

Developing an Automated Online Multiple Choice Test on a WordPress Site Using Opinion Stage Plugin: A Case for LearnAdlib College Advanced Level Computer Science

Mavu Newton*, Hillary Marufu**

* Faculty of Technology
** Zimbabwe Open University

DOI: 10.29322/IJSRP.13.03.2023.p13514
<http://dx.doi.org/10.29322/IJSRP.13.03.2023.p13514>

Paper Received Date: 6th February 2023
Paper Acceptance Date: 6th March 2023
Paper Publication Date: 15th March 2023

Abstract-The ADDIE model of instructional design was used in carrying out research. An Opinion Stage plugin was installed in a WordPress site and an automated online multiple choice test was developed for Lower Six Computer Science students for LearAdlib College, Zimbabwe. It was based on two introductory lessons which introduced Databases and Database Management. Two PowerPoint presentations were created for two lessons to introduce Databases and Database Management Systems to Lower Six students. The presentations were then converted into video lessons using PPTX to Video converter android application. The two lessons were then uploaded onto the college website via YouTube. Opinion Stage quiz plugin was then installed on the website at the end of the second lesson. After installing the plugin, an account was created and then the online test was designed. Three experienced Computer Science teachers evaluated the test before it was administered to a class of 30 students. They concluded that the test was suitable for the grade level and it covered demands of the Zimbabwe Curriculum Development Unit and it can adequately be used by students for learning and for preparation of examinations. The automated test successfully marked itself, instantly giving students feedback on the scores they got and the action they need to take depending on the scores they got. Student marks ranged from 1/10 to 10/10 and the average score was 8/10. Thus the performance of the students on the online test was satisfactory, though there were some students who needed to put more effort to follow the online lectures thoroughly and do all the activities instructed in the lessons. Among the 30 students who participated in the online test, seven of them used mobile phones in attempting the test and both the students and the teachers concluded that the test was very responsive to different mobile devices as students on very small screens also managed to answer the questions with as much ease as those that were using desktops and laptops. The teachers recommended that there should be more of such tests and quizzes on the college's website as they will help students to interact better with the learning materials on the site. That will make

learning more entertaining as students will write automated tests and quizzes, obtaining instant feedback any time they attempt the questions, hence ascertaining their level of understanding of concepts they would have learned. They will be guided on whether to proceed or to revisit challenging areas. That was quite motivating to them.

Keywords-ADDIE model, Database, Database Management System, Opinion Stage Plugin, online test.

I. INTRODUCTION

Online learning is increasingly becoming popular with the widespread of internet and internet related technologies [6] [7]. In some situations, online learning can be the only means available for a student to learn while in some situations students can afford what is called blended learning. Blended learning is where the students are afforded both online learning and physical classroom learning [5]. Thus blended learning is some hybrid of both online and traditional classroom learning. This means that the student exposed to blended learning can learn both at school and at home. He or she has the flexibility of initiating and extending learning into the night, the weekends and the holidays [8]. This implies that the student will have greater learning time compared to the student who either relies on pure online learning or pure classroom learning. Although online learning comes in handy in covering learning gaps that are associated with shortage of teaching/learning time, it does not come without challenges. One of the challenges of online learning is its ability to offer real-time in interactivity and discussion [9] [10]. If students become passive recipients of knowledge, they tend to get less from the learning process [9]. For them to understand and master better, they need to be active participants in the learning process. This is where the concept of online quiz, tests and exercises come in.

In this research paper, two video lessons will be developed as WordPress posts and published on the college website. At the end of the second post (video lesson), an automated multiple choice exercise is going to be developed so that students test themselves after listening to the video lesson. They will get instant feedback which shows them their score and then guide them on what to do depending the core obtained. Since the student will be self-testing his understanding, he or she will be allowed to revisit both the test and the lesson as many times as he or she wants until he or she improves to a point that satisfies him or her.

