

Project Proposal - Mathew Jones

by Mathew Jones

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“The impact of a digital game on mathematical skill acquisition and user retention in young children”

The research proposal is to see the effects of young children playing games with the intention of improving their maths skills and to see if it can keep them engaged.

Mathew Paul Jones

James Williams

1416 words

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1. Introduction

The project working title for this is “The impact of a digital game on mathematical skill acquisition and user retention in young children” and the aim is to create an educational game which can educate young children ranging from the ages of four to ten basic maths skills as research has shown a positive result for improving children maths skills while using digital applications for learning maths such as on a mobile device [1]. The project will be done on a computer as well as children learning on the computer as it is important to gain IT skills as well due to these skills being critical for future careers.

The children will play the game for 30 minutes every week and will be tested prior to the research and biweekly during it. The tests will be tracked, and results will show if there were any improvements, regression or stagnation in their skills. This project also aims to see if the games keep the children enjoying and engaged.

The reason for undertaking this project is to see if games can improve maths skills of young children. This is especially important in Wales as out of the 4 nations of the United Kingdom; Wales has polled last every time in the programme for international student assessment (PISA) and is currently below the Organisation for Economic Co-operation and Development (OECD) average [2]. PISA tests are undertaken by 15-year-olds but is critical at a young age to attain these maths skills at an earlier age.



There are many reasons why this is important, as education has proven to not only improve an individual's salary opportunities which will improve their lives but also helps stimulate a country's economy as an educated workforce is an effective workforce [3]. Improving math skills will also benefit young children to understand finances in their future lives such as budgeting, understanding the importance of saving, investing (compound interest) and in many other ways. The expected outcome to this project will be an improvement in mathematical skills as well as being able to retain the children's attention throughout the game.



2. Background to the Proposed Research

There are two domains where this project is related to, they are early years numeracy development and digital game-based learning. Research has shown a positive result when games are introduced into education. For instance, a study was done where 60 children from the ages of 3 to 6 had some exposure to mobile phone games to assist with their math skills in data, numbers, patterns, measurements and shapes. The results from this journal showed that there were improvements in all areas especially children who initially had a lower proficiency in maths [1].

There is also evidence that game-based learning improves memorisation, attitudes and motivation, especially with young children [4]. This is important as being able to learn new skills is important but is just as important to retain that piece of information. With this in mind the children should all show this effect as they are all aged from 4 to 10.

Trends and technologies

There has been great advancement in augmented reality. This will be extremely advantageous when teaching children 3D shapes as they will be able to freely look at all the different shapes themselves [5]. Having rewards in the game will be important to improve the children's retention as research has shown positive results for user retention when one is implemented, for instance using a point system or giving coins to purchase in-game items [6]. This must not affect the children in a negative way by making them addicted to the game. Learning is important but ensuring they learn for other methods is also important.

One research states that video games bring a positive impact on students' academic performance but raises the concern on what other effects will playing games bring such as addiction, excessive reliance and equity issues such as families who are unable to afford computers [7]. One article states that "improving ICT skills among students and teachers' benefits students in math and in their metacognitive skills" [8]. There are many positives it seems to introduce computers and games into learning especially with maths but there must be considerations over use of them. This will be taken into account when the children are participating in the study.

3. Research Problem statement

Young children in Wales are struggling with foundational numeracy. This is indicated by international assessments like PISA where Wales placed last out of the four nations of the United Kingdom and lower than the OECD average. This project aims to address this problem and conclude whether turning education into a game could improve this and improve children's views on learning maths.

4. Research Aim & Objectives

1. Design and develop an interactive digital game to educate young children with basic maths skills.
2. Measure the game's impact on their maths skills and compare with previous and final test scores.
3. To evaluate if the game has long term retention for the children and if they enjoyed the experience. This will be based on my perspective as well as a questionnaire done by the children.
4. Finally, to get responses of the parents to see if they perceive the game has improved their children's maths skills.

