

# Jomscore: Implementation of Online Question Bank as the Assessment Tool in Science and Programming Subjects

<sup>[1]</sup> Wan Aezwani Wan Abu Bakar\*, <sup>[2]</sup> Mustafa Bin Man, <sup>[3]</sup> Mohd.Kamir Yusof, <sup>[4]</sup> Nur Laila Najwa Josdi

<sup>[1]</sup> <sup>[3]</sup> <sup>[4]</sup> Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin, Besut Campus, 22200 Besut, Terengganu.

<sup>[2]</sup> Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu

Corresponding Author Email: <sup>[1]</sup> wanaezwani@unisza.edu.my, <sup>[2]</sup> mustafaman@umt.edu.my, <sup>[3]</sup> mohdkamir@unisza.edu.my, <sup>[4]</sup> laila455659@gmail.com

---

**Abstract**— With the onslaught of the pandemic, the country has experienced sudden and forced changes in various sectors, including education. From face-to-face classroom to online learning using platforms like Zoom, from physical assignments and exam submissions to online submissions and more. In the era of developed countries, this change may be a good starting point for national development. Although the learning and teaching process has changed, the exam continues as usual and is a little more challenging. To deal with any related issues, a Jomscore system is proposed to be used as an online question bank learning platform of PAA20504 (Introduction to Programming) subject thought for UniSZA Science and Medical Foundation students. The proposed system serves as the enrichment exercise and acts as the assessment tools in teaching and learning where students may learn by answering questions to help them memorize certain keywords and familiarize themselves with the format of exam in their next real exam. The system is accessible to both educators/teachers and learners/students, depending on their scope of use. At the end of the study, a survey was conducted to examine the effectiveness of this system and the results showed that not only did students benefit from this system, but educators also had the opportunity to diversify techniques and questions to test student performance without having to worry about going beyond the topics that have been taught. In conclusion, the development of this system can meet current educational needs that highlight technology as an innovation to drive national education. In addition, students' skills can also be improved effectively without having to take a lot of time and energy.

**Index Terms**— Assessment tool, Enrichment exercise, Online learning, Question bank.

---

## I. INTRODUCTION

After the recent epidemic, the country's education sector has seen tremendous changes [1]. Previously, classes were only held face-to-face, but students are now accustomed to online learning via sites such as Zoom and Webex. In the face of globalization, this change is a very good start. Textbooks and other educational materials are also now available on the website [2]. There have also been some changes in the evaluation and assessment aspects of the country's education system.

Exams are an important part of helping a person to evaluate everything that has been learnt in their daily lives. It plays a big role in almost every aspect of a person's life, not just education. From a pedagogical point of view, exams are an alternative means of checking understanding of what is learned in class, whether theoretical, practical, or applied. Exam preparation is an absolute duty of students and educators. The well-known pragmatism holds that exam results are best achieved through practice and hard work [3].

School students aren't the only ones taking exams. Students from higher education also must experience this thrilling period. Although there are fewer subjects to study than the school curriculum, the subjects at university are

many times more difficult, and it certainly takes some time to master a particular subject. A common situation that's frequently confronted amid the exam season is that students lack the time and materials to review the entire subject outline.

Some students may choose certain topics to review, but the risk is that these topics may not necessarily be on the test paper, making them less enthusiastic about studying for the next exam. In some cases, exams can be a challenge even for educators [4]. They find it difficult to find the right questions for their students. Exam questions must be relevant to the student's learning level to ensure that learning objectives are met.

The question bank contains groups of exam questions that may be used on exams from time to time [5]. It could help students to get ideas for real exam questions. It contains all the questions from past exams that will likely cover all the topics in the syllabus, so students could spare some time and energy in reviewing the whole subject. In addition, it offers students more reference materials for exams. This question bank is exceptionally supportive for both educators and students. If students are committed to answering all past exam questions seriously, students can develop strategies to deal with upcoming exam questions efficiently, meanwhile

for educators, it can help them widen the scope of the question at the same level of understanding. With several main objectives such as providing basic data to store questions along with scoring schemes and collecting questions based on the structure and curriculum of the subject, the study has developed a special question bank system for the subject PAA20504 (Introduction to Programming) for foundation students of PUSPA, UniSZA Batch 07 students. This Jomscore system will synthesize real exam questions of the mentioned subject from previous years for students' reference.

## II. RELATED WORKS

This study has reviewed several previous works related to the development of online learning models at the institutional level and identified the limitations faced to ensure that the model designed for this study is relevant and of high quality.

In *E-Learning in Mathematics Learning in Higher Education* [6] by Irfan, Muhammad, et al. (2020), the study clarifies that many universities in Indonesia have started introducing online-based learning to replace classroom lectures to halt the spread of COVID-19 in Indonesia. However, some argue that this initiative, especially in mathematics education degrees, faces several obstacles in the process. Therefore, this study was conducted to clarify these barriers. In particular, the identified limitations include the provision of materials, especially if the course shares many similarities with mathematics or programming languages. Additionally, lecturer's skills in editing videos and animations using various animation software programs are limited to some amateur tools such as PowerPoint and text. Overall, faculty are encouraged to master presentation software, word processing, assessment, and video conferencing to expand the use of platforms of interest to students during the online learning process. This result indicates that national higher education policies do not focus on the possibility of conducting online learning using platforms that can support online learning. This study can be used as a reference for further investigation of the barriers students face in adopting online learning.

