CONNECTING TO PROGRAMMING THROUGH GAMES

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ABSTRACT~ *Code combat is an innovative gamification approach that focuses on teaching and learning coding and programming by writing programs to the game code editor to control the game object.The purpose of this paper is to illustrate how code combat can be used to teach JavaScript programming language course to young ones with little or no coding experience. Because programming is perceived by the vast majority of people as a difficult concept to learn, the paper provides a structure for integrating Code Combat sessions into class activity to better illustrate the programming concept. The main concepts of programmimg, coding and the general syntax of Javascript programming language is what Code Combat will help impart to student. This paper provides 10 basic steps in preparing a course outline that gives teachers and researchers ways to implement code combat in education curriculum, breaking it into levels that meet the topics of the programming langauge JavaScript.*

Key Words~Programming, JavaScript, Game based learning, Teaching, Strategy.

1.1 INTRODUCTION

The traditional approach to education which relies explicitly on lectures and teacher-led demonstration is mainly perceived by student as a boring routine and a repetitive procedure. The traditional long approach to learning now acquires a somewhat inferior result relative to modern and more engaging methods. The demands for an increasing amount of student knowledge, skills and engagement calls for more innovation and improvement to education techniques that would improve, engage, refresh and motivate students learning experience.

Analysis of the several teaching methods has been opposed by the teachers and student's perspective and experience. However, teaching methods are largely influenced by the subject area, educational views and the class room structure. This paper discusses how JavaScript programming language can be thought to young ones with little or no coding experience. The focus of the traditional teacher-centered approach where student learns by lectures and direct instructions methods mainly to pass test and for assessment purpose will not involve student in programming to acquire, visualize and experiment programming concept.

To evolve to a more responsive and interactive form of teaching bettersuited for the subject to involve student in their learning process, a student-centered approach is presented where student have more engagement and in-class participation as the

teacher guide along the learning outlines. A gamified approach to the curriculum will significantly increase student engagement, participation, motivation, help student visual abstract concept, gain fluency with the language by reason of use, improve student thinking and programming skills and produce more familiarity with the program syntax.

Gamification process creates a model for an abstract representation of a real life concept. It helps is simulating theories while the concept is being learnt. It also helps introduce new concept and foster a better understanding of the concept being learnt.

JavaScript is one of the most popular programming languages. The main implementation of this language is WEB-application that is very popular today. JavaScript programming language and Java programming language are unrelated and are very different in their semantics. Therefore, they should not be confused as being same. However, there are some syntactic and standard library semantics similarities. JavaScript programming language is not limited to the web only. Its function extends to environments that are not web-based.

An instructional game type of software (Code Combat) will be adopted to teach JavaScript programming concept for this project. Software that are instruction-ally made for computer program, there are designed to deliver instruction and to assist in the delivery of instruction on a specific topic. These types of software's sole purpose are to support instruction and/or learning. There are 5 types of instructional software:

1. Drill and practice
2. Tutorial
3. Simulations
4. Instructional games
5. Problem solving programs

Instructional games have been of great value in increasing motivation by implementing and adding games and rules to simulations. These categoriesare different in some ways to drill-and-practice and also to simulation software because its gives a source of entertainment and the potential for competition and winning.

1.1 Motivation

On the other hand, all over the world, students are becoming less interested in science. In computer science, for example, according to Crenshaw et al. [1] and Kelleher [2], the number of students is shrinking. Moreover, "colleges and universities routinely report that 50% or more of those students who initially choose computer science study soon decide to abandon it" [3, page 39].Our university experiences the same phenomenon with a decrease of 16.6% over the last four years in students studying computer science. Therefore, in the computer science education research field, there is an important area directed to the recruitment and retention of students [4]. A promising way explored by this specific research is using games to teach and learn programming [5]. It allows students to better learn in a familiar and playful environment. Moreover, it promotes collaborative learning and spurs student to learn. We propose to study if serious games, which can be collaborative learning games, could be of value in order to teach programming and to attract and keep computer science students. The question is: Is it interesting to use a serious game for teaching programming? To achieve this goal, we propose the methodology of design experiments [6]: "prototypically, design experiments entail both "engineering" particular forms of learning and systematically studying those forms of learning within the context defined by the means of supporting them. This designed context is subject to test and revision, and the successive iterations that result play a role similar to that of systematic variation in experiment." The intent of

