

# BUNNY CODE: INTERACTIVE EDUCATIONAL CODING GAMES FOR KIDS

**Muhammad Yazid Bin Noor Rahimi** <sup>(1)</sup>  
**Muhammad Zulhilmie Bin Mohamad Rosdi** <sup>(2)</sup>  
**Akram M Zeki** <sup>(3,\*)</sup>

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<sup>1</sup> International Islamic University Malaysia, Malaysia, Email: [yazidrahimi7@gmail.com](mailto:yazidrahimi7@gmail.com)

<sup>2</sup> International Islamic University Malaysia, Malaysia, Email: [muhdzulhilmie19@gmail.com](mailto:muhdzulhilmie19@gmail.com)

<sup>3</sup> International Islamic University Malaysia, Malaysia

\* Corresponding Author Designation, Email: [akramzeki@iium.edu.my](mailto:akramzeki@iium.edu.my)

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Muhammad Yazid Bin Noor Rahimi  
*International Islamic University Malaysia,*  
Malaysia  
yazidrahimi7@gmail.com

Muhammad Zuhilmie Bin Mohamad Rosdi  
*International Islamic University Malaysia,*  
Malaysia  
muhdzulhilmie19@gmail.com

Akram M Zeki  
*International Islamic University Malaysia,*  
Malaysia  
akramzeki@iiu.edu.my

**Abstract**— This paper presents the analysis and design of a prototype system aimed at making coding engaging for individuals of all ages, from primary school students to seasoned learners familiar with the basics of programming. The primary objective is to enhance the accessibility and appeal of coding education across different age groups. The study begins by providing an overview of the Bunny Code project, outlining its scope and objectives. It describes the methodology employed, including the system architecture design, use case diagram, use case narratives, activity diagram, sequence diagram, and the prototype design. The comprehensive analysis and design process are detailed to provide insights into the development of an interactive coding learning platform. In addition to the technical aspects, this paper discusses the results of an online survey conducted to gather perspectives from the target user demographic. By incorporating user feedback into the design process, the study aims to ensure that the prototype system meets the needs and expectations of its intended audience. Ultimately, this research contributes to the field of educational technology by proposing innovative approaches to make coding accessible and engaging for learners of varying age groups. The findings and methodologies outlined in this paper serve as a foundation for the development of interactive and inclusive coding education tools, such as the Bunny Code platform.

**Keywords**— Coding Education, Interactive Learning, Educational Technology, Age-Appropriate Learning, Online Learning Platforms, Coding for All Ages.

## I. INTRODUCTION

"BUNNY CODE" is an innovative web-based application designed to make coding engaging and accessible for children. The primary objective of this application is to fuse education with technology, catering to the evolving cultural landscape of learning.

In today's digital age, children are increasingly drawn to interactive online activities, particularly gaming. This insight inspired us to integrate coding with gaming, leveraging children's natural affinity for play to introduce them to the world of programming in an enjoyable and motivating way.

Traditional methods of learning programming can often lead to boredom and demotivation, especially when the material is overwhelming or lacks interactivity. Children, in

particular, are more receptive to learning through interactive and entertaining experiences. Therefore, our application aims to combine gaming elements with coding tutorials, offering a platform where children can explore programming concepts while immersed in engaging gameplay.

What sets our system apart is its emphasis on interactivity. Unlike conventional platforms where users simply input answers into text boxes (as seen in platforms like W3Schools), we envision a more dynamic and stimulating learning environment. By creating interactive challenges, puzzles, and games that require coding solutions, we aim to sustain children's interest and enthusiasm throughout their learning journey.

The importance of introducing programming at a young age cannot be overstated, especially in light of the rapid advancements in technology. Many developed countries, particularly in the West, have already recognized this trend by incorporating coding into school curricula. Beyond fostering IT career aspirations, early exposure to coding nurtures valuable skills and unleashes creative potential in children.

Our proposed application seeks to bridge this gap by captivating children's interest and nurturing their coding abilities in an interactive and enjoyable manner. Through "BUNNY CODE," we aim to cultivate a new generation of tech-savvy learners who are empowered to thrive in an increasingly digital world.

