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Effectiveness of the Zipgrade app in marking and data analysis in the Human Anatomy Department of the School of Medicine and Pharmacy at the University of Rwanda

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ABSTRACT

INTRODUCTION: Introduction: ZipGrade is a free online app, and that helps to grade student assessments in multiple choice formats. It is an effective tool to analyze the student's performance within a short time. This study was conducted to determine the Zipgrade app's effectiveness in electronic marking and data analysis.

METHODS: The study used the Anatomy III answer sheets of 71 students from Pharmacy Level 2. The Zipgrade App was used to prepare and mark the answer sheets at the end of the assessment. Within 15 minutes, 69 out of the 71 answer sheets were scanned and marked electronically on the mobile Zipgrade app using a smartphone. The Zipgrade mobile app analyzes the performance of the students on each question.

RESULTS: Zipgrade App provided results in the form of percentages, tables, and graphs. The minimum score was 38/80 (47.5%), while the maximum score was 71/80 (88.8%). The average score was 58.4/80 (73.1%). The median is 60 (75%), while the standard deviation was found to be 0.09. Six students scored 85-90%, ten students scored 80-85%, nineteen scored 75-80%, and seventeen students obtained 70-75%. Seven students got 65-70%, and three students scored 60-65%. Five students scored between 50 and 60%, and two students failed the assessment by scoring 45-49%. Item analysis of questions showed that question 63 was the easiest, where 100% of students passed, and the most difficult was question 10, where only 10.1% of students passed the question.

CONCLUSION: Zipgrade is an important technology in marking and grading, and it is a more efficient tool for a data-driven education system in today's world

Keywords: Zipgrade; marking; Assessment; Analysis; Multiple choice questions

INTRODUCTION

ZipGrade is a mobile application that uses a device's camera to scan and grade multiple-choice answer sheets. For lecturers who give paper-based multiple-choice tests or researchers who want to collect multiple-choice responses on paper [1]. The time-saving benefits of marking and collecting data by simply using a smartphone camera to scan an answer sheet are enormous [2]. A professional

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educator's responsibility includes the task of teaching, guiding, directing, training, assessing, and evaluating students [2,3]. Educational assessment is the process of gathering and processing information to measure student learning outcomes [4]. Assessment of student learning outcomes includes performance assessments, self-assessments, portfolio assessments, daily assessments, midterm assessments, end-of-semester assessments, competency level exams, Final exams, and national exams [4].

At the Human Anatomy department, assessment is used as a basis for improving the learning process, and it allows the student to be involved in the learning process. The assessment provides an opportunity for the student to improve their learning outcome [5]. At the end of the lesson, an assessment is given to measure the achievement of competencies [6]. Therefore, an assessment in education is a key aspect of measuring a student's competency [7]. There are various ways to assess the student learning experience; the most common methods include using written tests, demonstrations, observations, practicals, and oral interviews [8]. Some of these methods may incorporate the use of technological devices and computerized scoring [9,10]. The development of digital technology today has supported many teaching, learning, and assessment activities [11]. On the other hand, these rapid technological advances have caused social inequalities, as they require constant training and retraining of users [12]. The use of information and communication technology (ICT) in education is very effective in increasing the competency and versatility of an educator in a modern era that has witnessed the shift from traditional teaching to digital teaching formats [11]. Based on this, it is important that educators seek digital concepts in analyzing the performance of the students and also improve the quality of the test items to suit the expected learning outcomes [12,13].

Analysis of test items can either be conducted quantitatively or qualitatively; while quantitative analysis determines the characteristics of the items, qualitative analysis determines the relationship of content and shape [5]. This is useful for improving judgment and procedures empirically. Also, qualitative analysis helps construct and validate content, while quantitative analysis measures the difficulty of the items by checking the validity and reliability of the questions [14]. The current study was conducted to determine the Zipgrade app's effectiveness in electronic marking and data analysis.

METHODS

A purposive sampling method was used to select the Gross Anatomy III module assessment for pharmacy level two students. This assessment consisted of 80 multiple-choice questions and was written by 71 pharmacy level two students in the School of Medicine and Pharmacy at the University of Rwanda. The Zipgrade app was used to prepare and mark the answer sheets at the end of the assessment.