5. Methodology

5.1 Methods

The methodology used whilst developing the game will be Agile with a one-week sprint. The reason for this is to review how progress is going and to spot any issues as soon as possible before moving too ahead. The research method used will be a mixture of quantitative and qualitative. These two methods are appropriate as tangible data will be gathered from the children completing tests, this is quantitative and an experiment strategy. The children's opinion from the survey will be a mixture of qualitative and quantitative, this is also a survey strategy. The data from the test will be put on to bar graph  analyse whether there has been any improvement, regression or stagnation after all the tests have been completed.

5.2 Materials

Data sources

The sources I will use will be mostly journals and books, with a few sources from accredited websites. I have chosen these data sources as they are reliable and trusted form of information when undertaking a project like this.

Data collection method

The children will be learning weekly for an hour and will do a test biweekly. A survey will be completed at the end asking if the children had fun  asking for any improvements and if they would play it again. Additionally, the parents will be asked similar questions regarding if they perceive any positive changes in their children. The test method of collecting data was chosen as it will show a clear trend of either improving, regressing or stagnation in the individual. The method of collecting surveys is to find out their opinion and this is critical to find out if they enjoyed the game and if they would play again to see if it was able to keep the child attention.

Ethical consideration

The ethical considerations issues related to the data will be the fact that children will be involve so I will need to ensure I have permission from them and their parents to test their skills on a weekly basis.

Software tool and techniques

Visual Studio Code will be used to code and the programming language used will be Python. PyGame will be used as well pytsx3 which is a library allowing text-to-speech. This will be important for young children who are unable to read or are not completely proficient at it. For inputting the data gathered Microsoft Excel will be required as well as Microsoft Word for writing up the project.

Hardware requirements

6 Project Plan

[illegible]

7. References

- [1] M. Yun, G. Joe and K. Jo, "HuG-M: Field-Based Early Childhood Mathematics Education Using the Math Play Application," *Ulsan, Korea*, 2025-07. doi: 10.1109/IWIS66215.2025.11142396. [Online]. Available: <https://ieeexplore.ieee.org/document/11142396>
- [2] Senedd research team. "How did Wales perform in PISA 2022?" Senedd research. <https://research.senedd.wales/research-articles/how-did-wales-perform-in-pisa-2022/> (accessed Oct 16).
- [3] Department for Business Innovation & Skills. "The Impact of Further Education Learning." <https://assets.publishing.service.gov.uk/media/5a7953e240f0b679c0a08351/bis-13-597-impact-of-further-education-learning.pdf> (accessed Oct 16).
- [4] N. Martin, et al., "A Comparative Analysis of User Experience and Educational Outcomes in Math Memory Games," *Ulsan, Korea*, 2024-11. doi: 10.1109/CENIM64038.2024.10882690. [Online]. Available: <https://ieeexplore.ieee.org/document/10882690>
- [5] H. K. Chung and J. H. Ko, "Augmented Reality-Based Educational Content Application Development," *Journal of Mobile Multimedia*, vol. 19, no. 4, pp.1021–1030, -07 2023. doi: 10.13052/jmm1550-4646.1945. Accessed: Oct 17, 2025, [Online]. Available: https://ieeexplore.ieee.org/xpls/abs_all.jsp
- [6] J. Tyni, et al., "Reward Types in Popular Recreational and Educational Mobile Games," *IEEE Access*, vol. 11, no. 4, pp.1166–1174, 2023. doi: 10.1109/ACCESS.2022.3231936. Accessed: Oct 17, 2025, [Online]. Available: https://ieeexplore.ieee.org/xpls/abs_all.jsp
- [7] B. Maraza-Quispe, et al., "Impact of Educational Video Games on the Development of Meaningful Learning in the Field of Mathematics: A Quasi-Experimental Approach," *IEEE Revista Iberoamericana de Tecnologías del Aprendizaje*, vol. 19, no. 4, pp.407–417, 2024. doi: 10.1109/RITA.2024.3458852. Accessed: Oct 18, 2025, [Online]. Available: https://ieeexplore.ieee.org/xpls/abs_all.jsp
- [8] K. Ackermans, et al., "Young learners' motivation, self-regulation and performance in personalized learning," *Computers & Education*, vol. 226, pp.105208, -03-01 2025. doi: 10.1016/j.compedu.2024.105208. Accessed: Oct 19, 2025, [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S0360131524002227>

