this will directly combine alternative classroom models with alternative tool sets. Currently, one of the initial forays into creating a developed tool is through the use of Multimedia Fusion 2(MMF2) to create a game detailing the basic concept of abstraction. This will serve as one of many models to gauge juvenile perceptibility of complex ideas using simple tools meant to create an engaging environment while actively dispelling negative connotations.

2. METHOD
This research focuses on utilizing existing classroom environments as well as blended learning, mobile learning, and online classrooms to monitor changes in educational receptivity among students K-12. This will be accomplished using complex tools to create simplistic, in understanding, interfaces to better minimize STEM misnomers while providing information.

In this instance, the tool will be visualized using scenarios meant to teach the concept of Abstraction. Students will be provided with the computer game, through use of MMF2. The interface itself is relatively simple and should not cause any undue problems with students.

2.1 *CS Principles*

Working in conjunction with the CS10K and CS Principles Program, there are identified areas that are important to address. These include, "A rigorous, creative, alternative new first course in computer science for high schools and college. Introduce central ideas of computing. Computational thinking practices. How computing changes the world. Engage and emphasize creativity."

2.2 *Identifying Purpose*

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Most research is focused in the area of CSCW after researchers from various academic disciplines realized that computers should be designed according to the user's needs and that various technological designs and efforts can greatly benefit from the input of others in the areas of cognitive science and humanities. This has lead to a new theory of user- centered design. In turn this project has a few focuses of interest.

2.3 Areas of Interest

Usability of collaboration tools and the effects on novice computer users. Such as Human Computer Interaction in regards to user interfaces. Integration of CDST tools into a classroom setting. Usage of CDSTs vs. traditional teaching models. Effects of gaming incorporation into a classroom setting.

2.4 Data Collection

An implemented method of collection will begin during live school semesters. It will consist of a Pre-Test asking a range of questions from broad to specific, detailing information regarding to the project. This information will be on understanding and aptitude of complex subjects within mathematics and computer science. Following this format select classes will be integrated with models, including that of teaching the basics of abstraction using the game creation program Multimedia Fusion 2. After successful inundation of the curriculum with CDSTs, students will be given a Post-Test, similar in format to the Pre-test. These answers will be compared to establish a trend in whether or not the CDSTs were effective. This is in conjunction with a control group talk with traditional teaching models.

3. FUTURE WORK

Following the successful completion of the CDST detailed with teaching the basics of Abstraction, the next step in the process will be to teach more complex scenarios within the same field. The slated project will be to create a game, most likely using MMF2, which will have the user/student create their own abstraction methods and successfully navigate levels of increasing difficulty. A website will also be created to house all CSDTs, including mathematics and the broader computer science curriculum, in order to create better access for teaching and testing purposes.

4. CONCLUSION

We plan to implement better tutorials, lesson plans, and mini-tests in order to teach each, oft maligned, subject to it's fullest. As well as creating dynamic CDSTs that will benefit not only students but teachers in their roles. Computer games are very popular among children and adolescents. In this respect, they could be exploited by educational software designers to render educational software more attractive and motivating.

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