Setting Up the Zipgrade app and answer sheet preparation: The ZipGrade app is available on both iOS and Android phones and is used in conjunction with a desktop-optimized website (www.ZipGrade.com). The Zipgrade website has a downloadable answer sheet with the precise layout and alignment guides the camera will capture when scanning. Three templates are available for tests with up to 20, 50, or 100 questions. Each question item has five answer options available, labeled A to E. For this study, the researchers selected the template for 80 MCQs. The steps followed by the researchers included downloading the Zipgrade mobile application, creating a Zipgrade account, and creating a new quiz answer sheet, which was coded as "CAT 1 gross anatomy III" (Figure 1 plate 1). The answer sheets created by Zipgrade provided spaces for their names, dates, and student registration numbers. The students were given instructions on how to shade the option of their choice using a pen.

Key setting: At the end of the assessment, the next step was to input the marking guide of the assessment on the Zipgrade. This was done by tapping the "Edit" key (plate 2). This command will pop up a screen with a row of selectable ABCDE options for each question. The researchers entered the correct option for each question (Plate 3). Alternatively, there was an option to enter the answer key by scanning an answer sheet that had the correct answers already shaded, but the researcher preferred to use the first method because it saves time. Once the quiz's answer key had been entered, the researchers proceeded to scan students' completed answer sheets.

Paper Scanning and electronic marking on Zipgrade

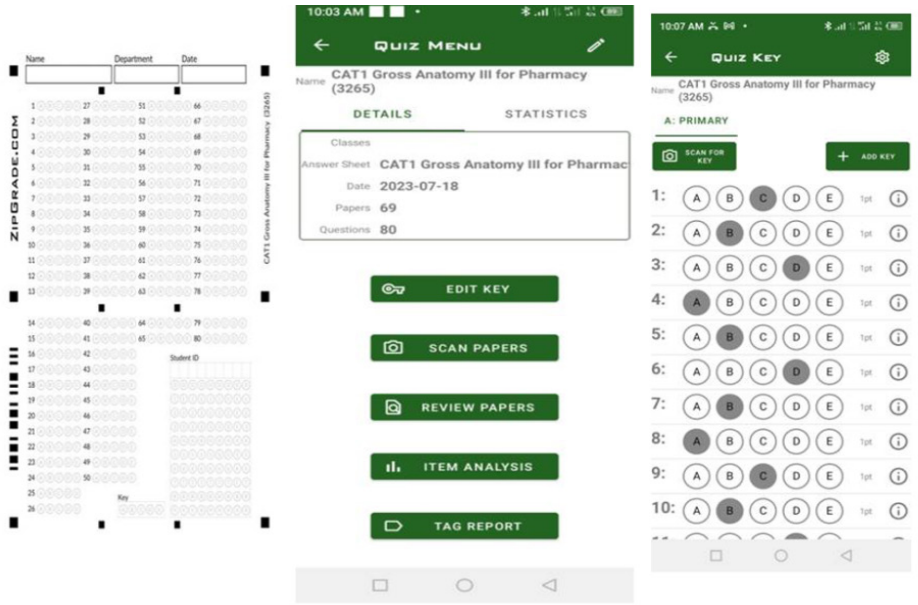

PLATE 1 PLATE 2 PLATE 3

Figure 1: Key settings

The steps followed were to tap the "Scan Papers" button on the Zipgrade app. This command turns on the smartphone camera and shows four alignment guides appearing near the four corners of the screen. The next step was to align the answer sheets with the four alignment guides so that Zipgrade could capture the digital print of the answer sheets. A sudden smartphone vibration is a confirmation that the answer sheet has been scanned, marked, and recorded on the Zipgrade app.

RESULTS

Zipgrade scanned and electronically marked 69 out of the 71 answer sheets within 15 minutes. Zipgrade generates a list of students and their corresponding scores (Plate 4). However, names

