# **G54GPP**

# **Project Proposal**

# *Literacy games for Key Stage 1 children with dynamic difficulty for individuals produced by machine learning techniques*

## 



## **Oliver Bodinar, Lawrence Cate, Robert Sadler**

## Background and Motivation

Literacy education is an essential part of the primary school curriculum but many pupils underperform in this key area. Tackling this issue and boosting literacy at a young age could have a dramatic positive impact on pupils’ overall education. The traditional methods of teaching will always have a role to play, but schools should also consider new ways of teaching made possible by developments in ICT. Schools are slow to adapt due to a variety of factors and even if they do have modern resources they are not always able to use them in the best way. Educational games can be developed to allow teachers to achieve educational goals effectively using technology and there are many existing products available.

RM/RW - The most ideal way to teach children is that each child has their own personal tutor to teach the child one on one at their own pace. However this is not practical as there are not enough resources[]. The traditional classroom became the default method of teaching, with one teacher standing at the front of the classroom conveying information at a set rate for the whole class. This method has not greatly changed even with the evolution of technology, with classrooms still following the same format. “Slate evolved to paper and paper evolved to tablets”, it isn’t really different, it’s just technology doing the same thing in a shinier way” (Grey, 2012). However, one of the new techniques are educational computer games.

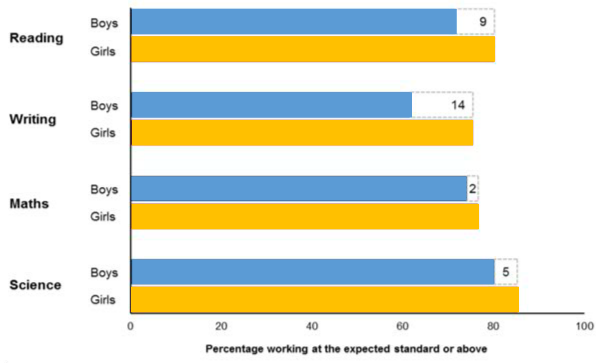
Computer games have made their way into the classroom as a way of interactive learning, but have their own problems. Looking at the existing market, *BBC Bitesize* (BBC, 2017) is the most commonly platform within the British school system. These games lack replay ability, and have a fixed structure with little replay ability, as well as lacking variety. A small selection of games which would only be ideal for one single session. Other commercial products such as *KidsSpell* (KidsSpell, 2017) and *Purple Mash* (PurpleMash, 2017) both follow the same format, but have a larger variety of games. The former however is based upon *Adobe Flash Player*, which is soon to become an unsupported plugin[], as well as being incompatible with IOS devices which have an 75.64% share of tablets and mobile devices market (StatCounter, 2016/7). Schools are increasingly acquiring iPad’s in particular for educational purposes. *KidsSpell* also includes adverts which are inappropriate for children (KidsSpell, 2017).

Expanding beyond the issues with educational games, to the issues with education as a whole. Taking data from the 2017 Department of Education report (Education, 2017) identifies a problem with the current mindset towards teaching. Education quality is assessed on whether a child reaches an expected standard which is set by the government.

**Figure 1 Figure 2**

**Source:** (Education, 2017)

Of the charts in Figures 1 and 2, there is a clearly visible problem. For reading, **49%** (Education, 2017) are not at the appropriate level set by the government for their individual ability , and for writing, it is **48%** (Education, 2017). Nearly half of all children in Key Stage 1 within England are either below or above the standards, indicating that students are left behind or held back. This is a problem with the traditional teaching method, as the curriculum is designed for the average as opposed to the individual. Nearly half of pupils have their education compromised in some manner. Another issue identified within the data, is the discrepancy between boys and girls (Figure 3). Using the traditional teaching techniques, girls outperform boys considerably.



**Figure 3**

**Source:** (Education, 2017)

In short, the “one size fits all” (Wilshaw, 2012) approach does not work for a vast proportion of children. To attempt to address this problem, we want to use the developments within Machine learning to provide a personalised educational experience. We want to produce a set of browser based Literacy games with an AI foundation designed to be played on iPads. The game’s will have a dynamic difficulty, i.e. the difficulty of each session that the child plays of a game will be based on their previous performance. As a child progresses through the games, the games will adapt. If a child struggles with a certain area, then the words within the games will evolve to focus on what they are struggling with. Likewise, if a child is excelling with certain words, the games will increase in difficulty to challenge them more. The games will change with the child, with a constant aim of increasing their literacy ability, but at their own pace. The goal is that no one will find anything too easy, or too hard. (Cody, 2012)

## Aims and Objectives

The aim of our project is to create a software game for school pupils that teaches them key literacy skills and adapts to their individual learning style, whilst also providing feedback to their teacher.

