

Research Article

e-Mathscore : Score at Your Fingertips


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Abstract: *The e-Mathscore innovation addresses the challenge of efficiently managing and monitoring Summative Assessment Test (UPS) and Continuous Assessment (PB) scores in mathematics education through data analysis technology. By leveraging the capabilities of Google Data Studio and Google Spreadsheet, e-Mathscore provides a systematic platform for lecturers, students, and parents to access and review assessment scores. Originating from the online Matriculation Program Semester Examination (PSPM) results checking system, e-Mathscore offers an intuitive solution for enhancing student self-awareness and improving teaching and learning (PdP) productivity for lecturers. With its user-friendly interface, e-Mathscore facilitates easy access for students and parents, thereby reducing paper usage and streamlining the assessment process. The innovation demonstrates significant potential for commercialization, as it addresses a critical need in the education sector and offers scalability for implementation across various subjects and matriculation colleges in Malaysia. Moreover, the system's ability to provide comprehensive insights into student performance, along with features like the PSPM target meter, further underscores its impact on educational outcomes. Overall, e-Mathscore represents a transformative solution poised to revolutionize mathematics education and improve learning experiences for students and educators alike.*

Keywords: Summative Assessment Test; Continuous Assessment; Matriculation Program Semester Examination.

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1. INTRODUCTION

Malaysian Matriculation Colleges offer the Matriculation Program, which serves as a preparatory program for *Bumiputera* students to qualify them for entry into first-degree programs in specialized fields such as science, technology, and arts at Higher Education Institutions (HEIs) both domestically and abroad. The matriculation program is divided into two tracks: the Two-Semester System Program (SDS) and the Four-Semester System Program (SES). For SDS students, there are two streams: science and accounting. In the matriculation program, students' academic achievements are

assessed based on Summative Assessment Tests (UPS), Continuous Assessments (PB), and the Matriculation Program Semester Examination (PSPM). UPS and PB assessments are conducted throughout the semester, from the first day of classes until the end of the semester. UPS is conducted three times to assess students' mastery levels, while PB involves individual and group assignments. The weightage of assessment components is distributed as follows: 20% for UPS, 40% for PB, and 40% for PSPM. These assessment scores are crucial components of the matriculation program as they provide information about students' progress to lecturers, parents, and students themselves before they sit for the Matriculation Program Semester Examination (PSPM). This information not only helps students understand their performance levels before facing PSPM but also aids them in setting goals and performance targets for PSPM based on the UPS and PB scores they have obtained.

The use of technology in the field of education needs to be enhanced, especially in delivering information within the learning system to students in schools, colleges, and universities by educators. The need for this technology is crucial to align with the advancements of the current digital era, where students can engage in learning at flexible times and places. One of the significant challenges demanding change in the education arena is the Fourth Industrial Revolution, which now emphasizes the use of the internet in all affairs, also known as the Internet of Things (IoT). The use of modern computer technology and communication devices enables humans to gather, process, and manage information easily and systematically (Anggraini and Mukhadis, 2013).

The innovation group has reflected on the current process of managing PB and UPS scores before the Matriculation Program Semester Examination (PSPM) begins. The reflection results indicate that lecturers face time constraints in managing and providing PB scores to each student individually. Findings from interviews with five students reveal that students often experience delays in receiving scores because they need to wait or schedule appointments with lecturers to obtain PB scores. Furthermore, students have busy study schedules with curriculum and extracurricular activities. This situation adds to their difficulty in finding time to meet with lecturers to obtain their UPS and PB scores.

To overcome the challenges associated with the traditional management of PB and UPS scores, the Aspirer innovation group has taken proactive steps to develop an online assessment scoring system called e-Mathscore. The idea of this innovation stems from the online Matriculation Program Semester Examination (PSPM) results checking system. The target of this innovation is all lecturers and students in matriculation colleges. This innovation aims to enhance the efficiency of score management systematically to facilitate students' access to all Summative Assessment Test (UPS) and Continuous Assessment (PB) scores. Its specific objectives are:

- i. To facilitate lecturers in managing and delivering UPS and PB scores to students.
- ii. To enhance the college's image by utilizing a more efficient and systematic online system for managing UPS and PB scores of students.

