A March Towards Constructionism based on Storytelling, Gaming and Collaboration

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Abstract

This paper describes a model based on learning by new and innovative methods including learning through storytelling, learning by gaming, learning by doing, learning by teaching, involving collaboration, etc. There are three activities developed for the Sugar environment, which is an open source software that can be run on any platform, that complement our educational model. These three activities are Food Force II, SocialCalc and Newspaper. Pilots were conducted where these three activities were implemented and results were obtained about how well these activities fit into the present educational system and help in removing to some extent the deficiencies that exist in this system.

1. Introduction

Epistemology is the construction of personal standards for telling fact from fancy, truth from fiction, and certainty from doubt. Ontology is the construction of theories of what exists. Ethical constructions remind us of what we think we should do even if we don't want to, and why [1]. Every person possesses these qualities but hardly any two people agree on them. Today around the world, most children view education as a repulsive phase that they must endure. We have a long way to go before children's right to pursue truth is seriously

recognized. While the theoretical layer of didactic methods has advanced, unfortunately, in much of the world's formal education systems, there has been little progress. Newer concepts like 'edutainment'[2] have been introduced in order to engross the child in activities that are considered educational and because of the present curriculum, tedious. David Cavallo mentions in his paper 6 Models of Growth[3], "a major reason for the lack of change in education is not due to lack of ideas about learning on a micro or individual level, but rather is due to a lack of models for growth and change at a macro or systemic level."

Technology can undoubtedly bring positive changes in the educational systems around the world. The computer serves as a powerful tool for getting new pedagogical approaches into the system. But, while getting computers into the hands of more children is undoubtedly of benefit, the question remains, "how does one maximize the learning that occurs?" The question often is framed in terms of teacher-centric methods (Instructionism) versus child-centric or learning-centric methods [1]. We should be striving for a "learning-centric" approach, where teachers mentor students as they engage with powerful ideas, "teaching less and learning more."

Although there have been many educational models introduced into the system, none of them can be said to have been completely successful, each with varying degrees of progress. The problems with these models range from ineffective large scale implementation of models, little attention paid to systematic change, isolated experiences that do not influence the whole system[3], inadequate stress laid on the substance that is replicated from small scale models to large scale ones, etc. These educational systems lay more stress on bookish knowledge, rather than the knowledge that a child imbibes, leaving him/her without any practical knowledge or understanding of the subject.

It is important to give children access to knowledge—through media such as electronic books, the world-wide web, and multimedia, etc. We also should try to skew the odds toward children and teachers appropriating this knowledge by putting it to use and engaging in critical dialog. This can be achieved by giving them tools that put them in the roles of consumer, critic, and creator within the context of a learning community. One of the forces being unleashed by the one-to-one computing initiatives—where children have access to computing "anytime" and "anywhere"—is the change in the way software developers and computer-makers think about the education industry. A combination of strong and capable leadership—by technologists and epistemologists—and cross-community collaboration is necessary to ensure that the ideals of freedom, sharing, open critique, and transparency will be part of the interface to learning that touches children in the world's classrooms. While community collaboration may seem unrealistic from the vantage point of a model of economy as a machine, which individuals are single-purpose cogs wheels and gear,

collaboration—and the resulting synthesis of ideas—is the most efficient means of invention and subsequent development.

2. Proposal of a New Model

In this paper we propose a new model, for the educational system existing in India, which concentrates on and resolves the following issues–integration of the formal education system comprising of teaching a fixed curriculum via textbooks in a teacher-led classroom, peer to peer sharing of information i.e., collaborative interaction of students and teachers in order to learn by discussing, teaching, and development of community leadership skills [4].

