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“Optimizing Innovation in Knowledge, Education and Design”

EXTENDED ABSTRACT



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Assalamualaikum warahmatullahi wabarakatuh,




First and foremost, I would like to express my gratitude to the organizing committee of i-Spike 2023 for their tremendous efforts in bringing this online competition a reality. I must extend my congratulations to the committee for successfully delivering on their promise to make i-Spike 2023 a meaningful event for academics worldwide.

The theme for this event, 'Optimizing Innovation in Knowledge, Education, and Design,' is both timely and highly relevant in today's world, especially at the tertiary level. Innovation plays a central role in our daily lives, offering new solutions for products, processes, and services. By adopting a strategic approach to 'Optimizing Innovation in Knowledge, Education, and Design,' we have the potential to enhance support for learners and educators, while also expanding opportunities for learner engagement, interactivity, and access to education.

I am awed by the magnitude and multitude of participants in this competition. I am also confident that all the innovations presented have provided valuable insights into the significance of innovative and advanced teaching materials in promoting sustainable development for the betterment of teaching and learning. Hopefully, this will mark the beginning of a long series of i-Spike events in the future.

It is also my hope that you find i-Spike 2023 to be an excellent platform for learning, sharing, and collaboration. Once again, I want to thank all the committee members of i-Spike 2023 for their hard work in making this event a reality. I would also like to extend my congratulations to all the winners, and I hope that each of you will successfully achieve your intended goals through your participation in this competition.

Professor Dr. Roshima Haji Said
RECTOR
UiTM KEDAH BRANCH



WELCOME MESSAGE (i-SPIKE 2023 CHAIR)



We are looking forward to welcoming you to the 3rd International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education 2023 (i-SPIKE 2023). Your presence here is a clear, crystal-clear testimony to the importance you place on the research and innovation arena. The theme of this year's Innovation is "*Optimizing Innovation in Knowledge, Education, & Design*". We believe that the presentations by the distinguished innovators will contribute immensely to a deeper understanding of the current issues in relation to the theme.

i-SPIKE 2023 offers a platform for nurturing the next generation of innovators and fostering cutting-edge innovations at the crossroads of collaboration, creativity, and enthusiasm. We enthusiastically welcome junior and young inventors from schools and universities, as well as local and foreign academicians and industry professionals, to showcase their innovative products and engage in knowledge sharing. All submissions have been rigorously evaluated by expert juries comprising professionals from both industry and academia.

On behalf of the conference organisers, I would like to extend our sincere thanks for your participation, and we hope you enjoy the event. A special note of appreciation goes out to all the committee members of i-SPIKE 2023; your dedication and hard work are greatly appreciated.

Dr. Junaida Ismail

Chair

3rd International Exhibition & Symposium Productivity, Innovation, Knowledge, and Education 2023 (i-SPIKE 2023)

C++ RUSH: INTERACTIVE GAME FOR NOVICES IN LEARNING BASIC COMPUTER LANGUAGE

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ABSTRACT

C++ is one of the fundamental, easy-to-learn programming languages that aid in understanding the fundamentals of all types of programming. Since the fundamentals of C++ have been mastered, migrating to other programming languages would be simple for someone with a solid grasp of the language. This project aims to design and develop an educational, interactive programming game. Using a questionnaire, another objective of this project is to assess the usability of the developed programming game. The methodology used for this project is Agile Model because iterative development is one of its components. The six phases of the Agile methodology are requirements, design, development, testing, deployment, and review. With 30 participants, usability testing was conducted for this study. The vast majority of individuals concur that gamification can transform a difficult and complex topic into an extremely enjoyable one. This project has ultimately enabled the user to learn C++ effectively. Future works may incorporate a wider variety of programming languages.

Keywords: C++, programming, gamification, education games, multimedia learning

INTRODUCTION

Educational games play a crucial role in facilitating the learning process. It is due to the fact that the learning environment becomes more engaging and appealing the more students engage in educational challenges (Borna & Rad, 2018). Programming language is a difficult subject to absorb at first glance, especially for beginners. As one of the learnable programming languages, Java's Oriented Object Programming (OOP) concept is difficult for most beginning students to grasp (Maiga, 2019). According to Zamin et al. (2018), because of their immaturity and lack of programming experience, novice programmers struggle to comprehend and master logic and scripting languages.

This project combined an educational game with C++, the most fundamental programming language, in order to provide early exposure to novice programmers and assist those who are struggling to learn C++. Gamification is the application of game elements, primarily video game elements, to non-game contexts to enhance motivation and engagement in learning. The use of gamification in a teaching method or practice can assist many students who are dissatisfied with conventional methods (Alsawaier, 2018). There are relatively few educational programming language games in Malaysia. Some novices without a background in a programming language may find it challenging to grasp the concept at the outset of their education (Baharum et al., 2020). With the intention of creating an interactive game, it is hoped that this game will make programming a lot more enjoyable.

