A Study of Student Perception Towards Programming Learning Using the CodeHS Platform at Kolej Komuniti Pasir Salak

M. S. Mat Saad[1*] and M. R. Abdul Razak[1*]

[1]Kolej Komuniti Pasir Salak,
36800 Kg Gajah, Perak, Malaysia.

*Corresponding Author's Email: syahril@staf.kkpsa.edu.my

Article History: Received 15 August 2024; Revised 05 September 2024; Accepted 02 November 2024

Abstract

This study aims to survey students' perceptions of programming learning using the CodeHS platform at Kolej Komuniti Pasir Salak. Computer programming learning often faces challenges in attracting student interest and engagement due to the general perception of complexity. Through a survey of 19 second-semester students enrolled in the Basic Programming course, this study collected data using a Likert scale questionnaire focusing on perception, interaction, and acceptance of the platform. The findings revealed that the CodeHS platform created a more enjoyable and interactive learning environment, with students' overall perception rated at a very high level (mean = 4.276). Interaction between students and lecturers also improved significantly, with a mean score of 4.460, fostering collaboration and enhancing learning experiences. Furthermore, students exhibited high acceptance of the platform, with a mean score of 4.389, citing ease of use and user-friendliness. These results demonstrate the potential of CodeHS to improve student motivation, engagement, and programming mastery. The study provides practical insights for educators to adopt innovative teaching strategies and integrate effective technological tools in programming education.

Keywords: CodeHS; Programming learning; Student perception.

1.0 Introduction

Computer programming learning often faces various challenges in attracting student interest and engagement during lectures. The general perception that this course is complex and difficult to understand contributes to these challenges (Mohd Yusof *et al.*, 2021; Nurul Faeizah H. *et al.*, 2022). In the context of programming learning, students need to understand the basic concepts of programming and apply them in the context of computer programming, which is often the main barrier (Maura and Sutabri, 2024; Mohd Yusof *et al.*, 2021).

To overcome the challenge of understanding basic programming concepts, educators are striving to renew their approach to the learning experience. They emphasize a deep understanding of basic concepts before applying them in problem-solving using computer programming (Noor Fadzilah *et al.*, 2017; Nurul Faeizah H. *et al.*, 2022). This approach is expected to improve students' proficiency in understanding and practically applying these concepts.

Various teaching and learning methods have been proposed to attract interest and increase student engagement in every lecture session. One proven effective approach is collaborative programming learning through online platforms such as CodeHS (Maura & Sutabri, 2024). Compared to similar tools like Repl.it, which also allows real-time coding and feedback, CodeHS provides structured lessons and problem-solving activities that focus on programming skill mastery. Other collaborative learning platforms tend to prioritize coding practices, whereas CodeHS integrates interactive lessons with assessments, making it more suitable for foundational programming courses.

In an effort to renew and improve the quality of computer programming teaching and learning at Kolej Komuniti Pasir Salak, it is important to understand students' perceptions of using the CodeHS platform. Knowledge of students' views and experiences is crucial for planning and renewing more effective teaching strategies and increasing student motivation in learning. By gaining a deeper understanding of student perceptions, educators can renew and enhance student engagement and create a more innovative and effective learning environment.

Despite the growing use of student-centered learning platforms, there is limited empirical research on the effectiveness of CodeHS, particularly in Malaysian educational contexts. This study aims to fill this gap by exploring how the platform influences student motivation and programming skill development. It is hoped that the results of this study can contribute to improving the quality of computer programming teaching and learning at the institution.

The existence of computer programming courses in current education clearly indicates an increased demand for computer programming skills in various industrial sectors (Engkamat *et al.*, 2023). Computer programming courses present significant challenges, especially due to the practical requirements of programming that involve hands-on coding practice. Many students face difficulties in understanding and mastering these courses (Mohd Yusof *et al.*, 2021).