2. METHOD & MATERIAL

e-Mathscore system is an innovative idea that is user-friendly for both students and lecturers. This innovation is developed using *Google Data Studio* along with *Google Sheets*. *Google Data Studio* is a data visualization platform that can be used to create visually interactive reports and dashboards based on data imported from various sources such as *Google Sheets*, *Google Analytics*, *BigQuery*, *MySQL*, and others. *Google Data Studio* has the capability to combine and process this data into visually appealing and informative visualizations in the form of graphs, tables, and diagrams that are more systematic. The *Google Sheets* serves as the student data sheet where their names, lecturer's names, Practicum, PB scores, including Individual Assignments and Group Assignments, as well as UPS scores, are recorded.

Figure 1 depicts the logo of the e-Mathscore system, accompanied by the motto "Scores at Your Fingertips". The theme, logo, motto, and graphical interface design of e-Mathscore are proprietary and the result of collaborative creativity among team members.



Figure 1. e-Mathscore System Logo and Motto.

The development of the innovation project occurs in three (3) phases: the development phase, the trial phase, and the implementation phase, as depicted in Figure 2.

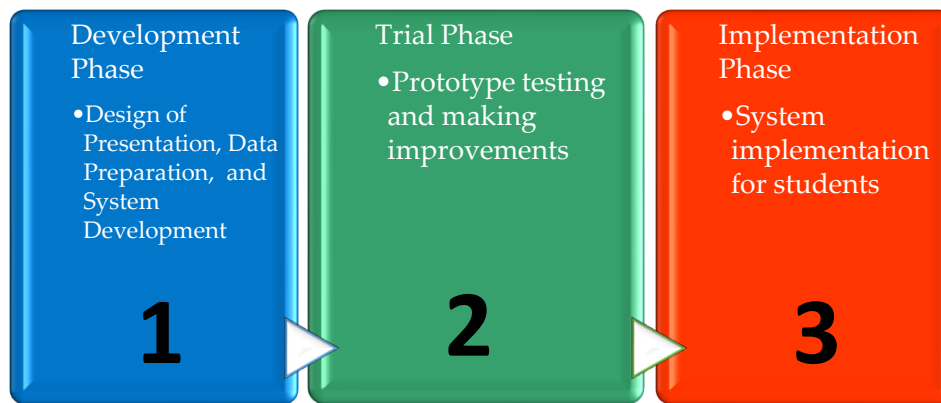


Figure 2. Development Phases of e-MathScore System.

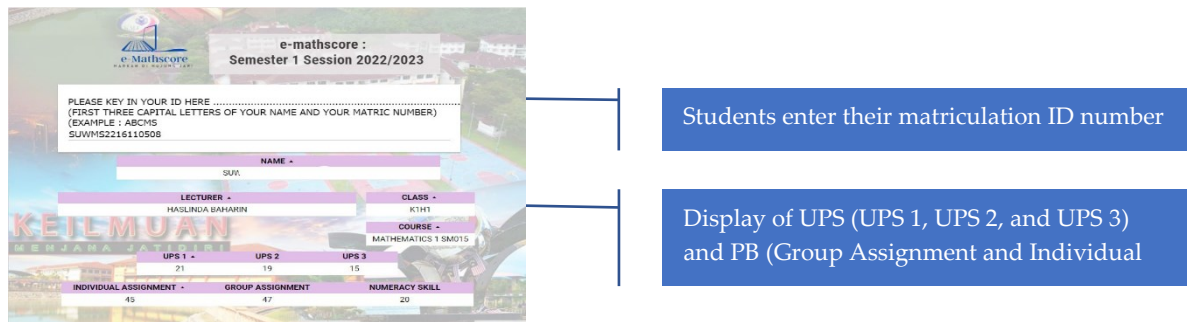
At the outset, the innovation group uploaded UPS (UPS 1, UPS 2, and UPS 3) and PB (Group Assignment and Individual Assignment) scores for the Mathematics courses of students into a *Google Sheet* file, which was then stored in *Google Drive* (Figure 3). Subsequently, the *Google Sheet* file was exported to *Google Data Studio* as the data source for creating the e-Mathscore Dashboard. In *Google Data Studio*, the data analysis displays students' particulars, including their names, practicum, lecturer's name, UPS, and PB scores, in the form of numbers and tables.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Name	Matric N	IC	Inque	Practicum	Lecturer	UPS 1 (21)	UPS 2 (21)	UPS 3 (18)	Individual Assignment (15%)	Group Assignment (20%)	
2	*****	***	***	***	***	***	***	***	***	***	***	
3	PUTRA AFYIMAN BIN SAFNIRIZAL	MS232	050611	MS23	K1H1	AMILY BINTI MAHMUD	15	20	18	15.0	20.0	
4	NURALIFAH BINTI SAIPUL BAHREN	MS232	050611	MS23	K1H2	ROSMAN BIN RAWI	17	20	18	15.0	19.0	
5	AHMAD DANISH LLAW BIN ISMAIL	MS232	050611	MS23	K1H3	SARAH BINTI ZUBIR	20	14	14	15.0	17.0	
6	ALIA NATRAH BINTI AZMAN	MS232	050611	MS23	K1H4	DIANA BINTI DAUD	20	20	18	15.0	18.0	
7	AISYAH FARZANA BINTI MD SHAH	MS232	050611	MS23	K1H5	AFIKA BINTI HASSAN	18	18	15	14.0	19.0	