## II. LITERATURE REVIEW

### A. E-Learning Application Review

A learning system based on formalized teaching but with the help of electronic resources known as "E-learning". E-learning is an advanced method to aid and enhance learning. Traditionally, teaching could be done in or out of the classrooms, the use of computer technology and the Internet ease this method for people to gain knowledge. E-learning has proved to be the convenient method for student to start learning anywhere and anytime as long as have access to the Internet connection. Further, it could be less motivated for students to sit and watch video provided by the teachers. Educators could include some interactive graphic, 3D simulations, real-time online, or animation for students to have a connection between teachers and students.

## B. Existing E-Learning

### 1. W3school: <https://www.w3schools.com/>

W3school is an educational website for learning basic coding online. This is a website where people can learn, practice and training the basic of programming language like python, PHP, jQuery, Java, also language for accessing database which is SQL. (Refsnes, 1999-2021) W3school was create in 1998. This website also provides a tutorial before the user go to the exercise. Their focus or their aim for w3school is easy learning where they focus on simplicity, also they use a simple code example and simple illustration of how to use it. As the focus for w3school is easy learning, so they start the tutorial from the basic level and move to the professional reference. So, people or users can improve their knowledge and skill also their feel like more challenging when it comes to harder part.

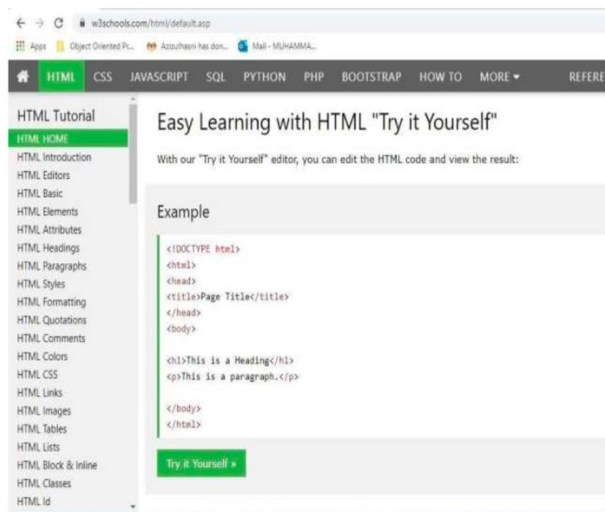


Fig 1. w3school website

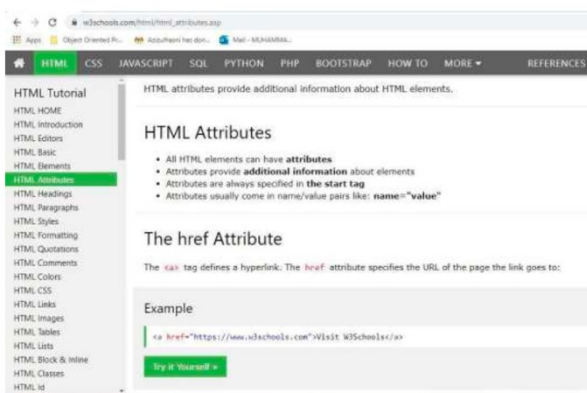


Fig 2. Users can try to challenge themselves by clicking on "Try it Yourself".

### 2. Codemoji: <https://www.codemoji.com/>

Codemoji's computer science curriculum for schools allow 1st – 8th grade students to learn the basics of web development and coding, including HTML, CSS and Javascript, in a fun and easy way, allowing them to create their own website, animations and much more with our unique and adaptable learning platform.

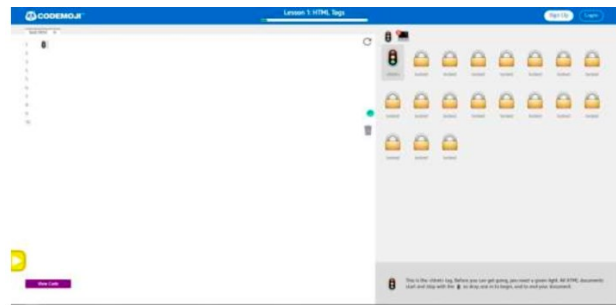


Fig 3. user can drag the icon into the coding area and click view code.