Recent research emphasizes the role of collaborative learning platforms in addressing these challenges. Tools like Minecraft's Hour of Code have demonstrated how gamification and collaborative activities can enhance engagement and skill acquisition in programming education (Xu, Wu, and Ouyang, 2023). Similarly, platforms like Repl.it provide real-time coding and feedback, which promote both social interaction and cognitive learning among students (Hidalgo, Bucheli-Guerrero, and Ordóñez-Eraso, 2023). Moreover, studies on remote collaborative programming highlight the need for real-time feedback mechanisms, shared workspaces, and peer interactions to reduce the isolation of online programming courses (Chowdhury, 2021). These findings highlight the growing effectiveness of collaborative tools in programming education.

1.1 Collaborative Programming Learning

The ability of students to learn programming online with classmates through real programming assignments and participate in live programming activities is crucial for their learning. A study conducted by Chong *et al.*, 2024 shows that students find it easier to produce program code with the help of collaborative learning tools. These tools encourage collaborative programming learning by providing a space for students to engage in discussions and interactions on the same platform. According to Chong *et al.*, 2024, collaborative programming can enhance problem-solving abilities and understanding of concepts, as well as technical programming skills.

CodeHS is an online learning platform that provides a space for real-time collaboration in program development using programming code. Similarly, Minecraft's Hour of Code uses gamification to support beginner-level programming through collaborative tasks, enhancing engagement and skill development (Xu, Wu, & Ouyang, 2023). Repl.it further supports collaborative learning by offering shared workspaces and instant feedback, allowing students to work in groups and improve programming outcomes (Hidalgo, Bucheli-Guerrero, & Ordóñez-Eraso, 2023). In remote learning contexts, studies emphasize the importance of structured feedback, social presence, and shared identities to reduce the challenges of isolation and improve engagement in programming courses (Chowdhury, 2021). These platforms demonstrate that collaboration, whether gamified or real-time, significantly enhances the learning process for programming students.

Chong *et al.*, 2024 conducted a study on the impact of using active teaching and learning aids in computer programming courses. The study results show that using tools like CodeHS can increase student motivation and provide quick feedback. Students also agreed that real time programming learning platforms like CodeHS are among the best platforms for online programming learning.

In an effort to continuously improve the learning experience, the use of learning technologies like CodeHS should be matched with comprehensive teaching strategies. Approaches such as project based learning, where students need to develop real programming projects, can integrate theory with practice. This enables students to not only master basic concepts but also apply them in real world situations, enriching their learning experience (Nurul Faeizah H. *et al.*, 2022).

1.2 Continuous Support and Evaluation

Furthermore, continuous support from educational institutions is critical in ensuring the successful implementation of learning platforms like CodeHS. This includes providing adequate training for instructors, access to quality learning resources, and sufficient technological infrastructure. Only with this comprehensive approach can the goal of improving the quality of computer programming teaching and learning be achieved more effectively (Hat *et al.*, 2013).

Another important aspect is the continuous evaluation of the effectiveness of the platforms and teaching approaches used. For example, the use of real-time collaboration and gamification strategies in tools like Minecraft's Hour of Code and Repl.it has shown the need for strong technological infrastructure and instructor training to maximize engagement and learning outcomes (Xu, Wu, and Ouyang, 2023; Hidalgo, Bucheli-Guerrero, and Ordóñez-Eraso, 2023). In remote programming courses, shared evaluation systems and interaction frameworks have been proposed to address the challenges of asynchronous or synchronous collaboration, highlighting the need for continuous monitoring and feedback mechanisms to improve learning (Chowdhury, 2021). These studies highlight the importance of adapting platforms to students' needs and evaluating their long-term impact to ensure sustainable programming education practices.

Therefore, community and industry involvement also play a significant role in enriching programming learning. Involving students in real industry projects or hackathons, for example, can expose them to real world challenges and enhance their practical skills. This not only increases student motivation and interest but also helps them build professional networks useful for their future careers (Chong *et al.*, 2024). By combining these elements, computer programming education can be strengthened to meet future needs.