Constructionist learning is inspired by the constructivist theory that individual learners construct mental models to understand the world around them [5][6]. However, constructionism holds that learning can happen most effectively when people are also active in making tangible objects in the real world. In this sense, constructionism is connected with experiential learning and builds on some of the ideas of Jean Piaget [7][8]. Seymour Papert defined constructionism in a proposal to the National Science Foundation entitled Constructionism: A New Opportunity for Elementary Science Education as follows: "The word constructionism is a mnemonic for two aspects of the theory of science education underlying this project. From constructivist theories of psychology we take a view of learning as a reconstruction rather than as a transmission of knowledge. Then we extend the idea of manipulative materials to the idea that learning is most effective when part of an activity the learner experiences as constructing a meaningful product."[9][10][11]

Learning by doing in a broader sense signifies a method where children are taught concepts and simultaneously they are given chances to apply them in real-time scenarios. Performing tasks practically makes it easier for the children to grasp a concept and helps retain it for a longer period of time. Educational games based on this learning concept itself can prove to be an important and versatile way to harness a child's untapped potential and gauge his true ability [12]. The concepts to be taught in class can be logically implemented in a game. Teaching by gaming will not only engross the child, but also give him reason to explore further on his/her own account.

Learning by teaching designates the method introduced by Jean-Pol Martin that allows pupils and students to prepare and to teach lessons, or parts of lessons. Learning by teaching should not be confused with lectures by students, as students will not only convey certain content while choosing their own methods and didactic approaches in teaching classmates, but also learn in the process,

which is the main objective. Neither should it be confused with tutoring, as the main objective of learning by teaching approach is to concentrate on the process of increasing knowledge by exchanging ideas [13].

In this model, it has been proposed to give lessons to children in the form of stories also. The huge potential of this approach lies in the fact that children are able to relate very closely to stories. Researchers have proved that if abstract concepts to be taught are articulated in a meaningful way in the form of stories, then it can create a long-lasting impression on the minds of children [14]. Also, children tend to learn better when they willingly try to understand a concept and teaching through stories is one interactive way to grasp a child's curiosity.

The present system offers little choice of subjects, that too only in the senior secondary grades. The division into different streams too is more often done on the basis of marks rather than choice. Offering the child more flexibility in these areas would actually enable him to think of what he/she really wants [15].

We aim to achieve the ideals established by the above proposed model through the introduction of a few activities developed for the Sugar environment, a shell on the basic Linux operating system. This model concentrates on three open educational resources games which are interactively educational platforms that concentrate on mainly three objectives: incorporating our model into the current formal education system such that it helps in removing at least to some appreciable extent the existing deficiencies and complement further in achieving the objectives it was laid down for, accessibility of information which is a serious issue in the classrooms of India today achieved via peer-to-peer interaction and collaboration among students and teachers through an integrated mesh network and lastly, development of community leadership skills that comprise of the skill set of a person to recognize, understand and effectively address the issues affecting the community. These games primarily focus on diminishing the existing deficiencies in the present educational models all around the world by collaborative, joyful and self-empowered learning. This paper describes how these educative games can be seamlessly incorporated into the present curriculum and how this can help to develop a thought process in the children that not only familiarizes them with a few concepts of their academic syllabus but also prepares them for real life situations and tackling them skilfully.

Previous attempts at major education reform have foundered on the impossibility of rewriting all textbooks and retraining all teachers simultaneously, on the blank incomprehension of parents, and on political opposition to these new-fangled ideas [1]. Sugar gets around these obstacles by not confronting them. In particular, Sugar can provide the collaborative experience we associate with the Internet, without changes to textbooks or

curricula, and without major retraining of teachers. New textbooks will come in due course, and teacher training will eventually catch up. With computers and Internet, children can show parents what they are learning.
In this model we concentrate on three open source activities that can help in the implementation of this model. The three activities are Food Force II, SocialCalc and Newspaper.
These activities can be downloaded at:
Food Force II: http://seeta.in/j/products/6.html
SocialCalc: http://seeta.in/j/products/socialcalc-on-sugar.html
Newspaper - http://seeta.in/j/newspaper-feedback.html