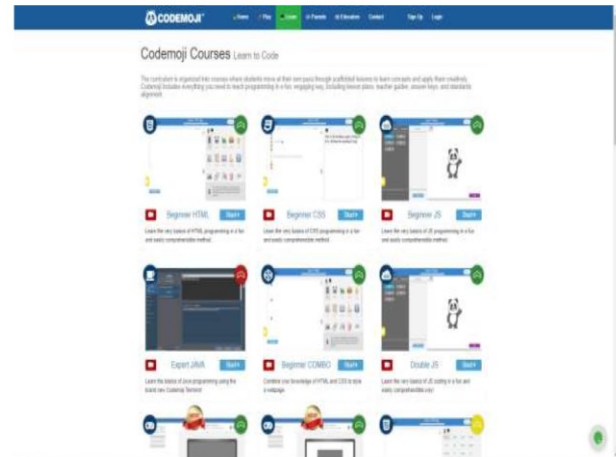


Fig4. Codemoji have a lot of courses from beginner to expert level for user to learn.

### 3. Blockly: <https://blockly.games/>

The Blockly library adds an editor to your app that represents coding concepts as interlocking blocks. It outputs syntactically correct code in the programming language of your choice. Custom blocks may be created to connect to your own application. From a user's perspective, Blockly is an intuitive, visual way to build code. From a developer's perspective, Blockly is a ready-made UI for creating a visual language that emits syntactically correct user-generated code.

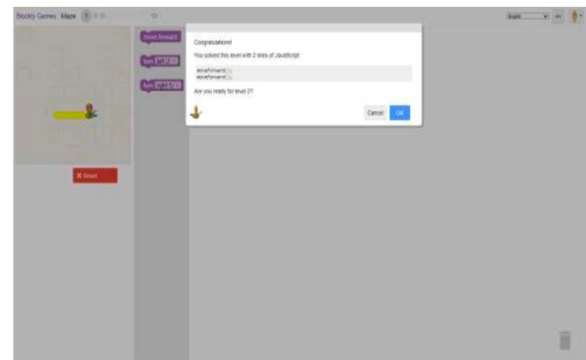


Fig 5. a code will pop out if the user gets the correct answer.

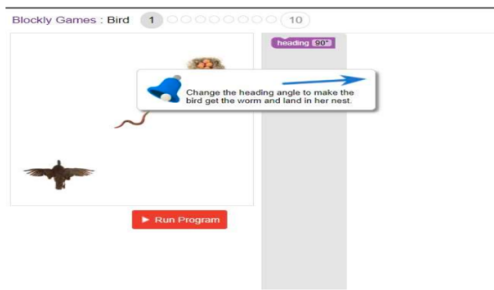


Fig6. Blockly use drag and drop features to keep users attracted to play the games.

C. Advantages and Limitation

Table 1: Advantage and Limitation of The Existing Website

Website	Advantages	Limitations
<b>W3School</b>	- Easy learning.	- Not visually attractive.
	- Provides a tutorial before exercises.	- Suitable for secondary school and above.
	- Provides notes before tutorials.	
<b>CodeMoji</b>	- Offers drag and drop features.	- Requires student sign-up.
	- Uses objects for explanations.	- Incomplete explanations.
<b>Blockly</b>	- Uses interactive drag and drop for coding.	- More game-like than instructional.
	- Easy and fun to play.	- Limited guidance for code implementation.

F. E-Learning Adaption

Based on the review from the existing website, the developer found several advantage and limitation from the existing website that the developer able to do an improvement from the existing website to ensure the developer can develop a good and efficient website. Since the developer want to develop an interactive learning, the improvement that the developer can develop is to have an animation after the children give the correct answer. By having that, kids will be happy, and they will enjoy learning more about the course. In addition, when user click a button, it will produce a sound effect which make the game more attractive to play and having a good user experience. Next, developers can focus on one programming language. If they want to continue with another language, they can navigate to the desired language available.

Furthermore, Bunny code, as the name itself tells a storytelling where user need to finish the game while learning coding and having a story about a bunny. To sum up, user interaction with

the game is important to keep user to stay longer and addictive to play the games while learning something new.

III. METHODOLOGY

A. Development Approach

The Bunny Code developments uses an agile methodology which is very suitable for this system. The core reason is that agile is designed for flexibility and adaptability. If an error occurred, the developers could adapt the effort quickly to get back on track or even change tracks if that is what needed. By using agile methodology, the system usually gets better quality, faster developed and better technical methods. This methodology allows the developers to perform regular check-up and find areas of improvement on an ongoing basis. In addition, this methodology helps developers to save time in terms of fixing the problem that occurs while developing this project.



