

A study of the effectiveness of game-play techniques and the “gamification” of education for 1st grade students

Academic Research Thesis

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This proposal document contains information about the research portion of the graduate thesis. The educational testing module contained herein will be used as a foundation for the research portion of the academic paper, and for testing the following thesis statement:

“Through the use of game-play techniques within an educational setting, first grade students will be able to understand and complete second, and possibly, third grade mathematics lessons. The increase in mathematics skill will be attributed to the use of tangible rewards, effort-based achievement systems and interactive game-centered scenarios. These physical and virtual acknowledgments of successes, when delivered through a balanced reward system, will increase a student's involvement within the classroom and lead to a greater absorption of the information taught.”

This research study is being conducted as part of a Graduate MFA Thesis in Game Design by Chad Fillion for the Savannah College of Art and Design. Currently it is available to any interested participant who has been offered the opportunity to become involved. The study is currently closed to the public.

As accurate research is a critical component to the thesis paper itself, it is designed to be a manageable level of data to process. Information will come from voluntary participants brought into the project on an invitation only basis for the initial phase. If the test results and research suggests that continued and further testing should be performed, larger quantities of participants may be invited to participate.

Results of the findings will be published in the MFA Thesis, with plans to use the case study as a basis for future academic papers, journal submissions, seminars and lectures. Once the initial thesis is published, the information and data will be made publicly available for anyone interested.

Project overview

Though the label “Gamification” is a fairly new concept, the idea of inserting game-play into a classroom as an educational tool (gamification) has been in use in classrooms for decades. The study presented here is projected to provide empirical data and insight into the effectiveness of using gamification, and its ability to accelerate the learning path of students. The theory is that students involved in a gamified education setting can learn more advanced material easier. By harnessing their natural ability to retain complex ideas while the brain is “at play”, understanding and absorption of the material taught will be greater. Though this study is a localized study, the basis of the findings here may be used for a broader study of similar capacity to further support the thesis.

Foundation

Using mathematics as a basis of the study, students will be exposed to material outside of the normal curriculum of a standard first grade classroom. After the program is completed, the results of the study will be compiled and reported on. This small segment of test takers and timeframe will be a solid foundation for which extended study can be based on. Secondary test opportunities may be conducted if further data is required.

Twice a week for eight (8) weeks, sixteen different topics will be taught. (A full review of the topics selected is detailed later in this document.) Extensive time on any given topic should also be avoided, aiming for a single topic on each day, with a dual review held at the end of each week to review both topics covered. At the end of week four (4) a general review should be given on topics taught to date. During the final week a general review should be given for the last 4 weeks, as well as a final review of all topics.

Criterion

At the start of the study all participating students will be asked to answer, to the best of their ability, various mathematical questions to gain an initial understanding of their individual abilities. Using a standardized test packet on day one, consisting of first grade through third grade topics, each student’s answers will provide a

baseline from which we can rate their knowledge in the subject matter. Collectively we will be able to also establish a mean for all 1st grade students involved in the study.

After the initial testing is complete, classrooms will be selected, at random, to be either a “test” classroom, or a “control” classroom. Each classroom type will follow the same curriculum package to teach, but use different methods and testing scenarios. For the sake of the teachers administering the program, we will not combine control and test within the same room for fear of cross contamination of the data results.

Control

Control classrooms will use standard teaching methods, making a conscious effort to avoid gamification and game-play techniques wherever possible. Excessive game play and gamification may skew the results so teachers will be asked to refrain from using “play-based” lessons and exercises as much as possible, trying and minimize the exposure of game-play during the research period. In the control setting, general lecture style explanations and worksheet review of the material should be used to educate the children.

Variable

Test classrooms will follow the same provided curriculum, but offer a variety of gamification techniques to engage the students. In addition to the in-class (analog) game-play methods used, teachers will be given digital tools to assist in the teaching of the curriculum. A comprehensive digital game will be created to accompany the gamified class and should be used as a bonus supplement to augment the standard curriculum.