2.1 Food Force II

The basic infrastructure of the game is like this – The game has a leader of a community and a child who is the protagonist of the story. The child is daughter/son of the leader. The daughter/son of the leader is supposed to work for the betterment of the community. He/she is put into various scenarios, given various challenges to meet. Through these challenges and tasks, the practical knowledge of children is tested. The lessons are given to children in the form of game chats between different characters. The elderly person generally plays the role of a mentor for the children and hence guides them through these challenges and tasks.
The teachers can incorporate simple lessons in form of stories to train the students in that particular subject. The lessons to be taught to children can be included in the form of a storyline and a game-play can be structured around this storyline. The children will have the power to give shape to this story as they will be the ones controlling the game. This can further increase the participation of children. Chats between game characters are used as a medium to narrate the story and hence the lessons to the children. This process can definitely teach children to tackle with real life problems involving optimization of limited resources, crisis management and sustainable development.
This method has two major advantages over the conventional form of teaching. First, the children are able to practically implement what they learn which results into a much better understanding of the concepts than it could have been by reading textbooks in classrooms. Second, the various challenges in the game provide the teachers and instructors a medium to test the knowledge and understanding of the children, making them think more innovatively, developing community leadership [12] and hence discover their weak areas. Moreover, this can be achieved with the willingness of the children which is another advantage that ensures enjoyability of children.

To analyze the impact of learning through storytelling and Food Force II in particular, we did comparative studies of children. We went to different schools to demonstrate and get feedback from children and teachers.

The content in Food Force II is meant for children in the age group of 9 to 14 years. So we implemented our pilot tests on the students in this age group. All the students were divided into three groups A, B and C.

Group A students played Food Force II. It was observed that they were actively engaged in a varied activity. Students also shared tips and trading skills, while playing. Group B students were given a lecture about urban issues. They absorbed this information in a routine passive manner. They regurgitated this knowledge on paper rather than applying it in any dynamic context. Group C students were given books to read and understand about urban issues. Group C students learned at a rather slow pace in comparison to the students of other two groups. They were given very little freedom to manage the content and pace of their learning. It was observed that these students performed in isolation and couldn't share their knowledge.

At the end of this session, all the students were given a questionnaire based on cognizance and logical reasoning. Questions based upon logical reasoning were for testing the ability of children to apply reasoning to various things learned in game play like trading, collaboration etc. Questions based upon cognizance were for testing the ability of children to perceive, or to be conscious of events, objects or patterns and cognitive reaction to a condition or event.

The results of this test proved that students who played Food Force II had scored better than students who learnt from books and lectures. It was also observed that the students were eager to learn by playing the game rather than the old traditional passive methods. Not only students but also teachers were highly impressed with this innovative method of learning. Some teachers even recommended this new education tool as a part of their academic curriculum.

2.2 SocialCalc

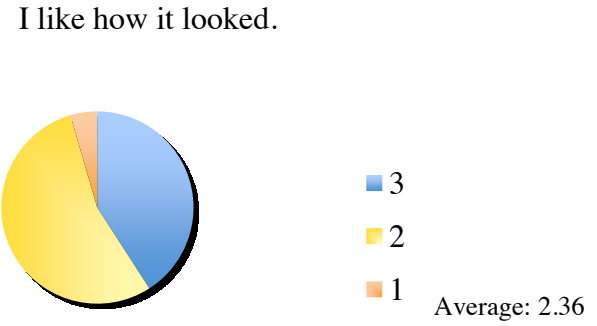
SocialCalc is a spreadsheet activity for functioning in the Sugar environment, OLPC's software paradigm. The main idea of the Spreadsheet activity for the Sugar environment is to include features that would enable children to make easy use of the typical features of Spreadsheet activities such as Organization, Tabulation, Graphing and simple Calculations [18]. The most unique feature of SocialCalc is Collaboration, the ability to support sharing of data over the network and multi-user editing. Interoperability is another feature that distinguishes SocialCalc. It supports interoperability between SocialCalc on

Sugar and Excel (.xls format) and SocialCalc on Sugar and Lotus Notes (.wk3 and .wk4 format) [16][17].

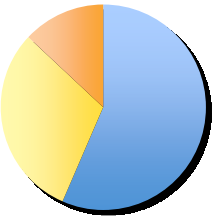
An XO laptop pilot program was initiated at the Cambridge Friends School in Cambridge, MA under a Harvard College Research Program headed by Katelyn Foley. They worked with 4th grade students. 27 students and 2 teachers received XO laptops. By reviewing 4th grade syllabi and meeting with teachers to discuss curriculum, they chose a bundle of 44 activities that would complement existing lesson plans. They developed several new lesson plans, including a matching game with states and capitals and a creative writing assignment.