Fig7. Illustration of agile methodology for software development

B. REQUIREMENT SPECIFICATION

To ensure that our project can give benefit to the children, we conduct an online survey to validate and refine our project. From this online survey, we get 53 respondents. Below is the visual that we get from the survey. For the survey we divide to two section which is demographic to know a little bit background's our respondents. Second section is to ask more about the user experience and their expectation. In first section, the respondent answers the basic information such as gender, age, and their occupation. From the survey, the more respondent is from male which are 67.9% while female only 32.1%. Second for the age, most of the respondent are below 24 years and followed by 25-30 years old which is 25-30 and no respondent for the rest of age. Last question for the section 1 is the occupation. The most respondent is student who is 88.7% followed by private sector 5.7% and the rest, which is govern, freelancer and self-employed are 1% each.

B. System Integration

For the system integration, there are few tools and open source and libraries that can be used to achieve features and functionality. First is the framework used to develop the

system, Vue JS, is an open-source front end JavaScript framework for building user interfaces. The programming languages that are used in the system mainly are: HTML, CSS, and JavaScript. Moreover, to achieve an interactive animation of the graphics, the system uses a library of ready-to-use, cross-browser animation from a website animate.css. The website offers various animations that can be utilised and free. On the other hand, the system also benefited from another CSS framework from bootstrap to make the system more pleasing to the audience.

## IV. RESULT AND DISCUSSION

### A. SYSTEM OUTPUT



Fig8. Homepage

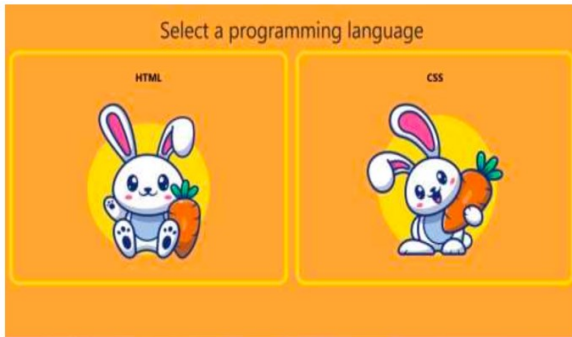


Fig9. Select programming language.

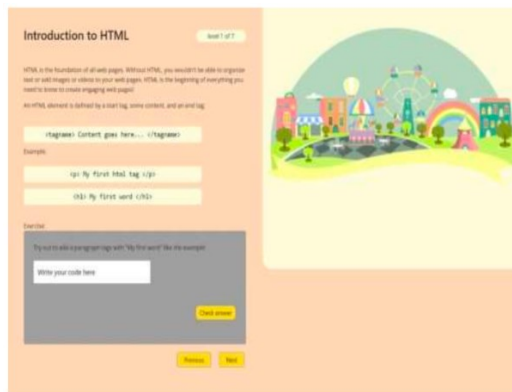


Fig 10. HTML (Introduction)

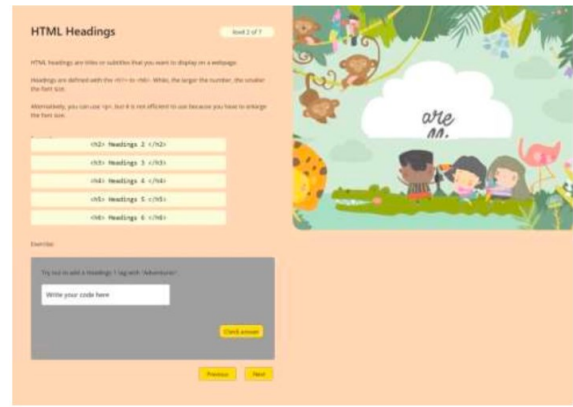


Fig 11. HTML (Headings)

