Teaching Students, Grades 5-8 Computer Programming With Bootstrap

PROPOSED RESEARCH PROJECT

Introduction

A pilot study of the Bootstrap Program was conducted at an Elementary School in Laramie, Wyoming during spring semester 2012. This after-school class is targeted at middle school and late elementary school students. Its purpose was to identify inherent problems with the teaching of content, designed for late middle school and high school students, to a younger demographic.

Since the pilot study, research into courses similar to Bootstrap has been conducted, and information on the benefits of teaching students computer programming at an early age has been collected to strengthen future proposals for implementing Bootstrap into class lesson plans.

Currently the design of testing material for future semesters of the Bootstrap program is underway with the purpose of collecting data on students’ understanding of the concepts taught in computer programming and their ability to use said lessons.

What is Bootstrap?

Created by Emmanuel Schanzer, Bootstrap is a supplemental Mathematics and Computer Sciences course. Bootstrap teaches students concepts in trigonometry and algebra, as well as in basic logic and problem solving, through the design of a computer game.

The course spans over nine separate units, ending with students presenting their finished game and providing a tour of their code to their peers.

Statement of the Problem

This study will investigate the feasibility of teaching 5th to 8th grade Laramie students Mathematics with computer programming by assessing students on their ability to write and translate their computer programs into mathematical equations.

Why a Pilot Study?

The pilot study helped pinpoint certain problems with the Bootstrap curriculum, as well as technological problems that need to be overcome before the continuation of the project in the spring semester of 2013.

The Pilot Study

Bootstrap's Teaching of Mathematics:

There is only a small portion of the lesson within Bootstrap that directly deals with students “translating” code into mathematical equations. This can be overcome with frequent class discussion of the Racket code as well as the introduction of worksheets that drill the students on the topic.

Student Experience:

Since the students range form 4th to 8th graders, their experience with mathematics and the use of computers is varied. This leads to some students becoming bored and unproductive while others become overwhelmed and shutdown. This can be overcome with more aides in the classroom assisting the students with problems, leaving the instructor to provide more challenging content for those students who are ahead.

Absences:

The current lesson plan does not allow much room for absence; in which case students can fall behind very quickly if they miss a lesson. This can be overcome with the initial planning of “make-up days” to allow students who have missed class to make them up. The pilot study was on a very strict schedule which did not allow for this.

Cheating:

The current system that allows students to access their code from anywhere without installing a program has caused small issues with cheating. This can be overcome with the help of more aides, as well as a better understanding of the software in use.

Importance of this Study

Currently, methods of testing students' understanding of computer programming and the use of mathematics throughout the Bootstrap course is being designed. It is important that these assessments do not deter students from participating in the class, since it is currently a voluntary after school program. At the same time, these assessments need to provide information which will help to refine future lessons, as well as provide data which may assist in the implementation of smaller lessons into preexisting classes in Laramie schools.

Importance of this Study

As computer programming continues to invade every aspect of our lives, it is important that students learn its importance and its wide range of functions.

By introducing students to computer programming at an early age, they may have more time to understand how to utilize it in a variety of applications, and hopefully begin to develop unique ways of writing code beyond the scope of what is currently in use.

It is also important to continuously develop methods of teaching. With the use of computer programming, students have a novel medium in which to learn mathematics, as well as other topics such as biology, critical thinking, and even arts.