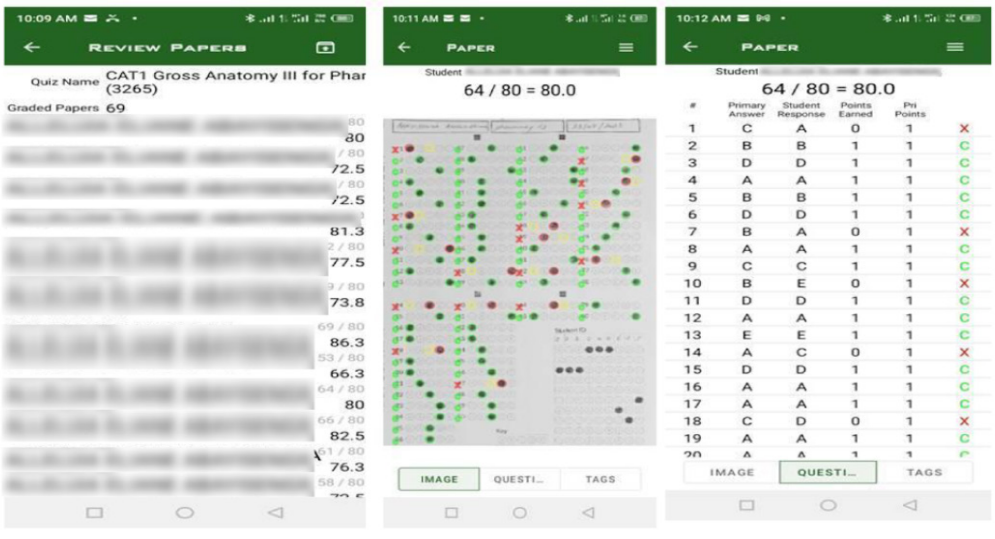

PLATE 4 PLATE 5 PLATE 6

Figure 2: Paper analysis

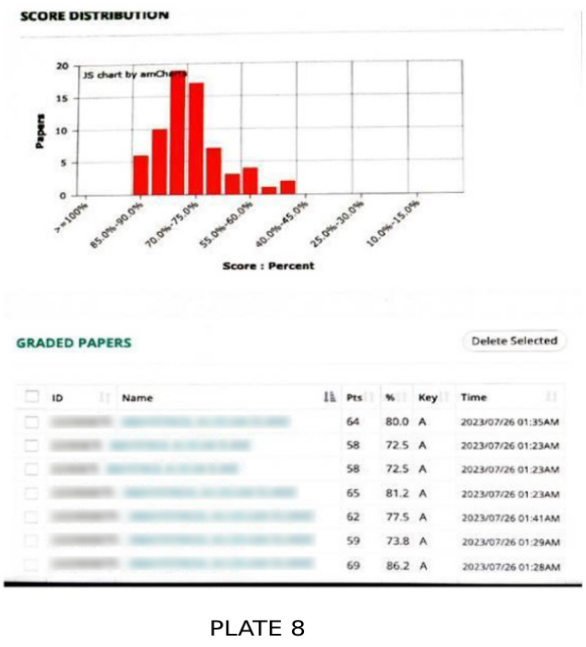

Figure 3: Quiz details and Score distribution

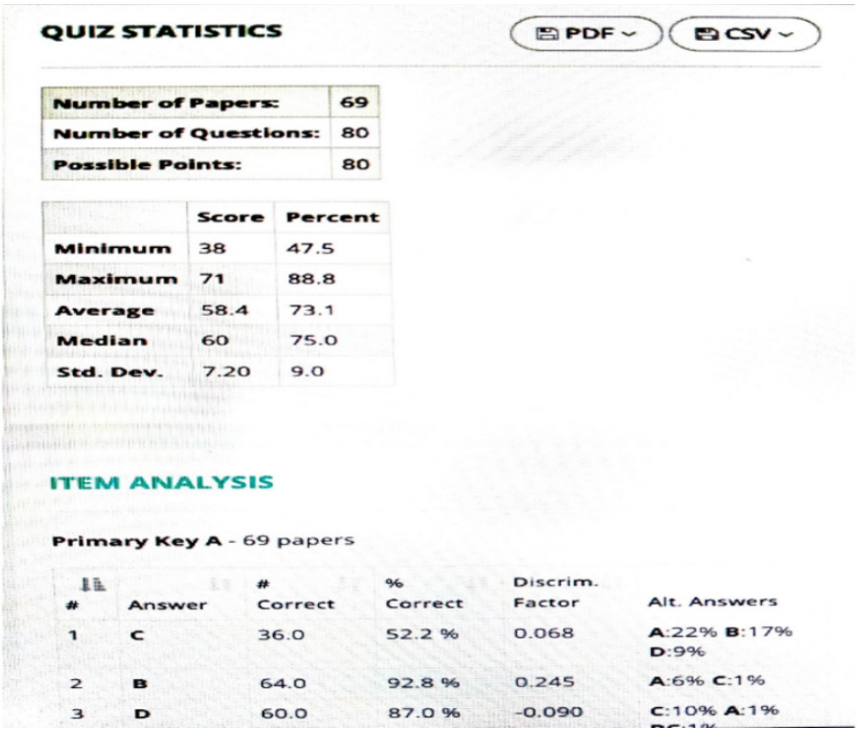

Figure 4: Quiz statistics and Item analysis

are hidden to ensure anonymity and confidentiality. Zipgrade also stores a copy of each marked answer sheet and shows the distribution of marks across the test items (Plate 6). Zipgrade analyzed each test item and showed the percentage of students who provided the right answer as well