Computer Language

There are numerous programming languages available today, and they are all becoming increasingly general-purpose and generic, but they each have their own strengths and weaknesses. Programming languages typically fall into a few distinct categories. Nevertheless, these languages allow for a variety of programming paradigms. Each year, numerous programming languages are introduced, but only a handful are gaining widespread acceptance and could be used by a professional programmer. The computer languages C++, Java, PHP, and C# are examples. However, this game focuses on the fundamentals of the C++ programming language.

Gamification

Gamification is the application of game design elements and the fundamental ideas and concepts that underpin gameplay to new contexts. Gamification is a trending topic in education and practice, attracting researchers and students from a variety of disciplines, including education, information studies, human-computer interaction, and health. The phrase is weighed down by numerous definitions and applications, while the concept's academic utility, theoretical foundations, and lack of established application standards are contested. Little empirical research has been conducted to establish gamification as a credible concept and to demonstrate its effectiveness as a tool for motivating and engaging users in non-entertainment settings, despite extensive debate about its benefits and drawbacks (Seaborn & Fels, 2015). Gamification is the process of incorporating game design elements into non-game contexts to make non-game activities feel more like games (Sailer et al., 2017).

METHODOLOGY

This project utilized iterative development, which is a component of the Agile development methodology. This research's methodology has been mapped based on the Agile model (Grepon, Benzar Glen, et al., 2021). As shown in Figure 1, this conceptual design includes requirement analysis, system design, algorithm design, the development phase, testing, and review.

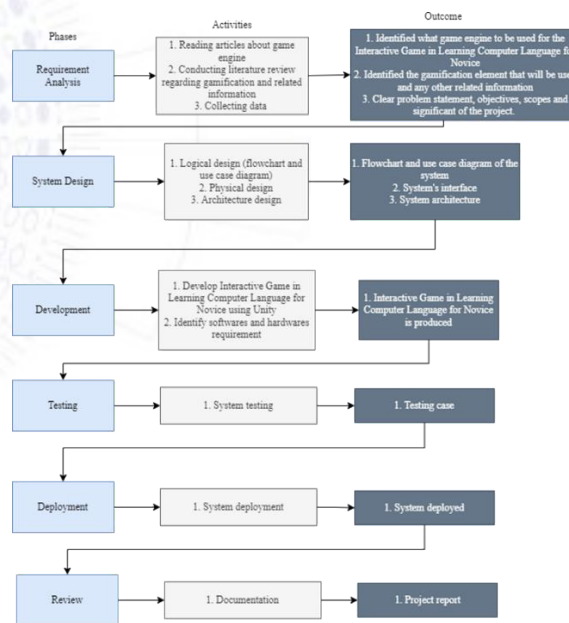


Figure 1. Project methodology based on Agile Model

C++ Rush is constructed using Unity software and stored in the PlayFab platform. The game involved walking, jumping, and avoiding obstacles while learning the C++ syntax. The game has its own uniqueness, especially in terms of partaking in challenges while learning the programming language. Instead of learning manually and conventionally, learners may enjoy the game and gain knowledge at the same time. Both methods offer a good learning style for children and could trigger a passion for learning C++. Screenshots of the game are illustrated in Figure 2.