Summation

Each student’s initial grade and test results will have been cataloged into a database. At the end of the eight (8) week period, the same tests will be given to the students again to complete. These secondary grades will be compared to the initial grades, and used as a comparison for each student’s growth on an individual basis. In turn, the test results of the control group will be compared to the variable group. The theory is that the students with the gamified learning experience will score higher on the second review paper overall, retaining more of the teachings from the lessons than that of the control group.

Process outline:

The nine (9) week outline of the program consists of sixteen (16) topic days, and a single final exam day. Example outline of the schedule is listed below:

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
Day 1 (Tuesday)	Baseline Topic 1	Topic 3	Topic 5	Topic 7	Topic 9	Topic 11	Topic 13	Topic 15	Final Exam
Day 2 (Friday)	Topic 2 Review	Topic 4 Review	Topic 6 Review	Topic 8 Lg. Review	Topic 10 Review	Topic 12 Review	Topic 14 Review	Topic 16 Lg. Review	

Testing material covered

The selected topics listed here do not necessarily represent the full spectrum of topics a first, second, or third grade student would learn in class. For example: number charts, patterns, place values, roman numerals, order of operations, decimals, rounding, skip counting, measurements, and division are all areas that have been removed from this research proposal. As time is already limited to the 16 available hours, including too many topics would tax the process and could burden the students. A broad selection of various topics to be reviewed is listed below:

First Grade Overview

- Fractions: $\frac{1}{2}$, $\frac{1}{4}$
- 2D geometry
- Count by 2, 3, 4, 5, 10
- Analog time: the hour & half hour
- Greater than / Less than / Equal
- Sum & Difference (single, double/single and double digits)
- Adding 3 numbers (single & double digits)
- Coins: 1, 5, 10, 25 cents & adding to get dollars

2nd & 3rd Grade Overview

- Three digit sum / difference
- Time: minutes after / till
- "Adding is multiplication"
- 3D geometry
- Make change from dollar
- Adding money - 3-4 items from a list
- Multiplication: $\times 2$, $\times 3$, $\times 4$, $\times 5$, $\times 10$ ("groups of")
- Fractions: subtracting from the whole, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{8}$

Initial Review Workbook

The review workbook students will be asked to complete will be a series of 8 worksheets, each corresponding to a week within the program. The premise is that each page will contain two subjects, both corresponding to a single hour of lesson time within the program. Though the initial workbook will only cover each topic with four or five examples, the lesson themselves will be more thorough.

Topic Lessons

Depending on the classroom style, each topic will be covered as a lecture, or an interactive lesson. A review worksheet will be provided for control classrooms, and some form of interactive game, lesson, tool or app will be provided for use in the test classroom. Non-digital games, as well as digital games, will both be utilized as tools for teaching the topics covered.

Running game-play

In the test classrooms there will be a running game in place to help encourage students to do better. This game will be a combination of competitive game-play, as well as encouraged advancement game play. Students will compete against themselves to better their own scores and times, earning tangible rewards, classroom "bonus" opportunities, and virtual achievements. In addition to the individualized path for each student, there will be a small level of competitive play in place to use as a catalyst to encourage more involvement within the class.

General questions

Who

- Any invited first grade teacher who is interested and works at a school willing to participating in the study.
- Any invited Parent/Guardian of a first grade child willing to participating in the study.
- Any invited facility or institution with first grade aged children willing to participating in the study.

What

- Administer a provided baseline mathematics review for each child.
- Work with children for two (2), single hour sessions on a weekly basis for nine (9) weeks. (18 total hours)
- Discuss and teach each lesson from a provided curriculum, and “review” each lesson with a provided exam.
- Work with the children in either the “control” environment or “test” environment as described within the research study requirements.
- Submit graded results for each review and exam through an online portal for data analysis to be conducted.