this methodology in educational research is to investigate the possibilities for educational improvement by bringing about new forms of learning in order to study them. Because designs are typically test-beds for innovation, the nature of the methodology is highly interventionist, involving a research team, one or more teachers, at least one student, and eventually school administrators. Design contexts are conceptualized as interacting systems and are implemented with a hypothesized learning process and the means of supporting it. Although design experiments are conducted in a limited number of settings, they aim to develop a relatively humble theory that targets a domain specific learning process. To prepare a design experiment, the research team has to define a theoretical intent and specify disciplinary ideas and forms of teaching that constitute the prospective goals or endpoints to student learning. The challenge is to formulate a design that embodies testable conjectures about both significant shifts in student learning and the specific means of supporting those shifts. In our experiment, the theory we attempt to develop is the process of learning programming through serious games. In this paper, we discuss how to build a design context that will allow us to construct several conjectures to test our theory about an original form of programming teaching.

1.2 Significance of the Studies

The significance of this study is to see how teachers can prepare a good course out line to teach JavaScript using instructional tool that is code combat. This study will contribute to the benefit of the society at a whole, considering that programming and coding plays a very important role in science and technology today and JavaScript being one of the popular programming languages available. The greater demand for graduate with programming background justifies the need for

effective, life changing teaching approaches that is better and well plane course outline to teach programming. Thus school that will apply the recommended approach and course outline design derived from this study will be able to train and teach student programming and JavaScript in the best possible way.

1.3 Aim and Objetives of the Study

The aim of this research is to allow students learn and practice programming methods using JavaScript programming language.

While the objectives are to:

1. Use a JavaScript basic methods in developing the game;
2. Use Conditional Statements (Logic statements) in the process
3. Implementation through Iterations (Loops)
4. The game is going to be integrated to class room session to help visualize the topic concept as they are being taught

1.4 Problem Statement

1.4.1 *Problems of Using Game Base Learning To Teach Code Combat*

Many problems are associated with using game to teach student of different age. So also with using code combat to teach JavaScript Examples of such problems are need for computers. To implement instructional games in education process, it's required the use of computers and availability of such is an issue. Many schools have computer labs that are not sufficient for the number of student or may not have the computers at all. This can be a big problem to implement the use of code combat to teach JavaScript and the required outline. Students are expected to be paired in groups and teams for them to work collaboratively in the lab

and the absence of good computer or the availability of computers will hinder such from happening.

Need for internet connection is another big problem associated with teaching JavaScript using code combat. Code combat is an online game that is web-application so to have student access it there is need for internet availability, good internet speed and good connection. The schools have to have a good bandwidth for steady internet connection and good internet speed because lack of such will led to lag that is a noticeable delay between the action of the players and the reaction of the server. These shows that there is need for internet availability and good internet connection

Another problem of using code combat to teach JavaScript is that of real world problems are not presented or are different to simulation game. Code combat teaches the basics of JavaScript but not all parts of it are thought in the game. Many commands only exist in the game world which are fine in game world but does not apply to the real world. Teacher have to make sure that student learn the basic and apply what they have learn to the really world to always making the game world to server as the really programming.

Problems also associated with using code combat to teach JavaScript is that of addiction, these make the student to focusing on getting every point, rewords, and marks. Making them to forget about the purpose of team work and also, from a past activities to the detriment of new activities and learning. The potential for these issues can be reduced by careful planing by the teachers and controlling the students to make them focus on the objectives of the curriculum and the studies. The rewords and marks also should be look at so that student will not forget about the objective.

With all the achievement and success of using games for education, the impact of using game base learning and the use of commercial games in education has drown many questions among researchers and educators alike. Questions like how can they be use facilitate student learning and how best can it be integrated in the curriculum? As regarding to the result of this question, there are no considerable bodies of literature available on game base learning in the schools and classroom and the benefits of this for education and learning. This has become a big problem to educators and researchers around.

Game are not necessarily the best cost effective means and option available for schools with low or a very tight budgets and source of income, implementing games require the use computers, tablets and other specialized technology as well as the use of internet. There may be a need to add more personal and train teachers and also the need of additional infrastructure which cost a lot of money and becomes a problem for school to make use of them.

2. LITERATURE REVIEW

Games impact for education purposes has been extensively studied for over a decade. Several authors' present a comprehensive model for games and learning that integrates gaming methodology, games cultures, and educational game design.Majority of work done has been on the comparisons of game integrated conditions, non-game traditional conditions and integrated games on how they affect and enhance learning. Each text presents a slightly contradictory view. Nevertheless there are also some similarities in the various work done. However, its often uncertain whether players are learning while they are having fun. Thus, gettinga unanimous result on the effect of games for learning is a bit difficult.