WordPress is a content management system used by web designers to design websites for various organizations and various functions [11] [14]. For basic website functionality, a web designer can use WordPress to design a website without coding. However, as the website becomes large and more complex, a web designer will need the skills of a developer to develop suitable plugins to use in a WordPress site. In most situations, some free and paid plugins can be found online edify complex functionality of a WordPress site. For this research, Opinion Stage plugin is going to be used to implement the online multiple choice test [12] [15]. Opinion Stage plugin has a free version and a premium version. The plugin implements what is called Trivia Quiz [12] [13]. It creates multiple choice questions that will be marked in real-time as the student will be writing. After marking work for all student, it produces a detailed report on the performance of the students, their challenging areas and their areas of strength. The teacher will simply download the report for decision making [12]. The premium version produces more reports compared to the reports produced from the free version of the plugin [12]. This research is going to use the free

version of the plugin as it can produce enough data to suffice the goals of the research at hand.

II. THE ADDIE MODEL OF INSTRUCTIONAL DESIGN

ADDIE model is a systematic, dynamic, flexible and generic instructional design process [1]. It stands for Analysis, Design, Development, Implementation, Evaluation [1]. In instructional design analysis is the process of finding the problem or the learning gap. Current knowledge or behavior in the students is ascertained and then expected new behavior is established. Thus learning gaps will be used to establish learning/ lesson objectives [1].

In the design phase of the process, the facilitator or teacher is now laying down teaching methods, choosing suitable media and noting down activities associated with methods chosen [2]. Thus the design process is the blueprint of the lesson to be carried out.

Development is the stage where actual materials for the lesson are either gathered or they are created from the available resources. Charts or pictures are drawn and materials from the environment are gathered in preparation for the lesson [2]

Implementation is the actual teaching/learning process taking place. The facilitator and the students meet in the classroom setup and the lesson takes place [1][2].

On evaluation, the facilitator or teacher now gathers data to confirm evidence of learning [3][4]. Teacher can do this in a variety of ways. He or she can analyze performance on exercises written, activities performed or interaction that took place during the lesson. In some situations, he or she may even design questionnaires and interviews to gather views from the learner or other facilitators who would have witnessed the lesson.

III. THE ADDIE MODEL: THE ACTUAL STEPS TO SOLVE THE PROBLEM

A. Analysis

The activities carried out in this research can be divided into three (3) main parts which are: The first online Lesson, the second online lesson and the test. After analyzing the national syllabus, the school syllabus and teachers' plans and schemes, aims and objectives established were as follows:

LESSON ONE

By the end of the lesson, students should be able to:

- define the terms database, database management system, relational database.
- list and explain the advantages of databases over file systems.
- describe common features of relational databases (relations, columns and records)
- give at least three common example of relational databases.

LESSON TWO

By the end of the lesson students should be able to:

- distinguish between databases and database management systems.
- design a simple sample of a database with at least three tables, showing the relationships between or among the tables in the database.
- write an online multiple choice test.
- answer interview questions related to the two lessons and the test.

B. Design

A lesson plan was designed and it had three main resources and activities which are:

1. The first video lesson
2. The second video lesson
3. The test

Installation of the following applications was also done.

1. PPTX to Video converter was installed on a phone.
2. PowerPoint slides for the lessons were developed using material from the textbook by David Watson and Helen Williams.

Opinion Stage plugin was installed LearnAdlib website, <https://learnadlib.co.zw>.

C. Development

At this stage the two video lessons and test were developed and deployed onto LearnAdlib website as posts. Illustrations of the video lessons and the test as they appear on the website are as follows.