as the percentage of students who gave the wrong answer (Plate 7). in addition, Zipgrade provides a list of graded papers including by indicating the obtained score, percentage, date and time the paper was graded (Plate 8; Names are hidden to ensure confidentiality).

Zipgrade statistically analyzes the score distribution of all 69 answer sheets, and this information is presented as a graph (Plate 8).

Zipgrade App provided results in percentages, tables, and graphs, revealing that the minimum score was 38/80 (47.5%) while the maximum score was 71/80 (88.8%). The average score was 58.4/80 (73.1%), the median was 75%, and the standard deviation was 0.09. This information can be downloaded as a PDF or CSV file (Plate 9). Zipgrade showed that 6 students obtained 85-90%, 10 obtained 80-85%, and nineteen got 75-80%, while seventeen obtained 70-75%. Seven students got 65-70%, and 3 of them got 60-65%. Only 5 students got between 50 and 60%, whereas only 2 students failed the assessment and they got between 45-49%. Based on Item analysis, Zipgrade showed that question 63 was the easiest, where 100% of students passed the question, and the most difficult was question 10, where only 10.1% of students passed the question.

DISCUSSION

The use of technology in education has improved the efficiency and effectiveness of teaching, assessments, marking, grading, and qualitative and quantitative data analyses. One such technological tool is the Zipgrade application, designed for electronic marking and grading. The use of the Zipgrade application at the Department of Anatomy, University of Rwanda, in this study has proven that it was better and more effective in marking and grading the answer sheets over the traditional manual marking and grading. The Zipgrade application has a lot of advantages over traditional manual marking and grading as it is time-saving, provides instant feedback, reduces paper usage, and provides detailed analysis of the students' performance in an assessment. The Zipgrade application gives educators more time to focus on teaching, researching, and professional development.

The ZipGrade is more useful for Lecturers in correction of multiple-choice questions. ZipGrade aids the Lecturers in analyzing the results of assessments. The application also helps the educators to create group or grade assessments. The answer sheets can be scanned using mobile phones and the grade statistics will be shown in less than 10 seconds. Students find it easy to write answers using Zipgrade answer sheets only by shading the right answers. Students are able to use pencils or pens, or to shade the answer choices on the provided answer sheet. Furthermore, lecturers feel motivated to develop quality multiple-choice. The development of many multiple-choice questions will make it easier for the lecturers to correct them as soon as possible. Short training on using ZipGrade is very effective as a tool to correct student assessment results. The lecturers no longer need to bring the student answer sheet home to further further marking. When students finish answering all the questions, the teacher can mark them as long as they submit. The feedback is very quick as students may leave the class of examination room knowing their results.

ZipGrade can be used to determine the validity, difficulty level, and differentiation of each test item. This application is easier to use than SPSS because analysis data can be exported to CSV and pdf formats. The application can also share the test results without any other challenge.

It is not enough for the lecturer just to prepare and ask questions, and correct students' answers. The lecturer must also mark and analyze the results of their assessment. During an assessment, arrangement of questions is required during the development of test questions. An analysis is also performed through gathering, summarizing, and using the information obtained from student tests results in the assessment. The analysis is carried out to study and examine each test item to obtain quality questions that can be used for the next student cohort. Also, the analysis is important to improve the quality of test items, revisions or elimination of ineffective questions. Furthermore, analysis is used to ascertain the level of student understanding of the material. It is important to use quality questions because they can provide accurate information about how effective the learning strategy is, and also determine the level of student understanding.

Zipgrade helps to identify the clarity of the taught materials through the performance of students for each tested item. After analysis of each item,

more explanations may be required to support students for the part which seems to be difficult for them as indicate by a low performance. Zigrade facilitate the decision making based on the student's performance. Through any electronic device,it is easy to access all records, grades, and test scores with deeper understanding of students' progress. Technology makes it easier than ever to grade collaboratively, share assessments, rubrics, templates and distribute reports when required.