Honey & Hilton, 2010; Martinez-Garza, Clark, & Nelson, 2013; Young et al., 2012 [2] acknowledges the potential of games to learning but also acknowledges the unevenness of systematic evidence for games as learning tools. Studies has also revealed the potential of digital games to support learning in terms of conceptual understanding (Barab et al., 2007; Klopfer, Scheintaub, Huang, Wendel, & Roque, 2009).[3] Games helps develop a good process skills and a way for constant practice (Kafai, Quintero, & Feldon, 2010; Steinkuehler & Duncan, 2008).[4] Vogel et al. (2006) [5] found that games and simulations leads to higher cognitive outcomes and attitudinal outcomes than traditional instruction. Learning components in games are often referred to as higher-order thinking and social skills (Schaffer, Squire, Halverson and Gee, 2005) [6].Game based learning and integrated gaming methodology emerges from the realization that content mastery is insufficient, though still very important. Instead of providing contents, games may be designed to provide rich and meaningful contexts for developing higher order thinking and social skills (Thomas & Brown, 2011) [9].

3. MATERIALS AND METHOD

JavaScript is a programming language for web pages. It adds lots of functionality and interactivity to websites (Styles, animations, dynamics etc.). JavaScript should not be confused with Java programming language. Both programming languages could be passed off because of their name but they are different. They have different syntax, semantics and uses.

Educational game software's are designed for educational purposes. This type of game are incidental for learning and they create value by helping people learn a particular subject, reinforce concepts and also improve learning skills by

involvement with the game. While learning takes place, game provides fun, involvement, interaction, structure, motivation and reward.There are various types of games all of which satisfy the fundamental need for learning: video games, board game and card games.

Code Combat involves writing codes to the code editor to control the game object. This is all about procedures. The aim of the student while playing the game is to complete the level tasks. Level task involves maneuvering through the game to defeat sword-toting enemies, collect gems and invest the collected gems. These tasks are increasingly tricky and involve cleverly written program codes. The codes command for completing each level task will range from commands like program call methods, variables, conditions and loops. Students progress along the game level is highly indicative of their understanding of the programming methods and also a measure that the student has gained while playing the game

The method that was use in this study is Game Base Learning. Correlation study was applied to investigate the relationship between each level of the game and to see how it will help in teaching the required course. Courses are specially designed for teachers and use in the classroom. Students' progress linearly, uses standard heroes, and will always have the correct equipment equipped. Students also have access to help videos for each level to help them if they get stuck. Teaching strategy of Game/Experiments/Simulation was employed to help in designing the the easy ways of impacting knowledge. Game/Experiments/Simulation provides a unique way of teaching and gives the student a great platform for learning and be in control of the environment to play with.

3.1 Teaching Strategies

They are many teaching strategies that are used in teaching today. But for this study Game/Experiments/Simulation strategy is employed. Strategic teaching is a way of making decision about a course, an individual class, or even an entire curriculum, beginning with an analysis of key variables in teaching situation. These variables may include characteristics of the learners, learning objectives, and instructional preference of the teachers. Today's students have grown up playing games ranging from computer games to mobile games and interactive tools such as internet. Games gives student opportunity to study real life problem in a safe environment and it makes learning very easy our focus is on games as a tool of teaching in this study.