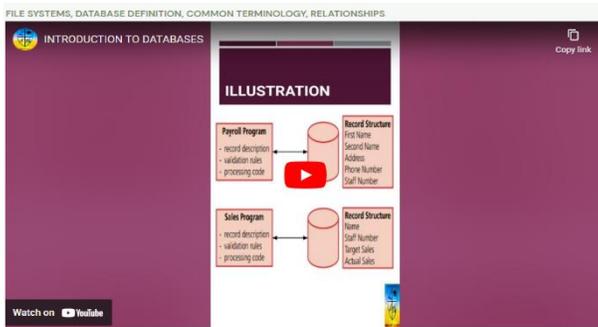


Fig 1. The First Video Lesson on LearnAdlib website



Fig 2. The Second Video Lesson on LearnAdlib website

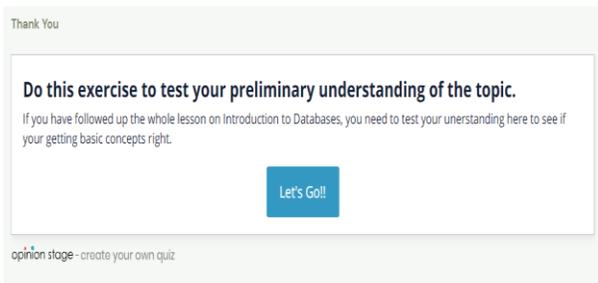


Fig 3. The online test on the college website

After clicking the start button shown above, the test will present each question at a time. As the student selects the answer, the system will mark the student's answer as either correct or wrong. After marking, the system will then go to the next question automatically. It will stop after the student answers all questions. This is shown in the diagram below.



Fig 4. Sample question before the student clicks the answer

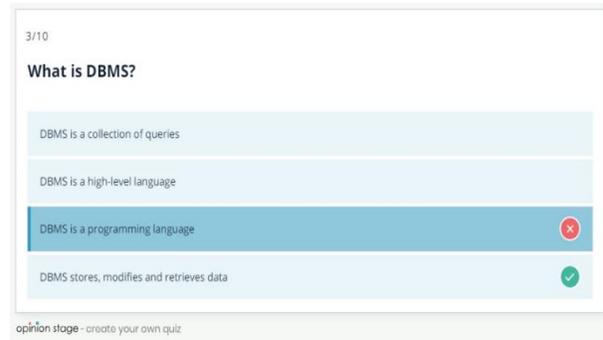


Fig 5. The student being marked wrong after clicking the wrong answer

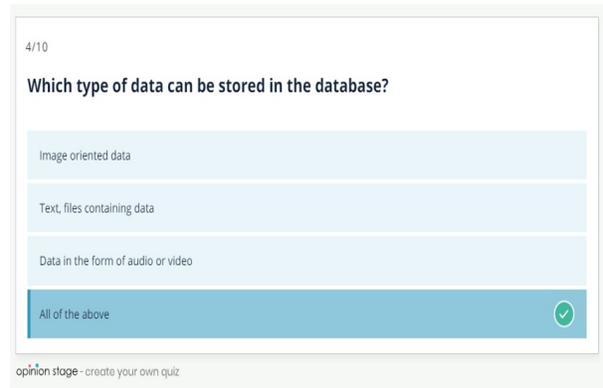


Fig 6. The student being marked correct after clicking the correct answer

After completing the test, the student will receive immediate feedback on his or her performance and some advice on what he or she should do, depending on whether he scored well or his mark is bad. Samples of good and bad total scores are shown below.

< Start again

You got 3/10 correct answers

Well, You are a Newbie!

It seems you are just starting out. Your effort is commendable though. No worries, there's a huge ocean of learning and you can do it. Focus on polishing up this topic. Remember, the sky's the limit!

Fig 7. Sample feedback for a poorly performing student

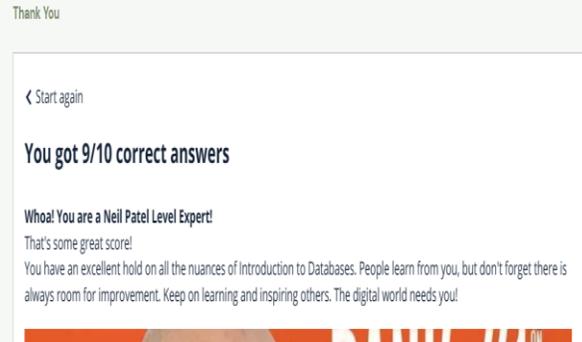


Fig. 8 Sample feedback for high performing student

D. Implementation

The researcher managed to instruct all the students to attend to the online video lectures as he supervised. The students went through both the lessons after which they were afforded the chance to ask questions. After discussion of student questions then the students were given time to write the online test. After the test 10 students were selected and interviewed. They orally provided their answers and they were recorded. Three Computer Science teachers were also interviewed and the results of the interview were recorded.