Strength and limitation of the study

The present study was carried out within few days and participation was good as all copies of students were included in the study. The study used the local equipment and it was cost effective. Limitation of the study includes lack of prior research related to effectiveness of Zipgrade in marking.Another limitation is lack of people who are more experienced in the use of Zipgrade to share experience and get support from them. For instance the study was limited to marking of Multiple Choice Questions while there are different models of conducting assessment such as Essay Questions, Short Answer Questions or Open Questions. Considering only one model of questions may lead to biased decision making.

CONCLUSION

Zipgrade is an important technology in marking and grading, and it is a more efficient tool for a data-driven education system in today's world. Marking with Zipgrade benefits students by providing faster feedback on their work, enabling them to identify areas for improvement as soon as possible. It also offers more detailed insights into their performance and reduces the risk of grading bias based on personal characteristics, ensuring fair assessments.

REFERENCES

1. Cuesta, P.V.N.; Mayorga, J.I.M.; Padilla, Y.N.P.; Mayorga, A.P.O. Alternative Assessment Tools for the Writing Skill Development of EFL Learners. European Scientific Journal ESJ 2019, 15, doi:10.19044/esj.2019.v15n7p177.

2. Dwi Surjono, H. The Effectiveness of the Zipgrade-Assisted Learning Outcomes Assessment Analysis in Promoting Indonesian Vocational Teachers' Competence; Vol. 11;.

3. Galang, R.E.; Hallar, A.D. The Impact and Effectiveness of E-Learning on Teaching and Learning. International Journal of Computing Sciences Research 2021, 5, 383–397, doi:10.25147/ijcsr.2017.001.1.47.

4. Ismail, M.A.A.; Ahmad, A.; Mohammad, J.A.M.; Fakri, N.M.R.M.; Nor, M.Z.M.; Pa, M.N.M. Using Kahoot! As a Formative Assessment Tool in Medical Education: A Phenomenological Study. BMC Med Educ 2019, 19, doi:10.1186/s12909-019-1658-z.

5. Bichi, A.A. Item Analysis Using a Derived Science Achievement Test Data; 2013; Vol. 4;.

6. Prieto, M.C.; Orcos Palma, L.; Jesús, P.; Tobías, B.; Javier, F.; León, M. Student Assessment of the Use of Kahoot in the Learning Process of Science and Mathematics., doi:10.3390/educsci9010055.

7. Mukhtar, M.I.; Ahmad, J. Assessment for Learning: Practice in TVET. Procedia Soc Behav Sci 2015, 204, 119–126, doi:10.1016/j.sbspro.2015.08.124.

8. Santosa, B.; Dwi, S. Work-Based Assessment at Vocational High School in Indonesia. International Journal of Research Studies in Education 2018, 8, doi:10.5861/ijrse.2018.3011.

9. Hursen, C. Technological Proficiency Perception Assessment of Teachers in Vocational High Schools. In Proceedings of the Procedia- Social and Behavioral Sciences; 2011; Vol. 28, pp. 977–981.

10. Kush, J.C.; Spring, M.B.; Barkand, J. Advances in the Assessment of Cognitive Skills Using Computer-Based Measurement. 2011, doi:10.3758/s13428-011-0136-2.

11. Kandiller, S.T.; Özler, D. From Teacher to Trainer: What Changes? Or Does It? Procedia Soc Behav Sci 2015, 199, 436–452, doi:10.1016/j.sbspro.2015.07.530.

12. Cherner, T.; Fegely, A.; Lee, C.Y.; Santaniello, L. A Detailed Rubric for Assessing the Quality of Teacher Resource Apps. Journal of Information Technology Education: Innovations in Practice 2016, 15, 117–143, doi:10.28945/3527.

13. Geisinger, K.F. Empirical Considerations on Intelligence Testing and Models of Intelligence: Updates for Educational Measurement Professionals. Applied Measurement in Education 2019, 32, 193–197.

14. Quaigrain, K.; Arhin, A.K. Using Reliability and Item Analysis to Evaluate a Teacher-Developed Test in Educational Measurement and Evaluation. Cogent Education 2017, 4, doi:10.1080/2331186X.2017.1301013.