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Online Homework System for Mathematics Form Three

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Abstract

Homework plays a vital role in learning experiences, especially in Mathematics subject. However, when an unexpected global emergency happens (COVID'19 Pandemic), the schools close, and students face difficulties with their studies as many schools still use classic style homework, which is paper-based homework. The problem arises when educators or teachers do not have the appropriate medium or platform to communicate and provide learning materials to their students. Thus, Online Homework System for Mathematics Form Three is an alternative learning medium for secondary school students to solve this problem. This web-based system is able to assist teachers in uploading homework for students. Students can also access the system to download their homework regardless of the places within the internet coverage without relying solely on the printed version. This system is developed based on the ADDIE model and the evaluation is conducted through questionnaires instruments, which involved 35 respondents from form three students and two mathematics teachers. Evaluation is to test the usability and effectiveness of the system. The findings indicate this system is easy to use, makes the learning process easier, provides the expected function, and is needed nowadays.

Keywords: learning experiences, mathematics, online homework system, ADDIE model.

INTRODUCTION

The 21st century is an era of technology, which rapid development of technology gives a great benefit to humans. Technology helps humans work much more comfortable and less time-consuming. Humans began to take technology seriously through technology development and implement it in various fields, including the education field. Education is an essential domain in enhancing knowledge (Raja & Nagasubramani, 2018). The execution of technology in education is an absolute prominence to help students grasp concepts and topics of subjects and fully comprehend the learning courses. As observed from the traditional learning method, students faced many difficulties in learning without the world of the internet and technology. Physical classes that encompass education via face-to-face also have drawbacks as teachers cannot focus on a student but a whole class. This leads to a predicament among

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students. However, with technology, students can acquire tips and notes, which made the learning process much more manageable.

The use of technology in the classroom positively impacts student learning and motivation, which is also essential for teaching and learning in the 21st century (Coleman, Gibson, & Cotton, 2016). This research has proved that technology integration in the education field enhances the teaching and learning process and increases learning motivation, which is essential for student success.

LITERATURE REVIEW

Homework in Education

Homework generally refers to a task assigned by the teachers to their students to reinforce the students' skills and information learned in the class. Homework is defined as school tasks that are given by teachers for students to complete outside of non-school hours (Cooper, Robinson, & Patall, 2006). In the other word, homework can be said as a way for teachers to extend their studies even without being in school and encourage students to study anywhere. Homework also plays an important role in student life and assists them in their studies. Homework is also viewed as a vital key to student achievement in nowadays society (Minke, 2017).

Some homework is designed to give students opportunities to practice skills taught in class, increase speed, demonstrate mastery, retain skills, review work, and study for tests (Epstein & Voorhis, 2010). The common purpose of homework is to have students revise the lesson that is already taught in the class. By completing homework, students can comprehend the lesson better as they are required to review the learning material once more. Among the suggested benefits of homework, the most obvious is it will increase students' retention and understanding of the material. Some teachers assigned tasks as preparation for the early introduction of future lessons (Cooper, 1994). This homework aims to aid students to be able to understand faster when the new material or concept is delivered in the coming session. Teachers also manage to ensure their students' competency in learning for both the next lesson and examination.

The Importance of Homework for Mathematics

Mathematics is one of core the subject that must be learned by every student who follows the national education system in Malaysia (KPM, 2017). Mathematics is an integral part of the curriculum in almost all countries (Akhter, 2018). Although Mathematics is not included in the compulsory subjects to pass SPM, it is still a subject that is often used as a condition or assessment to enter the higher education level and employment. Since this subject has its own significance in daily life, it is essential to have a regular practice. In American middle school, Mathematics homework was a regular practice for the students and assigned by the teachers during the classes (Roschelle, Murphy & Mason, 2016). Every student had to complete the assigned math problems. This method also becomes a practice in Malaysia, when most teachers give their students homework in the middle or at the end of class after they finish

the lesson concerning specific topics for the day. The teachers purposely give Mathematics homework to provide practice for the student. If the students have difficulties when doing the homework, they will know that they do not really understand the topic they have learned in the class. So, they will work harder to grasp the concept and complete the homework.