2.0 Methodology

This study uses a survey approach, where quantitative data is obtained through the use of a Likert scale questionnaire as the research instrument. The Likert scale was chosen because it is a reliable and straightforward way to measure attitudes, perceptions, and interactions. This type of scale allows for easy interpretation of respondents' opinions and provides a reliable way to quantify subjective data. The use of a Likert scale is widely accepted in social science research for measuring student perceptions, as it captures varying degrees of agreement or disagreement with specific statements. The study involves 19 students as respondents, consisting of 7 male and 12 female students. The respondents were selected from the second semester of the Information Technology Certificate program at Kolej Komuniti Pasir Salak, with the specific course (STM 20263) being the only one offered during this session. To minimize bias, the sample was chosen based on their enrollment in the course, without additional control measures for programming skills or prior interest in programming.

The questionnaire used in this study is divided into four sections: A, B, C, and D. Section A covers the respondents' profile information, aiming to collect basic demographic data. Sections B, C, and D pertain to students' perceptions of using the CodeHS platform in programming learning, interaction between students and lecturers, and students' acceptance and mastery of the CodeHS platform. For scoring in sections B, C, and D, a Likert scale is used with five levels of assessment: 5 – Strongly agree, 4 – Agree, 3 – Not sure, 2 – Disagree, and 1 – Strongly disagree.

This survey approach is chosen because it allows for the collection of broad and representative data in a short period. The Likert scale is used to measure the respondents' level of agreement with the given statements, which is then analyzed to determine the overall perception of students towards the use of the CodeHS platform. The data will be analyzed using SPSS software, applying descriptive statistics to calculate mean scores and variance. This will help in identifying trends and understanding the patterns in students' responses. The collected data will be analyzed using statistical software to identify patterns and relationships between the studied variables and to draw conclusions about the effectiveness of using the CodeHS platform in the programming course.

This study not only aims to understand students' perceptions of using the CodeHS platform but also to evaluate how well this platform can enhance interaction between students and lecturers and improve students' programming mastery. The findings of this study are expected to provide useful guidance for instructors in planning and implementing more effective teaching strategies and assist educational institutions in making decisions about the use of effective learning technologies. With a systematic methodological approach and robust data, this study aims to make a meaningful contribution to the field of computer programming education.

The Cronbach's Alpha coefficient value is used to assess the reliability of the research instrument. Table 1 below shows the Cronbach's Alpha coefficient values.

Table 1: Interpretation of Cronbach's Alpha Score

Cronbach's Alpha Value	Interpretation
> 0.9	Very Good
> 0.8	Good
> 0.7	Acceptable
> 0.6	Questionable
> 0.5	Poor
< 0.5	Unacceptable

Source: Joseph A. Gliem, 2003

Descriptive statistics were used to analyze the data using The Statistical Package for The Social Science IBM SPSS software. The analysis is based on the mean scores obtained from the Likert scale. The interpretation of the mean scores is referenced in Table 2.

Table 2: Interpretation of Mean Scores

Range of Mean Scores	Level
4.21 – 5.00	Very High
3.21 – 4.20	High
2.61 – 3.20	Moderate
1.81 – 2.60	Low
1.00 – 1.80	Very Low

Source: Moidunny, 2003

3.0 Results and Discussion

It is important to note that while these reliability results are very high, they are based on a small sample of 19 students. As with any study, the findings could vary with a larger, more diverse group of participants. This sample size may not fully represent the broader student population, particularly those with different levels of prior experience with online platforms or programming skills. Therefore, future studies with a more varied and larger sample size may offer more generalizable results.

The reliability analysis of the research instrument was conducted using Cronbach's Alpha coefficient values, as presented in Table 3. The Cronbach's Alpha coefficient values for the reliability tests of the questionnaire instrument ranged from 0.912 to 0.953. These values indicate a very high level of instrument reliability, providing confidence that the instrument used is highly suitable for the purposes of this study.

The results obtained from this reliability analysis are important in ensuring that the collected data is consistent and reliable. With high Cronbach's Alpha values, it reflects a high consistency among the items in the questionnaire. This means that each item in the questionnaire measures the same concept consistently, validating the overall study.

Specifically, a Cronbach's Alpha value approaching 1 indicates a very high consistency among the items in the questionnaire. This shows that the instrument used has high reliability in measuring the same construct. Therefore, the study results obtained from the data collected through this questionnaire can be considered valid and reliable for further analysis.