Figure 3. Google Sheet of UPS and PB Scores for Mathematics Courses

The e-Mathscore system has undergone 3 versions of enhancements. Prototype 1 trial was conducted during the 2022/2023 session, and the display of the e-Mathscore Version 1 Dashboard is as depicted in Figure 4. To ensure the security and privacy of student data, they need to input their

matriculation numbers as IDs to access their own UPS and PB scores. Students can access the e-Mathscore System through a hyperlink or QR code.



Students enter their matriculation ID number

Display of UPS (UPS 1, UPS 2, and UPS 3) and PB (Group Assignment and Individual)

Figure 4. Interface of e-Mathscore System Version 1

After the implementation of the e-Mathscore version system in the first semester of the 2022/2023 session, the innovation group conducted a reflection on the system. During the reflection process, two main area of improvement outlined in Table 1 were identified and need to be addressed.

Table 1. Areas for Improvement in e-Mathscore System Version 1.

Item	Areas for Improvement
Data Security	Two passwords have been added in this new version. First Security Layer: Students enter a provided system username ID and password to access the e-Mathscore system. Second Security Layer: Students need to enter their User ID (Matriculation Number) along with a Password (last 4 digits of the Identification Card Number) to access their scores.
Student Performance Comprehensive Analysis Information	The comprehensive analysis information is presented to illustrate students' performance prior to the PSPM, empowering them to devise effective learning strategies aimed at achieving outstanding success in the PSPM.

Niranjanamurthy & Chahar (2013) emphasized the importance of security features in internet and digital applications, such as ensuring data confidentiality, authentication, data integrity, and user access control. In response to this, version 2.0 of the e-Mathscore system (Figure 5) has been improved, particularly in terms of password security, comprehensive analysis of student performance, and a more appealing interface. These enhancements not only make the innovation more attractive and flexible but also ensure greater security. Additionally, the analysis information provided can motivate students to work harder to achieve excellent grades during the PSPM.