Web-Based System Can Enhance Homework Practice

The use of a web-based system is not a new thing in education and is usually applied for online teaching and learning. Web-based homework provides many alternatives than the traditional style homework, which is paper-based approaches. It also increases the student motivation in doing homework. Students felt motivated to do homework using the web-based homework systems and indicated it had a positive influence on their learning experience (Serhan, 2019). Usually, some tools create a student-centered environment, which allows the instructors to assign work based on students' needs while using various multimedia materials such as animation, video, and audio to enhance student learning (Serhan & Almeqdadi, 2020). Thus, its shows that web-based homework really can enhance homework practice among the students.

Importance of Homework Feedback

Feedback is considered an important phase in homework and also acknowledged as an essential element of improving students' learning process (Ahea, 2016). Usually, teachers give feedback to the students. So, the students can evaluate their progress themselves. Furthermore, the teachers usually are more effective in detecting mistakes in students' work. Providing good and quality information to students is very important in helping student learning. Homework feedback is an essential instructional tool for teachers in their teaching process (Cunha, Rosário, Núñez, Nunes, Moreira, & Nunes, 2018). Giving feedback not only can help the teachers identify students' learning problems, mistakes, or misunderstandings in homework, but also can give the teachers ideas to give learning materials that students need for improving their progress. Besides, teachers also can redesign homework to match students' current needs and improve the learning experience for students.

METHODOLOGY

Instructional System Design (ISD) is a structured method for developing learning and instructional systems (Ghani & Daud, 2019). ADDIE model was used to develop an Online Homework System for Mathematics Form 3. ADDIE model is one of the most common models used in the instructional design that has been used for designing and developing various learning and teaching software. It is because the ADDIE model helps to create an efficient and effective teaching design. It comprises five steps: Analysis, Design, Develop, Implementation, and Evaluation. Figure 1 shows the whole phase involved in the model.

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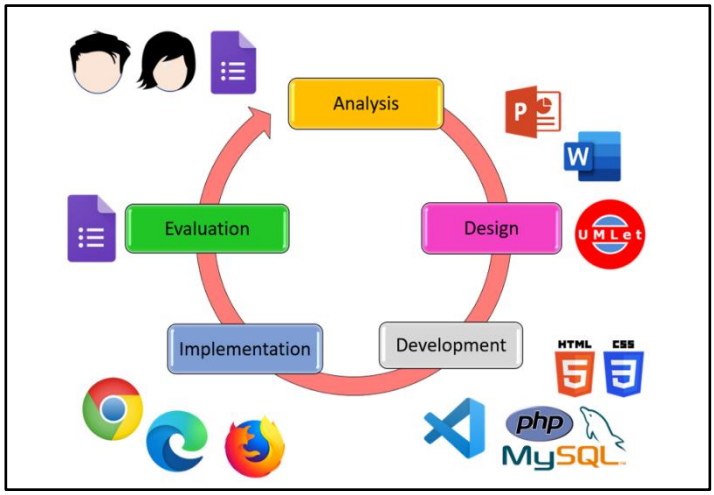

Figure 1: ADDIE model

ADDIE Model has a logical, thoughtful, and comprehensive step-by-step process that makes the development process convenient. ADDIE model also does not have strict linear steps. Each of five steps is easy to understand and related to each other. It also represents a dynamic and flexible guideline for building useful educational tools.

Analysis Phase

In the ADDIE Model, the initial phase is the analysis phase, which involves software requirement activities to gather the users' information. This phase identifies the research's problem statement, the goals and objectives, the project's scope, and the target user. From the problem statement, the goals and objectives, the researcher can analyse the learning content and learning theory related to the users' needs. The target user for this project is high school students form three and their Mathematics teachers. In this phase, the researcher also identifies the existing system's lacked function to be improved in the new system. The existing system is identified based on a few criteria.

Design Phase

In the design phase, the researcher used all the information gathered in the analysis phase. The researcher focused on design the system, which can satisfy the user requirement that the developer gathers in the previous step. The output from the analysis phase is used as a guideline for the design process of this system. In this phase, the researcher designed the user interface, construct the system's architecture and navigation structure, and design the database. The researcher will determine the content that will be used in the system. The design also includes Use Case Diagrams, Activity Diagrams, Sequence Diagram and Class Diagrams using UMLet.