Thus, the reliability analysis of this instrument supports the validity and reliability of the research data. By using an instrument that has been proven to have high reliability, this research can provide more accurate and relevant results regarding students' perceptions of the use of the CodeHS platform in programming learning.

Table 3: Instrument Reliability Analysis

Element in the Questionnaire	Alpha Cronbach's
Perception	0.948
Interaction	0.912
Acceptance	0.953

3.1 Elements of Students' Perception towards the Use of the CodeHS Platform

Based on the analysis results presented in Table 4, the overall mean for the elements of students' perception towards the use of the CodeHS platform is 4.276, reaching a very high level. This result provides a positive overview of students' experiences using the CodeHS platform in the context of programming learning.

These findings indicate that the CodeHS platform has successfully created a more enjoyable learning environment for students. The presence of this platform has had a positive impact on students' learning experiences, providing them with effective tools to understand and master programming concepts (Maura and Sutabri, 2024). A similar study by Chong et al., 2024 found that online collaborative platforms like Repl.it and CodeHS increased student engagement and facilitated learning by promoting active participation. In comparison, CodeHS not only provides a collaborative learning environment but also integrates structured lessons that guide students step-by-step, which may be more effective for beginners. This aligns with the emphasis in education on creating stimulating and meaningful learning environments for students.

Additionally, the CodeHS platform is capable of providing a positive learning experience and can have significant implications in the context of teaching and learning programming. By utilizing relevant and engaging technology, instructors can increase students' motivation and engagement in learning (Cavus *et al.*, 2006). This opens up opportunities for more dynamic and effective teaching approaches to strengthen students' understanding and skills in computer programming.

Therefore, the use of the CodeHS platform in the context of programming learning is appropriate and beneficial for students. By providing a fun and meaningful learning environment, this platform helps enhance students' learning experiences and opens up opportunities for improving their academic performance and programming skills overall.

Table 4: Mean Score and Standard Deviation for Perception Elements

Num.	Item	Min	Std. Dev	Level
1	Helps me improve my programming skills	4.21	0.631	Very High
2	Helps me remember what is taught	4.42	0.692	Very High
3	Helps me understand programming quickly	4.21	0.713	Very High
4	Helps me stay focused while learning	4.32	0.582	Very High

5	Makes learning enjoyable for me	4.32	0.671	Very High
6	Makes me more enthusiastic about learning	4.26	0.653	Very High
7	Creates a more cheerful learning environment	4.26	0.562	Very High
8	The use of the CodeHS platform opens my mind during the teaching and learning process	4.21	0.631	Very High
	Overall Mean for Perception Elements	4.276	0.57218	Very High

3.2 Elements of Interaction between Students and Lecturers

The analysis results presented in Table 5 show that the overall mean for the elements of interaction between students and lecturers is 4.460. This figure indicates a high and encouraging level of interaction, signifying that interaction and collaboration between students and lecturers play a crucial role in programming learning using the CodeHS platform.

These results highlight that the interaction occurring during learning sessions using the CodeHS platform has a positive impact on programming learning. Continuous interaction between students and lecturers enriches the learning experience, allowing students to receive direct guidance and support in solving or creating programming projects (Cavus *et al.*, 2006).

These findings are consistent with the results of Maura and Sutabri, 2024, who found that online programming platforms that support real-time interaction between students and instructors led to increased student satisfaction and engagement. The use of CodeHS in this study also highlighted the positive impact of frequent communication and feedback on student performance and understanding of programming concepts.

Collaboration in programming learning through the CodeHS platform provides opportunities for students to learn not only from lecturers but also from their peers. Interaction between students and lecturers fosters a dynamic learning environment and allows for the exchange of ideas and perspectives between students and lecturers (Maura and Sutabri, 2024).

Therefore, these findings underscore the importance of effective interaction between students and lecturers in programming learning. The CodeHS platform provides students with the opportunity to interact directly with their lecturers, enriching their learning experience and enhancing their understanding of programming concepts. This aligns with an active and student-centered learning approach, where interaction between students and lecturers is a key element in achieving learning objectives.