E. Evaluation

Opinion Stage plugin processes a detailed and downloadable report on student performance and statistics soon after all students have finished their test or quiz. The report is as shown in the picture below. The report contains the following information

- Summary of activity on the test page.
- The times and dates each student attempted every question
- The time each student took to complete the whole test.
- The answers each student wrote on each and every question.
- The number of correct and wrong attempts per each question
- Analysis summarizing how many time each answer was chosen on each and every question.

Submission	What is th	What is a	What is DI	Which typ	In which	Which of I	Which of I	Which of I	Correct an	Time to cc	Host URL				
1	2023-01-1	Database	Collector DBMS	stoi	Data in th	Text	Decentral	Microsoft	Single-us	Store data	Analysing	4	0:41	https://le	
2	2023-01-1	Database	Organized DBMS	is a	Text, files	Text	Distribute	Google	Single-us	User inter	Security	5	0:39	https://le	
3	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	8	1:44	https://le	
4	2023-01-2	Data	Back	Organized DBMS	stoi	All of the	Table	Decentral	Microsoft	High Lev	Store data	Analysing	1	0:29	https://le
5	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	10	0:44	https://le	
6	2023-01-2	Database	Collector DBMS	is a	Text, files	Table	Network	IBM DB2	Minimum	User inter	Security	7	0:25	https://le	
7	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	9	1:01	https://le	
8	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	9	0:31	https://le	
9	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	10	1:19	https://le	
10	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	10	0:42	https://le	
11	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	10	0:42	https://le	
12	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	Lack of Au	Analysing	9	0:39	https://le	
13	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Support A	Store data	Analysing	7	0:38	https://le	
14	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	IBM DB2	Single-us	Lack of Au	Analysing	8	0:38	https://le	
15	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	Lack of Au	Analysing	9	1:18	https://le	
16	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	Lack of Au	Analysing	9	0:41	https://le	
17	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	Lack of Au	Manipula	8	0:38	https://le	
18	2023-01-2	Database	Collector DBMS	stoi	All of the	Table	Decentral	Google	Single-us	Lack of Au	Analysing	8	0:35	https://le	
19	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Support A	Lack of Au	Analysing	7	1:44	https://le	
20	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	Lack of Au	Analysing	9	0:34	https://le	
21	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	Lack of Au	Analysing	9	0:35	https://le	
22	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	10	0:36	https://le	
23	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	10	0:41	https://le	
24	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	Lack of Au	Analysing	9	2:50	https://le	
25	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	10	0:39	https://le	
26	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	Lack of Au	Analysing	9	0:33	https://le	
27	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	10	0:41	https://le	
28	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Support A	User inter	Analysing	9	0:36	https://le	
29	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	IBM DB2	Single-us	User inter	Managing	7	0:31	https://le	
30	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	10	0:36	https://le	
31	2023-01-2	Database	Organized DBMS	stoi	All of the	Table	Decentral	Google	Single-us	User inter	Analysing	9	0:43	https://le	

Fig 9. Compact report from opinion stage plugin.

E1. Summary of activity on the test page

Before the main downloadable report, there is a summary of all activities that took place on the test page. Opinion Stage plugin will be recording all visits that occur to the page, including those that did not write the test and those that wrote but did not complete the test. This is shown in the diagram below.

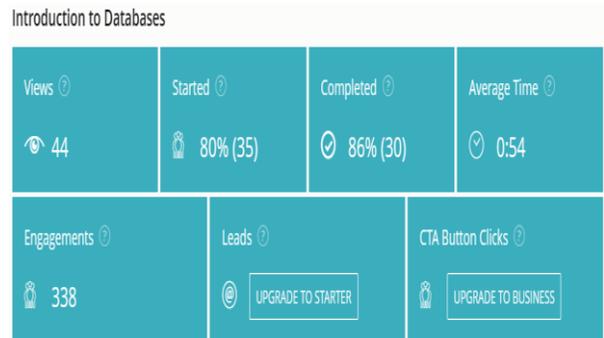


Fig. 10 Summary of activity on the test page.

It can be seen from the above summary table that people who visited the test page were 44. These included the teachers who were testing the page. Those who attempted the test were 35 (80% of all visitors to the page). Those who finishes the test were 30 (86% of those who started the test. This means all teachers just started the test in order for them to test it but they did not complete it. For all students and all questions, the average time spent on each question 54 seconds. That means for the 10 questions each student was going to spend less than 10 minutes. Total engagement was 388.