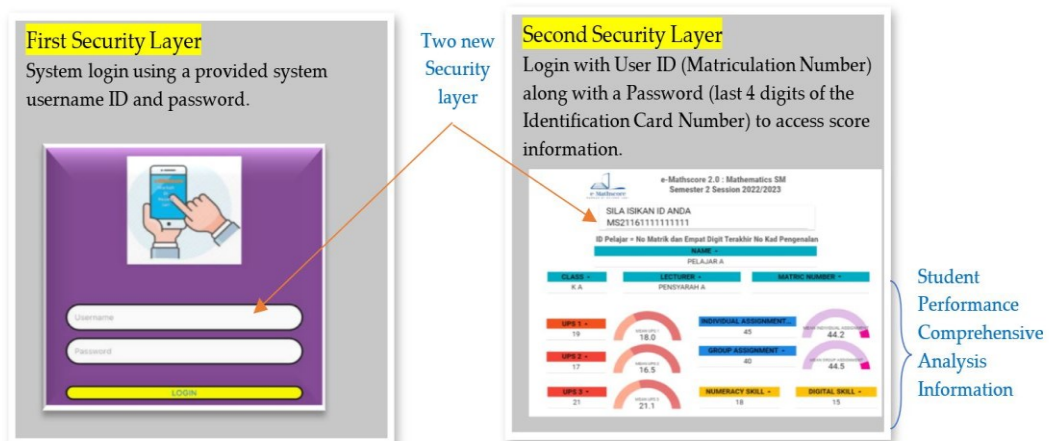


Figure 5. New Interface of e-Mathscore System Version 2 with Two Security Layers.

In 2024, the innovation group received feedback from mathematics lecturers suggesting that the system would be even more effective if it could offer feedback on students' performance and outline the targets that they need to achieve during the PSPM. In response, two additional features have been incorporated: feedback to provide motivational support for students and a PSPM target meter to signify the milestones they should strive to attain for outstanding PSPM outcomes. As a result, the refined e-Mathscore system, Version 3, has been meticulously crafted. The steps to access e-Mathscore System version 3 are as depicted in Figure 6.