Development Phase

The development phase is the third phase in the ADDIE model. It involves producing the project output based on the methodology. The researcher developed the system based on the designed user interfaces and database. For development, the researcher used PHP, HTML and CSS language to develop the system. The code editor used is Microsoft Visual Studio Code. The system is developed based on the information gathered in the design phase. Figure 2 shows the interfaces of Online Homework System for Mathematics Form 3.

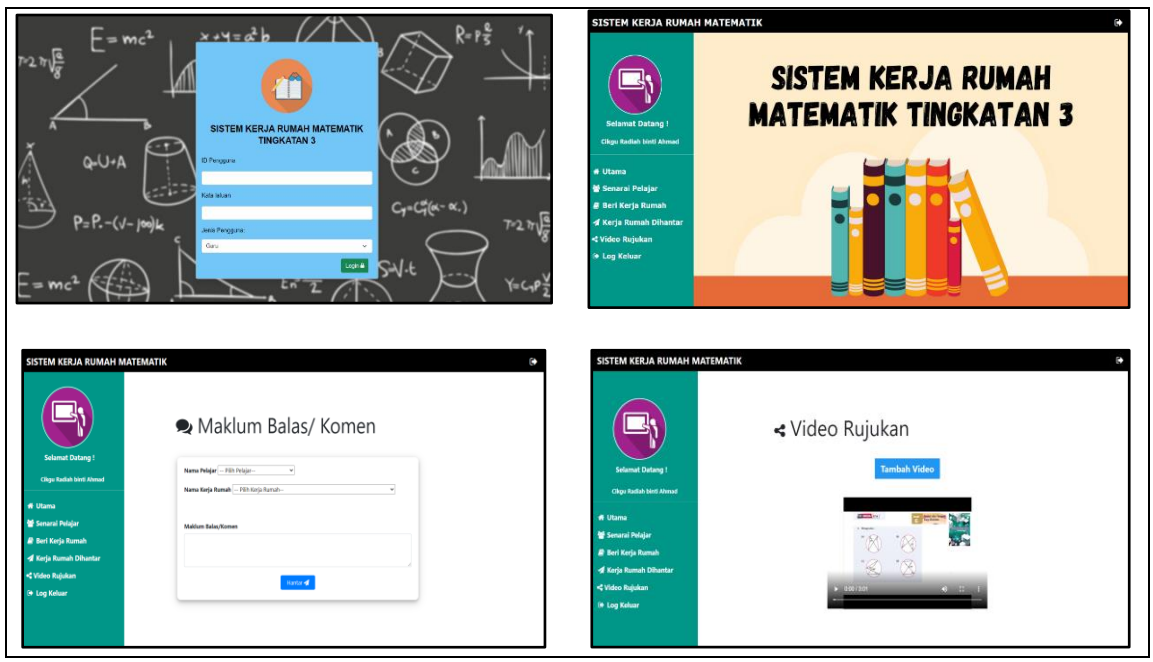

Figure 2: User interface of online homework system for mathematics form 3

Implementation Phase

The implementation phase is the phase after the system is developed. In this phase, the researcher performed unit testing to ensure that the system fulfils the users' requirements. Each of the units needed to be tested. After unit testing, the researcher performs system testing, which is when all the unit of the system is integrated and tested altogether. The unit testing and integrated unit is tested on different type of browser. Besides, the researcher also performs User Acceptance Testing (UAT). In UAT, the researcher released the system to be tested to the users, which is form three students and their Mathematics teachers. UAT is performed to identify if the system is well-functioning and suitable for the users. In this phase, the users' feedbacks were collected.

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Evaluation Phase

In the ADDIE model, the last phase is the evaluation phase. Evaluation is the process of testing the system to determine if the system is working or not. In this phase, there are two types of evaluation, which are formative evaluation and summative evaluation. Formative evaluation is an evaluation performed during the development of the project and summative evaluation is performed at the end of the project. Summative evaluation is performed to ensure that the project is achieving the goals or not by measuring the effectiveness of the system to the target users.