As part of the laptop pilot, they piloted the activity SocialCalc which was then recently developed for the XO. They conducted these pilots in partnership with an Indian software development company, Software for Educational, Entertainment and Training Activities (SEETA). A survey was developed and an interview protocol to gauge how children navigate this program and what features they find effective or ineffective. The first half of the semester consisted of teacher training workshops and in-class activities designed to introduce students to the XO laptop. During the second half of the semester, activities were developed using SocialCalc and then implemented into the classroom. One example was a social studies activity in which students discussed common stereotypes and explored their meanings through online research. They collected and organized related data using different types of charts in SocialCalc.

The survey was given to 4th grade students at the end of the fall semester. 23 students took the survey, which consisted of four statements with ratings and an open-ended question about a new feature they would add to SocialCalc. Survey results are presented below (3 is positive, 2 is neutral, 1 is negative):

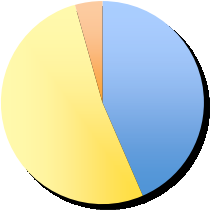


I would use this on my own, if given the chance.



Average: 2.04

It helped me do a better job on my assignment.



Average: 2.39

Features they wanted to include are – the graph should have numbers, the ability to pick color and font, not have it say an invalid or illegal string was identified, ability to pick colors of bars, erase one letter if you press erase and not all, etc.

The feedback given by students demonstrates neutral to positive responses to the first four statements. The statement "It was easy to use" received the lowest score, indicating that this age group found this program challenging. Trends in new features include an emphasis on choice. Students wanted more control over font and chart colors. Although the font can be modified, chart colors are randomly selected every time a graph is loaded. In addition, students were confused by error messages when they did not select the correct data set. It might be helpful to have more specific error messages that allow students to understand how they can correct errors. Three out of 23 students stated that the program did not need improvements. These results were used by the SocialCalc developers at SEETA so that the next release could address these issues.

2.3 Newspaper

This activity was developed to support the development of community newspapers and publications, thereby encouraging the development of an eco-system based on the foundation of sharing of ideas and active collaboration among the community members. The inspiration for this product came from three schools in Limpopo province of South Africa [19]. The learners from Mmaweshi, Driehoek, and Katane schools created their own newspapers and wrote articles dealing with issues that are important to them. They shared their newspapers with their communities to inform them about their schools and lives. It has content design and formatting capabilities. It has the option of five set of newspaper templates. One can use the "Create your own template" tool to create layouts of your choice through different sized and formatted text and photo boxes. It has the ability to share these templates without the internet when using a hardware device supporting mesh networking capabilities. We can also import pictures from the clipboard, load additional fonts that are related to the newspapers, share the newspapers with other community members without the internet, using mesh networking capabilities.

An important pilot study was conducted in Sagweshi village to help with the project. A local named Ronnie was employed to help carry out this pilot. Ronnie had studied journalism at university and was then unemployed, much like most of the area. Mmaweshi Primary School [19], which has been most promising with the newspaper, really took advantage of what Newspaper had to offer. Slowly, the learners' articles were developing proper headlines and conclusions. Using our explanations for the newspaper as a base, Ronnie had been able to help the kids understand their purpose for writing better.

3. Conclusion

Till date, many educational models have been proposed and implemented, none without merits and deficiencies of its own. In a step towards improving these models, we proposed a new educational model that emphasized befriending learning through gaming, storytelling and collaborating. This new model incorporated the ideals of constructionism, while keeping secure the already established system of teacher-led classrooms. To supplement this model, three activities developed for the Sugar environment were introduced. These were Food Force II, SocialCalc and Newspaper. Each of them was separately implemented and then surveys were carried out to gauge their usefulness and

bring further improvement in them. Many more such activities are being developed at SEETA [20].

4. References

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