When

- Participation may take place during any nine (9) week period so long as the final week ends on June 5th
- Consecutive weeks are requested, with an understanding that winter and spring break will not be used, or counted towards the nine (9) week requirement.
- If winter and spring break fall within the study dates, the research test period will be considered 11 weeks long.

Where

- Participation in the study should be performed in the normal school environment.
- No testing/review should take place outside of standard school hours, or on the weekends.
- If participants are not affiliated with a school, a classroom like environment should be provided for the learning

Why

- Taking part in the academic study helps to provide research data for the topic being studied.
- Upon completion of the program, and proper submission of all test data, leaders will be presented with a certificate of completion, a copy of the completed test results for analysis, a copy of the final thesis paper, and a signed personal letter from the thesis author.

How

- Participation in the study is a voluntary commitment to the nine (9) week program.
- Participation within the study is an acceptance to teach/administer the provided curriculum to the students.
- Each classroom environment will be designated, at random, as either a control or a test environment.
- Full curriculum and testing materials will be provided to each teacher/administrator.
- All results will be entered into an online grading portal on a weekly basis.

This study is being conducted by **Chad Fillion** and is part of his MFA Thesis in Game Design and Interactive Development for **The Savannah College of Art and Design**. It is not open to the general public and all contents are Copyright © Chad Fillion, 2014-2015. To reach Chad directly you may contact him at cfilli20@student.scad.edu or via phone at **603-969-1123**. For additional information on the thesis and the associated project and academic research, please visit <http://www.phlume.com/chad/mfa/thesis/>.

Gamification comparison for 1st graders

Research component for MFA Thesis

Baseline Workbook

Goals:

Gain a baseline understanding of all student's abilities with basic mathematics.
Review current 1st grade math understanding.
Introduce 2nd and 3rd grade mathematic principals.
Not right/wrong. Used to gauge level of understanding for Day 1.

Process:

Custom booklet with a 10-12 pages of exercises reviewing numerous math topics.
Work with Time, 2d Shapes, 3d shapes, Multiplication, Addition, Subtraction, Numbers, Fractions, Money, Counting by X (2, 3, 5, 10), <=>,
Each workbook assigned an alpha numeric cataloging system to anonymously identify students.
Prepend #TE (Test Env) or #CE (Control Env) onto the naming convention for cataloging each class
Example(s): John Smith, Born August 16 could be: **1TE-816-jsmi** or **3CE-jsmi816**
Students should be encouraged to complete what they know, and skip as needed.

CONTROL Environment (CE)

Goals:

Provide general learning direction in all areas of exercises from initial workbook
Use standard worksheet-based lessons/review to teach advanced topics.
No games, game-play, rewards, or incentive should be used at all for the control group.

Process:

Teachers should take 30 minutes of class time twice a week for duration of experiment.
Lessons should be on Tuesday or Wednesday. Review is 48 hours later.
Day 1 - Lesson is used to teach the advanced topics. Standard Lecture only
Day 2 - Review to test retention of topic. Provided worksheet only.
Each lesson is equivalent to a single "leg" within the experiment game.
Each review page is equivalent to a "final test" within the experiment game.
Same workbook cataloging system should be used on all lessons/papers completed.

EXPERIMENT Environment (EE)

Goals:

Provide interactive and fun learning opportunities for all areas of exercises from initial workbook
Use Game-based learning in a computer based, or within an analog environment.
The use of games, gameplay, rewards, and incentive should be used often in experiment environment.

Process:

Teachers should take 30 minutes of class time twice a week for duration of experiment.
Lessons should be on Tuesday or Wednesday. Review is 48 hours later.
Day 1 - Lesson is used to teach the advanced topics. Gameplay scenario encouraged.
Day 2 - Review to test retention of topic. Interactive interface "legs" encouraged.
Each lesson is equivalent to a single "leg" within the experiment game.
Each review page is equivalent to a "final test" within the experiment game.
Same workbook cataloging system should be used on all lessons/legs completed.