E2. Student Answers Per each Question

For all the questions, answers that were supplied by each student were recorded in the system Part of that long record is as shown below.

What is the full form of DBMS?	What is a database?	What is DBMS?	Which type of data can be stored in the database?	In which of the following formats data is stored in the database management system?	Which of the following is not a type of database?
Database Management System	Organized collection of data or information that can be accessed, updated, and managed	DBMS is a programming language	All of the above	Table	Decentralized
Database Management System	Organized collection of data or information that can be accessed, updated, and managed	DBMS stores, modifies and retrieves data	All of the above	Table	Decentralized
Database Management System	Organized collection of data or information that can be accessed, updated, and managed	DBMS stores, modifies and retrieves data	All of the above	Table	Distributed
Database Management System	Organized collection of data or information that can be accessed, updated, and managed	DBMS stores, modifies and retrieves data	All of the above	Table	Decentralized

Fig. 11 Small section of all student answers per each question

As shown above, all answers that students chose per each question were recorded in Opinion Stage. The questions are listed horizontally on the top. The 30 answers that students chose per each question are listed vertically. The image above is just a small section of that report.

E3. Table of student scores

Opinion Stage produced the scores for all the 30 students as shown in the following image.

L	9	(
Correct answers	8	(
4	8	(
5	7	(
8	9	(
1	9	(
7	10	(
3	10	(
9	9	(
3	10	(
10	9	(
10	10	(
9	9	(
7	7	(
8	10	(
9	9	(

Fig. 12 Scores for all students as in Opinion Stage report

From the above table student marks can be summarized by grouping students with the same scores so that the results can look like the ones below.

Table 1: Summary of Student Scores

Mark out of 10	Number of students who scored that mark
1	1

2	0
3	2
4	1
5	1
6	0
7	4
8	4
9	9
10	8
TOTAL	30

From the table it can be observed that most students scored 9/10, followed by those who scored 10/10 and then 8/10. Very few students scored low marks. A pie chart of student performance is as shown below.

Mark out of 10

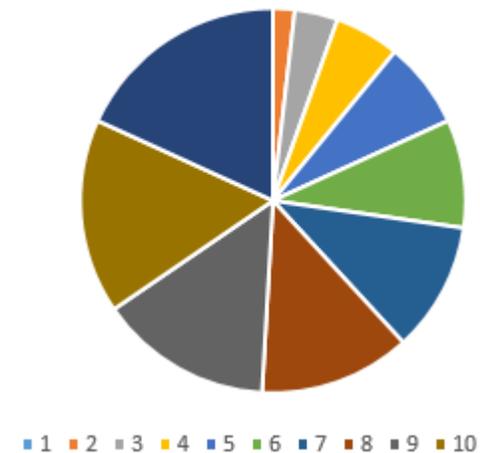


Fig. 13 Pie Chart showing the percentage of students who scored given scores

Highest mark, lowest mark and the average mark were calculated in Microsoft Excel and the results were as shown in the table below.

High	10
Low	1
Average	7.866667

Fig. 14 Average mark from Opinion Stage

Oral responses from the students and the teachers

Samples of phones with smallest screens that were used in the test by students produced the following views on sample questions.