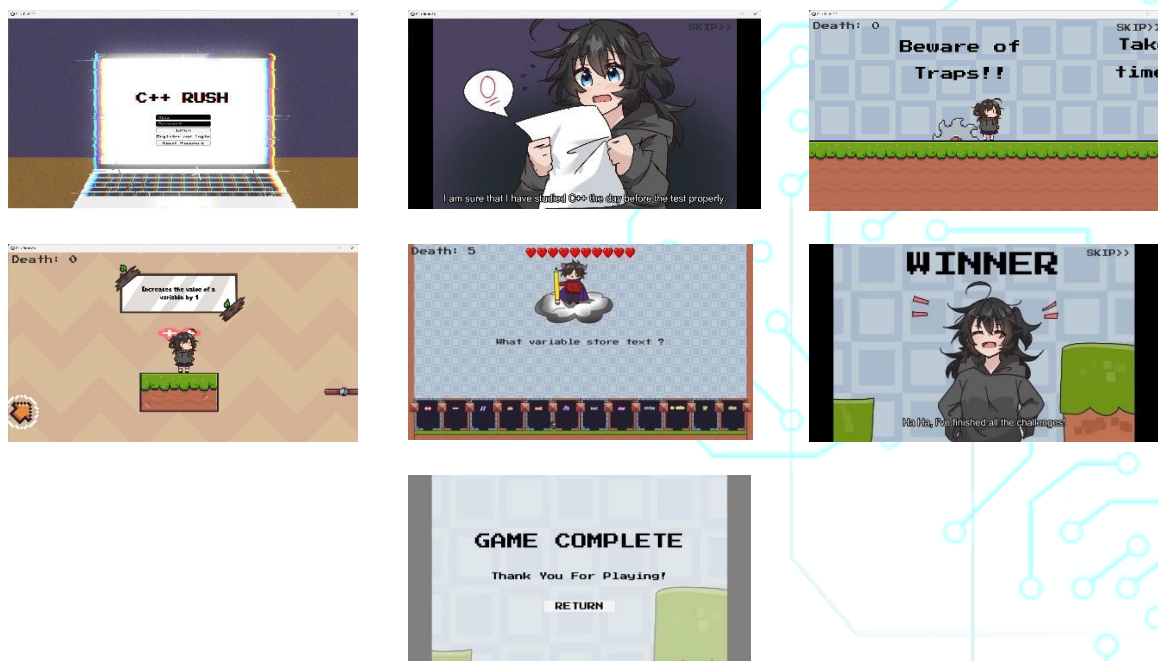


Figure 2. C++ Rush screenshots

RESULTS AND DISCUSSION

Usability is a crucial component of software systems because a negative user experience may cause users to choose alternative software. Through testing, the usability of a product can be improved. Usability testing evaluates how well a product can be utilized by a particular user to achieve a particular objective with effectiveness, efficiency, and user satisfaction in a particular environment. It is based on five criteria: learnability, efficiency, memorability, error, and customer satisfaction (Retnani et al., 2017). This test involved 30 participants, and 83.3% of respondents revealed that they find the game enjoyable and fun to play as shown in Figure 3.

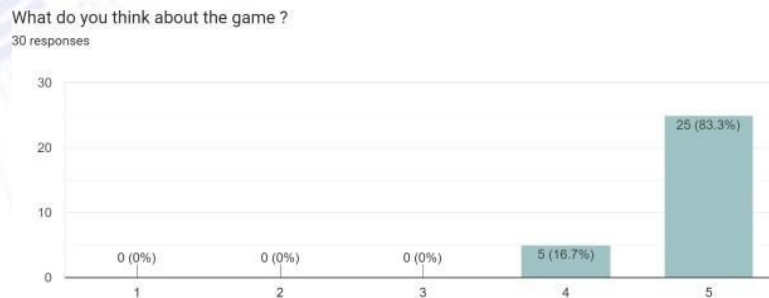


Figure 3. Respondents' feedback about their enjoyment of playing C++ Rush



Figure 4. Responds regarding the effectiveness of gamification in learning as implemented in C++ Rush.

Referring to Figure 4, 93.3 percent of respondents believe that gamification is an effective learning method as adapted in C++ Rush. This is due to the fact that it makes the learning process more dynamic and engaging, thereby increasing motivation and information retention. In addition, one hundred percent of respondents agree that playing games is more entertaining than reading.

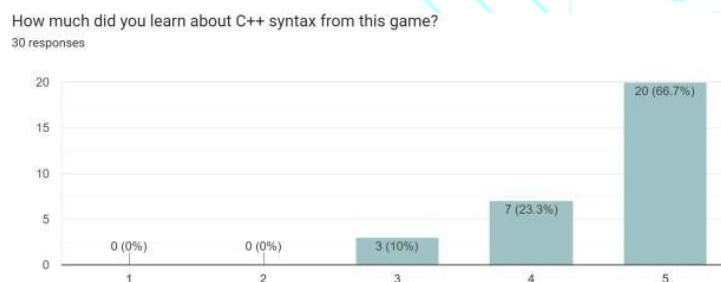


Figure 5. Respondents' feedback on how much they learned from this game

Figure 5 depicts the percentage of responses from 30 individuals regarding how much they learned about C++ syntax from playing this game. 66.7 percent of respondents are extremely satisfied, 23.3% are satisfied, and 10.0% are somewhat satisfied. This demonstrates that they can learn a great deal about C++ syntax by playing this game. All respondents correspond that they would recommend this game to a novice programmer. It validates that they feel confident about this game and that they want to share it with other programmers.

CONCLUSION

The two objectives of this project, which were to design and develop an interactive educational game for programming and evaluate the usability of the game, have been met. C++ Rush is conducive to self-paced learning because it offers an alternative and engaging programming and computer education methodology. It has tremendous potential to aid academicians and researchers in designing and developing a gamified learning model and helps elementary students comprehend the fundamental syntax and structure of a programming language. Practically, the game is used as an educational or gaming tool. Aside from that, the game can play an important role in computer education and learning, particularly in children's computer programming studies. With suitable learning models, C++ Rush could be upgraded to assist more students in the future, regardless of their familiarity with gamification techniques or programming languages. It is strongly suggested to continue advancing this research in order to make it more useful, appealing, valuable, and applicable in the future. Finally, it is anticipated that this research will improve the educational standard of the community.

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