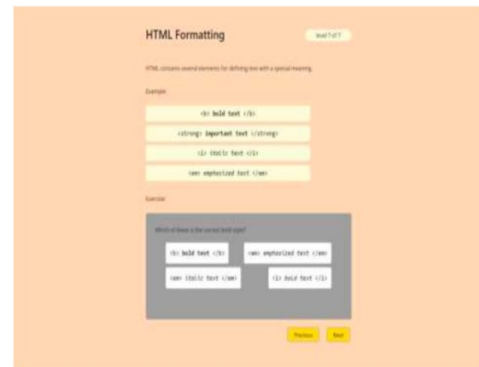


Fig12. HTML formatting

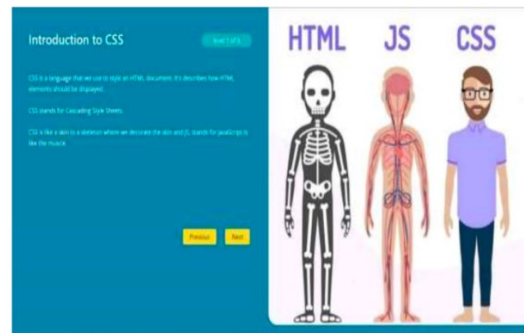


Fig 13. CSS introduction

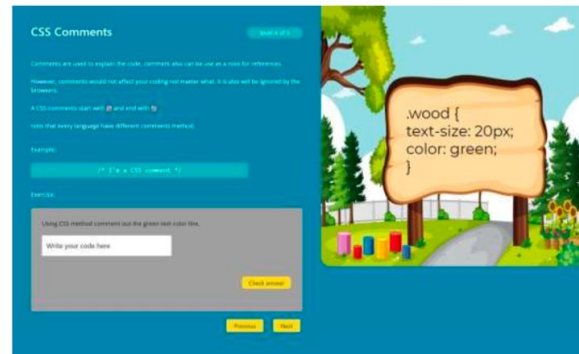


Fig 14. CSS (Comments)



Fig15. Result page

## V. LIMITATION AND FUTURE RESEARCH

For the project constraints, there are a few minor problems during and after system development. Basically, the constraint that we face is finding the target user for the user acceptance testing (UAT) because most schools are still not operational at that time. Since we plan to have face-to-face sessions for the acceptance testing. However, we still managed to get a few children from the surrounding areas to be part of our UAT. During the testing, we also explain to the user what the purposes of this code are and what are the benefit of using it.

Moreover, the system does not have the ability to keep track or save users' progress once they finish using the system. This is because, the system does not save to cloud or any database. Thus, whenever users re-visit the system, they must start again from the beginning of the level for each language. In addition, the limitation of the graphics is also one of the biggest projects constraints. For instance, a platform that could provide graphics for our system is not suitable since it neglects consistency for image usage.

There are a few more features that can be added to make the website more interactive and to attract more user to use the platform that been provided. Below is the potential future enhancement that can be build.

- Provide variety of language such as JavaScript, server side (SQL, MySQL)
- Space for the user to give their feedback or questions about the activity, from that developer can review what are the comment and improvement that can be done.
- Student profile for teachers to review their student activity.
- Save the progress using the cloud database.
- Create graphics using image tools to ascertain originality and consistency.

## VI. CONCLUSION

In conclusion, our user acceptance testing yielded valuable insights, albeit falling short of our initial expectations in terms

of participation. One notable issue identified was the lack of progress-saving functionality within the system, causing inconvenience for users who had to restart lessons from the beginning. To address this, we have undertaken a proactive approach to enhance our system by integrating a cloud-based database. This implementation will automatically save users' progress, enabling seamless continuation and eliminating concerns about lost work.

Additionally, to maintain originality and consistency in our graphical presentation, we have decided to create all graphics using in-house image tools rather than relying on external designers' artwork. This approach ensures a cohesive visual identity and allows for tailored customization to suit our platform's unique requirements.

Looking ahead, our system will be enriched with a broader range of programming languages, including JavaScript and SQL/MySQL, to broaden its appeal and accommodate users with varying interests and skill levels. By offering a diverse selection of languages, we aim to attract a larger user base and encourage exploration across different coding disciplines.

Moreover, we recognize the importance of fostering communication and engagement within our platform. To facilitate this, we will implement features such as a feedback mechanism where users can provide input or seek assistance related to activities. Additionally, educators will have the ability to review their students' progress directly from their profiles, enabling tailored guidance and support.

In summary, these planned enhancements reflect our commitment to continuously improving and expanding our educational platform. By addressing usability issues, enhancing graphical integrity, diversifying content, and fostering interactive communication, we are poised to create a more enriching and user-friendly experience for learners and educators alike within the "BUNNY CODE" ecosystem. We look forward to implementing these upgrades and further refining our system based on user feedback and evolving educational needs.

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