Project Proposal - Mathew Jones

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

74/100

PROJECT PROPOSAL – ACCA6020 INDEPENDENT PROJECT

Student MATHEW JONES 2317425 _____ Mark
74 _____

Intro / A&O (400 words)		
Project title; Identification of a specific problem to be investigated; Well-defined aims and SMART objectives; Explaining why this project is worth doing; Discussion of what the project needs to do in order to be a success; Description any deliverables that will be produced at the end of the project The student’s project is to measure the impact of a interactive digital game, on mathematical skills acquisition and user retention, in pupils aged from 4 to 10 years of age. The reasoning from national and international literature is that Wales is the worst of the four home nations in terms of mathematical skills and also continues to be near the bottom of the ‘PISA’ league tables in terms of numeracy skills.	20	18

The measurable successful outcome will be to design and implement a suitable and appealing game, for pupils to develop and hopefully improve and enjoy using their numeracy skills. The test scores will be analysed statistically to provide insight into the games effectiveness, along with any survey results(from pupils and parents) obtained. The project's aim and objectives are clearly stated and a useful Gantt chart measures a SMART proposed time line to ensure the project will be completed within the allotted timescale.		
Background to the Project / Literature Review (400 words)		
Description of how the work to be done by in the project relates to the work identified in the literature review; Discussion of any ethical issues raised by the project Identifying what has already been done within the field; Topic familiarity; Brief literature review using appropriate sources – 6-8 journal papers and book chapters rather than just websites; Selection of relevant models & concepts The motivation for the student's project is the observed and well documented findings, that the numeracy skills of Welsh	20	15

school pupils are the lowest of the home union nations, and is also near the bottom of the international PISA rankings. The student believes that a better engagement in numeracy skills acquired through a gaming approach will sustain student interest and engagement with mathematical/ numeracy skills. This hypothesis will be assessed both quantitatively and qualitatively via statistical analysis of test results and from pupil and parental surveys. Ethical issues regarding personal data are briefly considered with regards to sensitivity and are more broadly referred to on the ethics form. References contain some journal citations form IEEE journals and government reports as well as accredited websites, which are relevant to the aims of the project, but not much in terms of current work in the development of games to aid learning development.		
Project Design (500 words)		
Clear statement of which development methods are to be used and why they are appropriate; Clear statement of which tools are to be used and why they are appropriate; Clear description of how data collected will be analysed Methods which will be used to develop the game are stated such as visual studio code, python , PYGame etc.. as these are relevant to the game design and	30	15

implementation. However, what the form the actual game will take is lacking, along with what the proposed game structure would be, is missing in terms of levels, rewards what skills are being developed (+ - x /) etc. and what is termed as success/successful outcome? The student will aim to collect test results from pupils playing the game over a six week period, analyse and appropriately display them to see if any meaningful insights are obtained, along with data from pupil and parent surveys.		
Resources / Planning (200 words)		
List of any deliverables; Clear diagram showing both timing and resource use; Completed ethics form; Limited and relevant appendices The deliverable outcome will be a computer game designed to improve the numeracy skills of pupils aged from 4 to 10 years of age. The resources needed are outlined both for the project and the pupils requirements (a PC, keyboard mouse and relevant designer software)	15	13

A useful Gantt chart shows that time management has been undertaken, which if adhered to will ensure successful completion in a timely manner. The ethics form has also been successfully completed.		
Document Presentation		
Correct spelling, grammar and punctuation; Flow of narrative/fluency; Coherence; Word processed ; Correct use of referencing with bibliography; Strict word limit The report is well formatted, quite well written, flows quite nicely and is easy to read, conveying the salient points of the research project, namely its outline, aims objectives and methodologies, but does contain some minor errors. The report is within the allocated word limit and referencing is appropriately done within the written text.	15	13

TOTAL	100	74

PAGE 1

PAGE 2

PAGE 3



Comment 1

To measure the impact?



Comment 2

as well as?



Comment 3

proved?



Comment 4

Spelling

PAGE 4



Comment 5

States? Spelling

PAGE 5



Comment 6

other forms may be useful also, line graphs for trends etc.



Comment 7

enjoyed learning from the game may be better?

PAGE 6



Comment 8

form?



Comment 9

developing the? and testing?