Table 5: Mean Score and Standard Deviation for Interaction Elements

Num.	Item	Min	Std. Dev	Level
1	Interaction between lecturers and students is consistent throughout the semester	4.56	0.60	Very High
2	Interaction among classmates is consistent throughout the semester	4.53	0.697	Very High
3	I find it easier to join online discussions using the CodeHS platform with classmates to complete assignments/practice programming	4.26	0.733	Very High
4	Interaction between lecturers and classmates helps me understand online programming learning	4.42	0.692	Very High
5	The use of the CodeHS platform makes me more active in class	4.42	0.692	Very High
6	My lecturer provides immediate feedback to my questions using the CodeHS platform	4.58	0.507	Very High
7	The lecturer gives the answers I need	4.53	0.513	Very High
8	I understand the feedback given by the lecturer	4.37	0.597	Very High
	Overall Mean for Interaction Elements	4.460	0.52383	Very High

3.3 Elements of Student Acceptance of the CodeHS Platform

From Table 6, it can be seen that the mean score for the elements of student acceptance of the CodeHS platform is 4.389, reaching a very high level. This result indicates that students generally agree that the CodeHS platform is user-friendly and easy for them to use.

This finding is similar to the results found in a study by Engkamat et al., 2023, where students also rated the ease of use of programming tools like Repl.it highly. However, CodeHS stands out due to its additional support features, such as structured lessons and instant feedback, which contribute to higher acceptance and satisfaction levels among students.

This positive result reflects well on the acceptance of the CodeHS platform by students. High acceptance levels suggest the platform's effectiveness in meeting the needs and expectations of students, as well as the compatibility of the platform's features with the students' learning styles.

Good acceptance of the CodeHS platform is important as it can positively impact student motivation and engagement in learning programming. A user-friendly platform can help reduce any awkwardness or reluctance students might have in using technology, thereby increasing the likelihood of them taking initiative in their learning (Maura and Sutabri, 2024).

Therefore, this analysis gives confidence that students acknowledge the usefulness and advantages of the CodeHS platform in the context of learning programming. High acceptance also indicates the platform's potential to be an effective tool in enhancing the quality of programming education among students.

Table 6: Mean Score and Standard Deviation for Acceptance Elements

Num.	Item	Min	Std. Dev	Level
1	The CodeHS platform is easy to use	4.53	0.697	Very High
2	I did not experience any technical issues while using the CodeHS platform	4.42	0.692	Very High
3	The CodeHS platform interface is user-friendly	4.16	0.958	Very High
4	I know how to access the CodeHS platform used by the instructor	4.42	0.607	Very High
5	The instructor uses the CodeHS platform online, making it easier for me to submit feedback or assignments given	4.42	0.692	Very High
	Overall Mean for Acceptance Elements	4.389	0.63412	Very High

4.0 Conclusion

Based on the analysis conducted, although there is positive feedback regarding the CodeHS platform in aiding programming learning, it is important to consider several aspects that may require improvement. Despite high evaluations of students' perceptions, interactions, and acceptance of the platform, it is crucial to continue monitoring and enhancing the students' learning experience.

The overall mean score for the perception element, which reaches 4.276, indicates that students view the CodeHS platform as a tool that makes learning more enjoyable and effective. However, it is important to recognize that this perception may be influenced by subjective factors such as personal preferences and individual experiences. Therefore, it is essential to continually assess and evaluate the actual impact of using this platform on improving programming skills and students' understanding of the concepts taught.

Furthermore, although the interaction and acceptance elements have very high scores, with overall means of 4.460 and 4.389 respectively, it is important to remember the need to ensure that the interactions between students and instructors, as well as the use of the CodeHS platform, are effective and meaningful. Even if students find the platform easy to use and user-friendly, there may be technical issues that need to be addressed or specific aspects that could be improved to enhance the overall user experience.

While the CodeHS platform has proven to make a significant contribution to programming learning, it is crucial to continue taking steps to enhance the effectiveness and sustainability of using this platform. Future research could explore the long-term impacts of using CodeHS on students' programming proficiency over multiple semesters, to assess how sustained use of the platform influences learning outcomes. Additionally, research in diverse educational settings, such as schools in rural areas or universities, could provide a broader understanding of how CodeHS can be adapted for different learning environments and student populations.