Gamification Details is an important approach to learning. It's the act of interjecting games or games design to a subject that is not intended for game purpose to make learning process more fun and collaborative. According to TATA Interactive System (Gamification in Learning), [1] the gamification process entails:
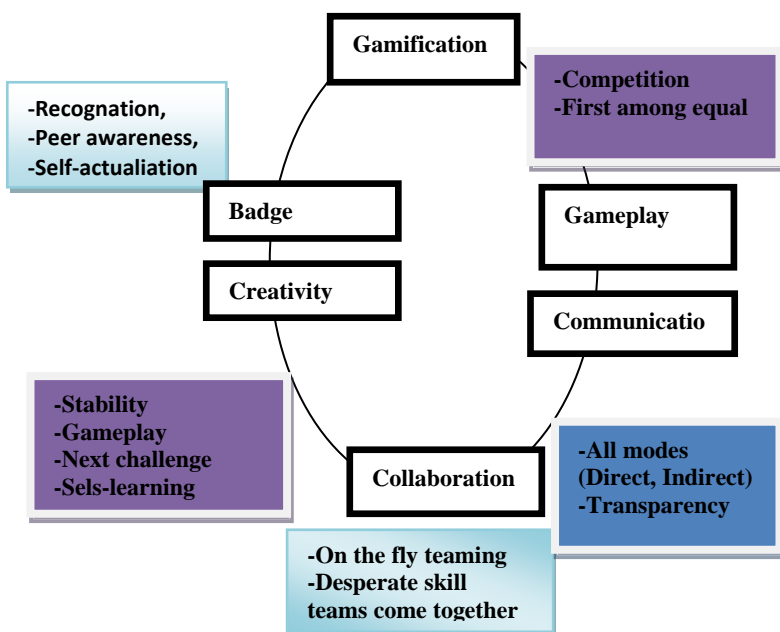

Figure 1: the game configuration

4. RESULT

4.1 Steps in designing a course to teaching code combat

1. Set up Objective:
i. Know the basic of syntax of JavaScript that is understands statements, variable naming, whitespace, and other basic JavaScript.
ii. Know the operators basic that include multiplication, division, addition, concatenation, increment and decrements.
iii. Know condition code that include if/else statements and flow control.
iv. Know loops that let you a block of code a certain number of times they include for loop, while loop, do while loop.
2. Decide what game to be taught
    We have chosen code combat as the tool of teaching in this study.
3. Learning outcomes

    Define the goals of the course and clear statement of knowledge, competence or skills you expect the student to learn or acquire at the end of the course. (Example, at the end of this course student should be able to know the basic syntax of JavaScript.)

4. Course content

    This entails the layout of the description of the topics to be address in the course, a graphical notation of the course or a concept map.

5. Break objective down into challenges
    These objectives are broken down in to multiple levels of challenges which are:
i. KITHGARD DUNGEON

    Time of study 1-3 hours

    This covers syntax, methods, parameters, string, loops and variable.

ii. BACKWOODS FOREST

Time of study 2-6 hours

Which covers if/else statements, relational operators, object properties and input handling

iii. SARVEN DESERT

Time of study 4-6 hours

Which covers while loops, break, arrays, string comparison and finding min/max.

iv. CLOUDDRIP MOUNTAIN

Time 4-6 hours

Which covers objective literals, remote method, invocation, for loops, function drawing and modulo.

v. KELVINTAPH GLACIER

This covers advance techniques.

Once a certain number of challenges have been accomplished then move to the next level.

6. Design rewards

Prizes for completing or winning a game level may include certificate, snacks, small prize and grades

7. Build game

Work out the rules for the game and print or assemble the right component that will help in setting the game up. In this case make use of the computer laboratory to access and make it available for the student to work with. Although this can take a bit of time and even some money, good quality pieces are reusable and exciting for student to work with.

8. Test game

This is very important step! Have your game tested and look at issues like fun (engagement), ease of play, how long the game takes should also be taken care of and most importantly, the integration of learning objectives into gameplays if possible administer a pre- and post-test on material to be able to learned before and after the game.

9. Run game

Students are to play in teams or individual. Don't let them sort themselves into teams. Assign them randomly or make sure they are balance in terms of experience with the subjects.

5. CONCLUSION

Several literatures has revealed that gamed based learning approach produces a more superior result to learning, than the traditional teaching method. While the traditional teaching method focuses on teacher lead instruction using a direct teaching approach, game based learning offers a more interactive, participatory, engaging and an easy approach to learning.Well, the concept behind gaming idea is to make learning feel and look different. In light of these findings, this paper integrates Code Combat session as an instructional tool to the learning curriculum. Because most games are designed for content mastery, the course outline has been structured in such a way that goes inline with the objective of the game and the varying levels. The teacher is guided by a 10 step teaching approach that outlines steps in designing a course. These steps progresses in such a way that teaches JavaScript from the basic syntax to a more advanced concepts using Code combat.

Teacher supports and guides the student as they progress up the game levels. Each level of the

games brings a complex and challenging programming methods and approach. The task becomes increasingly tricky and involves more improved coding methods. The course outline and the teacher support will help the student walkthrough these challenging stages. This will not only involve the student to gaming and having fun but also help the student learn the subject; JavaScript programming language and several other important programming concepts.

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