This dissertation project builds upon one group member’s G52GRP project entitled “Savannah School” which produced four literacy based games with fixed difficulties, but the teacher had the ability to see statistics on each child’s progress.

Aims:

* To produce a set of fun educational literacy games
* The games must have an educational value
* The overall system should provide a personalised learning experience
* Teacher should be able to monitor each pupil’s progress

Objectives:

* To produce 9 professional HTML5 based games compatible with iPad’s
* Each game must be part of the curriculum, and will test either Reading, Spelling or Phonics.
* To Produce a teacher’s portal to monitor each child’s progress
* Implement Machine Learning techniques to provide a personalised experience
* Thorough user testing with children to assess practical application and benefits
* Ability for the games to be played as individuals, but also as a group activity.

## External Aspect and Impact

With a specific external focus on a local primary school within Nottingham, as well as applying IBM’s machine learning tools for educational use.

The greater impact is the research into whether the approach we take is successful, and the practicality and benefits to such a system. The impact could attitude to education as a whole. This project will be a proof of concept, and an evaluation of the general theme of machine learning in education.

## Workplan

Workplan is made up of an overall Gantt Chart with specific milestones.

## Milestones

|  |  |
| --- | --- |
| **Milestone** | **Date** |
| Website | 30/10/2017 |
| Nine Educational Games | 13/11/2017 |
| Unique Login System | 20/11/2017 |
| Teacher’s Portal | 20/11/2017 |
| Machine Learning | 19/02/2018 |
| User Testing | 16/04/2018 |
| Data Analysis | 24/04/2018 |

Gannt Chart

See Following Page.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Dates:** | 19/10/2017 | 16/10/2017 | 23/10/2017 | 30/10/2017 | 06/11/2017 | 13/11/2017 | 20/11/2017 | 27/11/2017 | 04/12/2017 | 11/12/2017 | 18/12/2017 | 25/12/2017 | 01/01/2018 | 08/01/2018 | 15/01/2018 | 22/01/2018 | 29/01/2018 | 05/02/2018 | 12/02/2018 | 19/02/2018 | 26/02/2018 | 05/03/2018 | 12/03/2018 | 19/03/2018 | 26/03/2018 | 02/04/2018 | 09/04/2018 | 16/04/2018 | 23/04/2018 |
| Nottingham University |  |  |  |  |  |  |  |  |  |  | Holiday | | | | Exams | |  |  |  |  |  |  |  | Holiday | | | |  |  |
| Local Primary Schools |  |  |  |  |  |  |  |  |  |  | Holiday | | |  |  |  |  |  |  |  |  |  |  |  | Holiday | | |  |  |
| **Tasks:** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| General Research |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| School and Council contact |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Equipment Gathering |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ethics and Proposal |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| New Website |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Update Original Games |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Improved Stat. Tracking |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Add New Games |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Secure Login Account System |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Teacher/Admin portal |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Multiplayer Tasks |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| User Avatars |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Game testing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Interim Report |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Word recognition M.L |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Specialised word selection M.L |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Machine Learning Testing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| User Testing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Data Analysis |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Presentation of data |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Acceptance Testing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

# Bibliography

BBC. (2017). Retrieved from BBC Bitesize: http://www.bbc.co.uk/education

Cody, A. (2012, July). Retrieved from Education Week Teacher: http://blogs.edweek.org/teachers/living-in-dialogue/2012/07/could\_school\_be\_both\_too\_easy\_.html

Education, D. o. (2017). *Phonics screening check and key stage 1 assessments in England.* Department of Education.

Grey, C. (2012). *Digital Aristotle: Thoughts On The Future Of Education.*

KidsSpell. (2017). Retrieved from Kids Spell: http://kidsspell.com/

PurpleMash. (2017). Retrieved from Purple Mash: https://www.purplemash.com/login/

StatCounter. (2016/7, September). *Tablet Operating System Market Share United Kingdom*. Retrieved from http://gs.statcounter.com/os-market-share/tablet/united-kingdom/#monthly-201609-201709-bar

Wilshaw, (. h. (2012). Interview with Graeme Paton. *The Telegraph*.