RESULTS AND FINDINGS

The results and findings for this study were collected using the questionnaire. The questionnaire is distributed randomly to 35 respondents of form three students and two their Mathematics teacher. The respondents were informed the surveys were voluntary, anonymous feedback and the result would be used to improve the system. This questionnaire includes two parts which are the usability and effectiveness of the Online Homework System for Mathematics Form 3 and will focus on design, functionality, ease of use, and the satisfaction of users. Before evaluating the system, the respondents can view the video of the functionality of the system.

According to Wu and Leung (2017), Likert scale is basically an ordinal scale measure. Likert scale has five scales, which are Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5). Table 1 shows Likert scale used in questionnaire and Table 4.2 shows mean score classes and evaluation level.

Table 1: Likert scale

Scale	Explanation
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

Table 2: Mean score classes and evaluation level

Mean Score Classes	Evaluation Level
1.00 – 2.33	Low
2.34 – 3.66	Medium
3.67 – 5.00	High

Table 3 shows items included in questionnaire for testing the usability of the system. Overall, for the usability of the system, most of the respondents agree. However, for some questions such as questions 2, 4, 5, 7, 8 and 9, a few respondents were neutral, neither agree nor disagree. For question 2, one

respondent neutral that the colours and designs used by this system is interesting. For question 4, one respondent neutral that the buttons and font sizes used in this system are suitable. For question 5, one respondent neutral that comfortable using this system. For question 7, one respondent neutral that the way to use this system is easy to remember. For question 8, one respondent neutral that this system is user friendly and for question 9, one respondent neutral that the system has the functionality that they are expected. The result of mean score shows that the respondents agree with the design and content of Online Homework System for Mathematics Form 3.

Table 3: Usability of online homework system for mathematics form 3

No No	Question	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Mean Score
1.	The content and design used in the system is clear to be understand.	0	0	0	8	29	4.8
2.	The colours and designs used by this system is interesting.	0	0	1	5	31	4.8
3.	The buttons in this system all work fine.	0	0	0	5	32	4.9
4.	The buttons and font sizes used in this system are suitable.	0	0	1	4	32	4.8
6.	The system is easy to use.	0	0	0	5	32	4.9
7.	The way to use this system is easy to remember.	0	0	1	6	30	4.8
8.	This system is user friendly.	0	0	1	1	35	4.9
9.	The system has the functionality that they are expected.	0	0	1	4	32	4.8
10.	Overall, I am satisfied with the system.	0	0	0	5	32	4.9
		Total					**4.4**

Table 4 shows items included in questionnaire for testing the effectiveness of the system. Overall, for the effectiveness of the system, most of the respondents agree. However, for some questions such as questions 2, 6 and 7, a few respondents were neutral, neither agree nor disagree. For question 2, one respondent neutral that the system makes student to submit homework to the teacher easier. For question 6, two respondents neutral that the system works really well that manual. For question 7, one respondent neutral that the system makes students more flexible in completing homework given by the teacher. The result of mean score shows that all the respondents agree that Online Homework System for Mathematics Form 3 is a system that is really needed with current situation.

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Table 4: Effectiveness of online homework system for mathematics form 3

No	Question	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Mean Score
1.	This system makes the teacher to give homework to students without face to face easily.	0	0	0	3	34	4.9
2.	The system makes student to submit homework to the teacher easier.	0	0	1	5	31	4.8
3.	The system make the teacher task easier.	0	0	0	4	33	4.9
4.	The system can help student complete homework assigned by the teacher.	0	0	0	6	31	4.8
5.	The system is really needed with current situation.	0	0	0	1	36	5.0
6.	The system works really well that manual.	0	0	2	8	27	4.7
7.	The system makes students more flexible in completing homework given by the teacher.	0	0	1	4	32	4.8
	Total						**4.8**

CONCLUSION

The findings indicate that Online Homework System for Mathematics Form 3 can be considered as one of the learning tools that can help in the education world especially for the students. It is suitable to be used during pandemic issue and anytime. However, there are many improvements can be made in the future for this system to ensure it will fulfils the users' requirements.

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