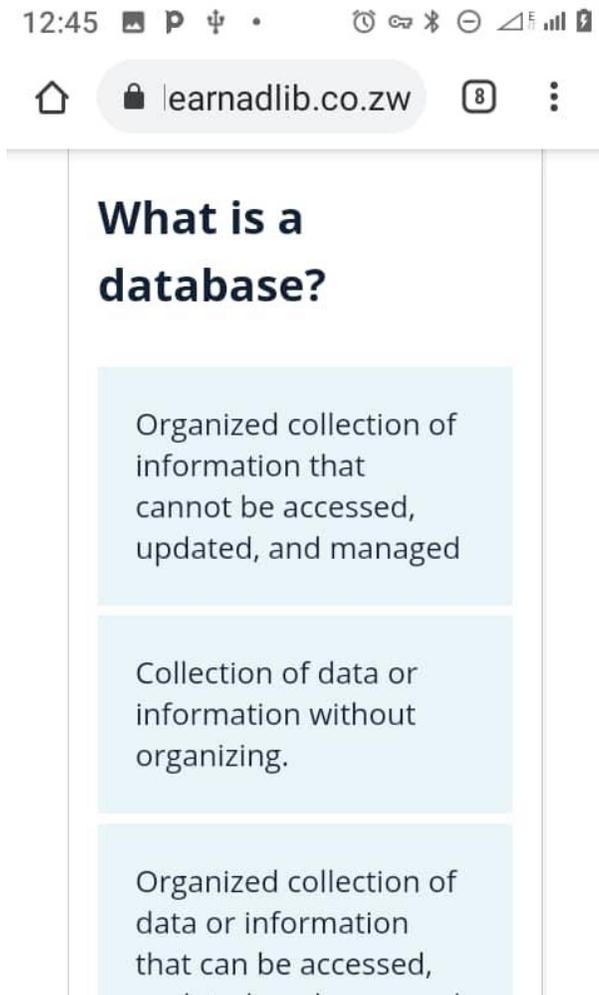


Fig. 15 How a question and its answers appeared on the smallest screen.

The question above appeared on the screen of the student before the student started choosing the correct answer. During the time of answering the question, the screen would highlight the answer chosen by the student as shown in the diagram below. From the two sample screens, it can be seen that students who answered the questions using mobile phones were able to do it with as much ease as those who were on desktops. Thus the multiple choice test was quite responsive to different devices that were available to students.

All students who were interviewed were of the feeling that the test quizzes improve their level of interactions with online learning materials and hence they would need to see more of such on the college website. This motivates them to either re-do what they would not have understood as they would have found some kind of test to check their understanding of most preliminary concepts learned.

The three teachers acknowledged the importance of online tests and quizzes. They even advised that if it was possible all online lessons were going to have quizzes or tests at the end so that as soon as students follow an online lesson they will be provided with something that they will then use to test understanding and get such immediate feedback on what they are going to do next.

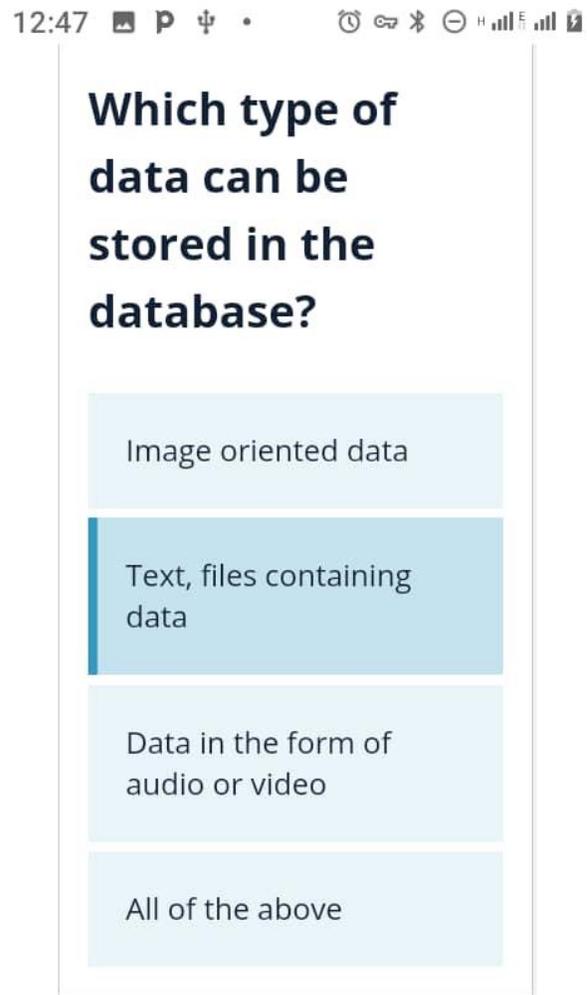


Fig. 16 Student clicking the right answer using a small screen device

IV. CONCLUSION

Development of an automated online multiple choice test was done and completed using Opinion Stage plugin. The test was taken by 30 students and they performed generally well except for a few. The test gave a lot of insight on the part of the researcher, the students and then Computer Science teachers who participated in the activity. Recommendations were that more of such tests and quizzes need to be available for most online lessons so that students can improve on the way they interact with online material they will be learning.