Recommendations for improvement include implementing additional resources to support learning, conducting further research to assess the long-term impact of the platform's use, and integrating student feedback to tailor and enhance the platform to better meet students' needs in programming education. With a proactive and ongoing approach to improvement, the CodeHS platform can continue to be an effective tool in enhancing programming education among students.

Acknowledgements
The authors would like to extend their sincere gratitude to all the participants, faculty members, and staff who provided invaluable support and insights, as well as to Kolej Komuniti Pasir Salak and Jabatan Pendidikan Politeknik dan Kolej Komuniti that have made significant contributions to various parts of this research endeavour.

Author Contributions
M. S. Mat Saad: Conceptualization, Methodology, Data Collection, Writing - Original Draft Preparation; **M. R. Abdul Razak**: Data Curation, Validation, Supervision, Review & Editing.

Conflict Of Interest
The manuscript has not been published anywhere else and is not being considered by any other journals. All authors have authorized the review, agree with the submission, and state that they have no conflicts of interest in the work.

References
Cavus, N., Uzunboylu, H., & Ibrahim, D. (2006). Combining Collaborative Learning with Learning Management Systems in Teaching Programming Language. *2nd International Open and Distance Learning (IODL) Symposium*, 23–25.

Chong, L., Ninie Farahana K., & Nur Raihana S. (2024). Persepsi Pelajar Semester Dua Diploma Kejuruteraan Mekatronik di Politeknik Sultan Azlan Shah Terhadap Pelaksanaan Pembelajaran dan Pengajaran (PdP) …. *Technical and Vacational Education International Journal*, *4*(1), 352–360.

Chowdhury, T. (2021). The Other Side of Black Screen: Rethinking Interaction in Synchronous Remote Learning for Collaborative Programming. arXiv preprint arXiv:2111.06013.

Engkamat, A., Leong, Y. M., & Gran, S. S. (2023). Replit: A Simple Approach To Real-Time Collaborative Coding. *International Teaching Aid Competition 2023*, *1*(1), 882–886.

Hat, N. C., Sha'ari, S. H., & Abdul Hamid, M. F. (2013). Persepsi pelajar terhadap penggunaan animasi dalam pembelajaran bahasa arab. *Jurnal Teknologi (Sciences and Engineering)*, *63*(1), 25–29.

Hidalgo, C. G., Bucheli-Guerrero, V. A., & Ordóñez-Eraso, H. A. (2023). Artificial intelligence and computer-supported collaborative learning in programming: A systematic mapping study. Tecnura, 27(75), 175-206.

Hun, R. S., & Nor, M. R. (2023). *Kajian keberkesanan penggunaan perisian simulasi autodesk tinkercad dalam pelaksanaan amali kursus digital electronics*. *November*.

Maura, M. F., & Sutabri, T. (2024). Analisis Penggunaan Platform Replit dalam Pembelajaran Coding: Studi Kasus Terhadap Tingkat Keterlibatan Pengguna dan Efektivitas Pembelajaran. *IJM: Indonesian Journal of Multidisciplinary*, *2*(3), 139–145.

Mohd Yusof, S. S., Kohlit, M., Maarof, F., & Abu Bakar, A. Z. (2021). Keberkesanan Penggunaan Alat Bantu Mengajar Interaktif Dalam Pengajaran Dan Pembelajaran Asas Pengaturcaraan. *Technological Forecasting & Social Change*, *15*, 62–79.

Noor Fadzilah, R. A., Rafiza, K., NurKaliza, K., Siti Azrehan, A., & Nur Hashima, M. (2017). Penggunaan aplikasi visual dalam pembelajaran konsep dan asas pengaturcaraan. *Proceedings of the National Pre University Seminar 2017*, 246–251.

Nurul Faeizah H., Hairulliza M. J., & Siti Aishah H. (2022). Meaningful programming learning: A Student-Centered Technology Integration Model. *Jurnal Pendidikan Bitara UPSI*, *15*(1), 29–40.

Xu, W., Wu, Y., & Ouyang, F. (2023). Multimodal learning analytics of collaborative patterns during pair programming in higher education. International Journal of Educational Technology in Higher Education, 20(1), 8.