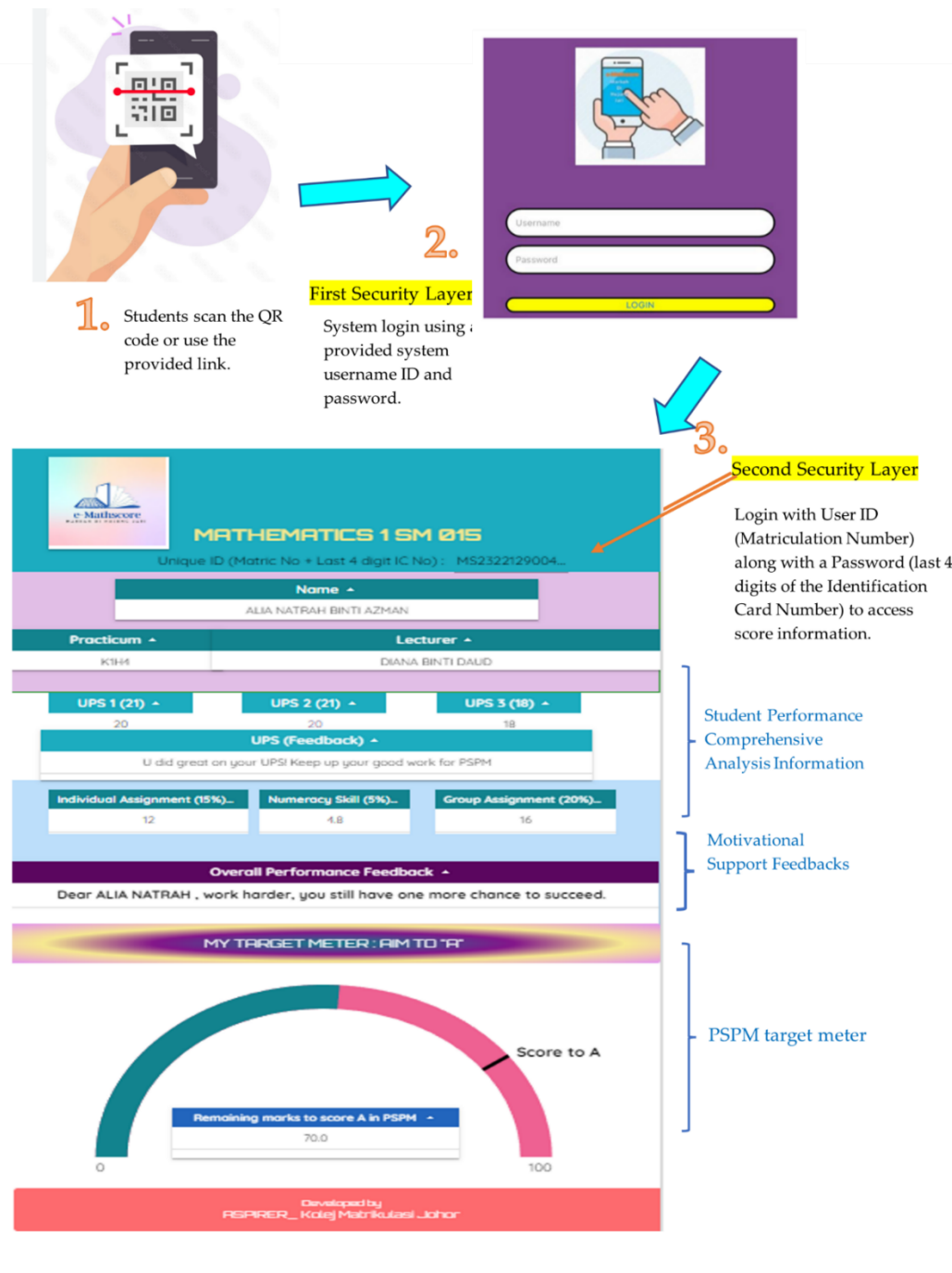


Figure 6. Steps To Access System e-Mathscore Version 3.

3. FINDINGS

A survey was conducted using the Google Form application to gather responses regarding the e-Mathscore system. A total of 100 respondents, comprising students and 20 mathematics lecturers from matriculation colleges, participated. The data collection method used was quantitative in nature. The survey instrument was distributed in the form of a Likert scale questionnaire to facilitate the measurement of the study instrument's percentages. The Likert scale used for measurement ranged from 1 to 5 (1 = Strongly Disagree; 5 = Strongly Agree). The user response findings were very positive, as shown in Figure 7.

3.1 The Survey Findings: Student Responses

Based on the analysis of student survey (Figure 7), the highest mean score (4.88) was for "the e-Mathscore application has saved users' time in accessing score information," followed by "e-Mathscore is based on All In One concept" (4.78), indicating that it significantly facilitates users in obtaining all necessary information quickly and accurately.

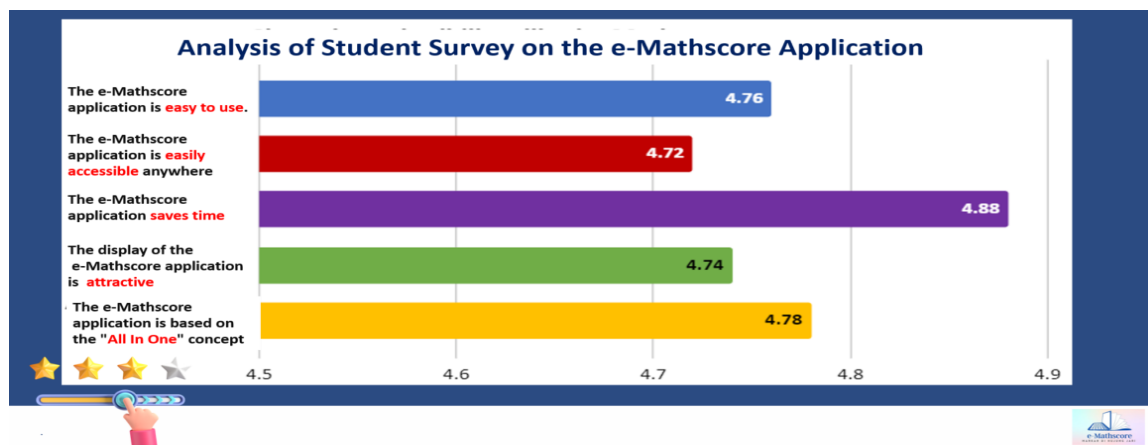


Figure 7. Survey Findings of Student Response.

3.2 The Survey Findings: Lecturers Responses

The survey results regarding the impact of implementing the e-Mathscore system among mathematics lecturers at the Matriculation College have been collected. The findings show that the minimum score exceeding 4.75 for all items clearly indicates that e-Mathscore has successfully achieved all objectives in alleviating the burden of lecturers in managing students' UPS and PB scores.