REFERENCES

- [1] Holden, J. T. (2015). An introduction to the ADDIE instructional systems design model. FGDLA (1-17). US: fgdl.a. us.
- [2] Spatioti, A. G., Kazanidis, I., & Pange, J. (2022). A Comparative Study of the ADDIE Instructional Design Model in Distance Education. In *Information (Switzerland)* (Vol. 13, Issue 9). MDPI. <https://doi.org/10.3390/info13090402>
- [3] Sulistyaningrum, N. D., Mumpuniarti, M., & Nurkhamid, N. (2021). Development of activity of daily living modules based on behavioral

- approaches for moderate intellectual disability. *Jurnal Prima Edukasia*, 9(1). <https://doi.org/10.21831/jpe.v9i1.32857>
- [4] Dick, W., Carey, L., & Carey, J. O. (2015). *The systematic design of instruction* (8th ed.). Pearson.
- [5] David Watson and Helen Williams 2019 Cambridge International AS & A Level Computer Science Hodder Education, London
- [6] Castro, M.D.B., Tumibay, G.M. A literature review: efficacy of online learning courses for higher education institution using meta-analysis. *Educ Inf Technol* **26**, 1367–1385 (2021). <https://doi.org/10.1007/s10639-019-10027-z>
- [7] Susilawati, S., & Supriyatno, T. (n.d.). *Online Learning Through WhatsApp Group in Improving Learning Motivation in the Era and Post Pandemic COVID-19*. <http://journal.um.ac.id/index.php/jptpp/>
- [8] Müller, C., & Mildenerger, T. (2021). Facilitating flexible learning by replacing classroom time with an online learning environment: A systematic review of blended learning in higher education. In *Educational Research Review* (Vol. 34). Elsevier Ltd. <https://doi.org/10.1016/j.edurev.2021.100394>
- [9] Simamora, R. M. (2020). Studies in Learning and Teaching Studies in Learning and Teaching The Challenges of Online Learning during the COVID-19 Pandemic: An Essay Analysis of Performing Arts Education Students. 1(2), 86–103. <https://doi.org/10.46627/silet>
- [10] Basar, Z. M., Mansor, A. N., Jamaludin, K. A., & Alias, B. S. (2021). The Effectiveness and Challenges of Online Learning for Secondary School Students - A Case Study. *Asian Journal of University Education*, 17(3), 119–129. <https://doi.org/10.24191/ajue.v17i3.14514>
- [11] A. Kumar, A. Kumar, H. Hashmi and S. A. Khan, "WordPress: A Multi-Functional Content Management System," *2021 10th International Conference on System Modeling & Advancement in Research Trends (SMART)*, MORADABAD, India, 2021, pp. 158-161, doi: 10.1109/SMART52563.2021.9675311.
- [12] <https://www.opinionstage.com/>
- [13] Vanfossen, L. (n.d.). WordPress Plugins File Gallery WordPress Plugin.
- [14] Iqbal, M., Noman, M., Amir Manzoor, E., Muneeb Abid, M., Noman, M., Raza Talpu, S., & Manzoor, A. (2020). AN EMPIRICAL STUDY OF POPULAR CONTENT MANAGEMENT SYSTEM-WORDPRESS VS DRUPAL VS JOOMLA Robust Train Timetable View project Project Management by Amir Manzoor (PMBYAM) (pmbyam.com) View project AN EMPIRICAL STUDY OF POPULAR CONTENT MANAGEMENT SYSTEM-WORDPRESS VS DRUPAL VS JOOMLA. <https://doi.org/10.21917/ijms.2020.0168>
- [15] Lin, J., Sayagh, M., & Hassan, A. E. (2022). The Co-evolution of the WordPress Platform and its Plugins. *ACM Transactions on Software Engineering and Methodology*. <https://doi.org/10.1145/3533700>

AUTHORS

Mavu Newton – Master of Science in Information Systems Management, Midlands State University, Zimbabwe.

Hillary Marufu – Master of Science in Information Systems, National University of Science and Technology, Zimbabwe.