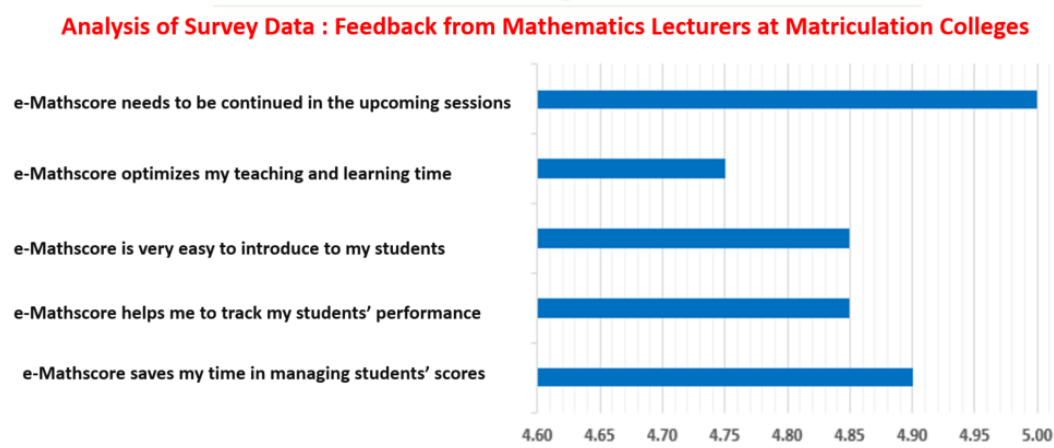


Figure 8. Survey Findings of Lecturer Response.

3.3 Users Open Testimonies

Furthermore, open testimonies from users were also conducted. Students' opinions on e-Mathscore system were recorded through video recordings. Among the responses received are as listed in Table 2.

Table 2. Open Testimonies Recordings.

Users	Responses
User 1	"easy to view scores.. everything is at your fingertips.."
User 2	"..e-Mathscore is a user-friendly system.."
User 3	"e-Mathscore is flexible.. can check from anywhere.."
User 4	"..attractive display and easy to use.."
User 5	" Target meter for PSPM helps me to set clear goal and motivate me to work harder"

4. DISCUSSION

The e-Mathscore system, equipped with security features, functions as a database system that systematically gathers students' UPS and PB scores, enabling users to access them more effectively and flexibly from anywhere at any time through students' digital devices. Additionally, the PSPM target meter in e-Mathscore version 3 serves as a valuable tool for PSPM preparation, empowering students to take ownership of their learning and strive for academic excellence.

4.1 High Efficiency

The use of the e-mathscore system has successfully had a high impact, particularly on students and lecturers at matriculation colleges. Lecturers able to optimize their time and productivity in the teaching and learning process. This is because students can access their scores at any time without disrupting class time. After knowing their PB scores, students can take the opportunity to increase awareness and prepare themselves for the PSPM by analyzing the p target meter.

4.2 High Significant

The e-Mathscore system has a significant impact across the educational service boundaries. The more efficient management of PB scores by the Mathematics Unit can enhance the image of the Mathematics Department, particularly, and Matriculation College in general. This statement is supported by A Saad and EDC Daud (2013), emphasizing the importance of using online electronic information systems in information management tasks to enhance the excellence of the quality of educational organizations in the era of globalization. Additionally, the e-Mathscore system also allows parents or guardians to monitor their children's academic performance, enabling them to share responsibility in ensuring the students' excellence. Thus, the e-Mathscore innovation has proven to contribute to producing quality matriculation outputs for further education in higher institutions, which are the custodians of the matriculation system.

4.3 Awards and Recognizations

This e-Mathscore innovation has been recognized and awarded the gold prize in the Mathematics Innovation Poster Competition 2023 (MiPC2023) at Johor Matriculation College. This award represents the highest recognition bestowed upon innovations demonstrating excellence and superiority in the context of education. The innovation has also been registered with the Intellectual Property Corporation of Malaysia (MyIPO) to protect its copyright, with the registration number LY2023M03268.

5. CONCLUSION

In conclusion, the success and effectiveness of the e-Mathscore system in enhancing the UPS and PB review process and providing significant benefits to lecturers, students, and parents are evident. This innovation has not only helped improve efficiency, accessibility, and transparency in reviewing UPS and PB scores but has also motivated students to enhance their performance in Mathematics subjects. Therefore, researchers recommend introducing the e-Mathscore innovation to lecturers of other subjects and disseminating it to matriculation colleges throughout Malaysia.

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