Zhao, Yu, et al. (2021) in *Digital Competence in Higher Education: Students' Perception and Personal Factors* [7] describes university students' perceptions of digital literacy and analyzes the impact of personal factors on digital literacy in a sample of 5,164 first- and fourth-year students from all majors at Gansu Agricultural University (China). It explores the digital abilities perceived by a sample of college students. It also shows that creating digital content is the least known aspect among students. In addition, the impact of individual variables on perceptions of digital literacy was explored, noting the effects of gender, grade, urban-rural differences, and prior formal education on digital literacy. With the emergence of infectious diseases, the penetration of multimedia technology in the field of education has become faster and deeper. That's why it's important to understand

where your students' digital proficiency stands. The results achieved in this study not only indicate the current degree of perception of digital competence by students, but also the degree of awareness of students in various educational systems for later comparison with students in other countries and other educational settings. It also provides awareness of digital capabilities. In addition, it provides reference data for teachers and educational institutions to develop appropriate training and teaching strategies.

An effort in [8] sheds light on a meta-analytic research methodology on the use of the ADDIE framework (analysis, design, development, implementation, and evaluation) in the process of designing and developing educational materials that enable broad access to quality higher education. 30 of the 50 articles reviewed speak to the effectiveness of online learning through carefully planned and designed courses and programs for higher education institutions. It also emphasizes the importance of instructional design and the active role of institutions in providing support structures for teachers and students. From a student's perspective, the convenience of online learning is invaluable for adults with multiple responsibilities and highly scheduled lives. Online learning therefore helps staff development and adults return to school and pursue additional education that does not fit into their daily lives. From an organizational perspective, online modalities allow universities to offer additional or partial courses to students, ensuring them to have access to the courses they need. Finally, in order to maintain or increase enrolment rates from year to year, universities need to be responsive to student needs and requirements and provide the flexibility of online learning. These advantages may make online study courses an increasingly important part of post-secondary and postgraduate education. Universities should therefore take steps to ensure that students perform as well in online courses as they do in face-to-face courses.

*Evaluating and Enhancing Quality in Higher Education Teaching Practice: A Meta-Review* by Harrison, Reema, et al. (2022) [9] provides comprehensive evidence relevant to how to assess and improve the quality of teaching practice in higher education. 13 review articles found that leveraging educational quality: Data on the use of student feedback, self-assessment tools, teaching peer reviews (both formative and summative), and teaching portfolios. Reported evidence includes the efficacy of each of these approaches and the fact that multimodal approaches may be the most effective but require resource considerations. As universities employ different methods to measure and improve the quality of their teaching, the results of this study may be useful in practice at this critical time. The review reported here shows how institutions are implementing ways to assess the quality of their education without considering how this data is used and the possible unintended consequences of this approach. Questions that stay vital here related to how to assess and maintain approaches to make strides in teaching quality, and how educators can utilize information created from assessment

in significant ways to bolster person and collective educating quality. The synthesis of the evidence presented in this research lays the groundwork for a more rational, evidence-based approach to improving quality across the higher education sector.

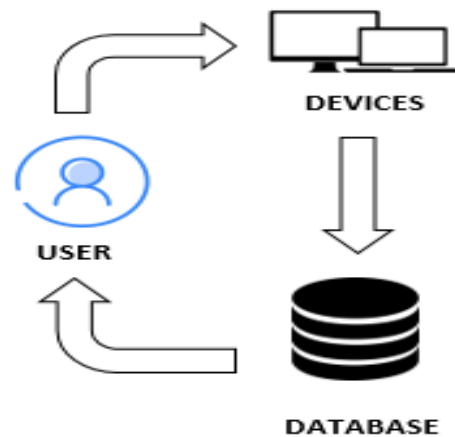
Driven by the frequency in which universities implement e-learning with limited understanding of the impact of online pedagogy on student engagement, a research project A Conceptual Framework to Enhance Student Online Learning and Engagement in Higher Education by Brown, Alice, et al (2022) [10] was undertaken to investigate the use of course-specific learning analytics to encourage students to become more actively involved in their learning course. These findings leverage learning analytics data and apply nudges to course specific LMSs to expand research related to CLA and nudge in higher education, to motivate as well as improve early student engagement and experience in the course. Studies have found that academics benefit from using and integrating CLA to develop strategic and targeted approaches to specific drivers. This encouragement helps students access key assessment requirements resources, more realistically align their own expectations with course expectations, and more effectively fulfill their learning commitments and responsibilities.

Makruf, Imam, Andi Arif Rifa'i, and Yunika Triana (2022) in Moodle-Based Online Learning Management in Higher Education [11] stated that the devastating impact of the COVID-19 pandemic is affecting many aspects of human life, including institutions of higher education. To ensure the implementation and assurance of quality of learning, the National Institute of Islamic Religions (Institute of Islamic Studies) Surakarta (IAIN Surakarta), one of the Islamic higher education institutions in Indonesia, has implemented online learning using the Moodle platform. This study attempts to measure the performance of learning management in three aspects of Moodle-based online learning: learning planning, learning implementation, and evaluation. This result indicates that online-based learning is suboptimal, especially in terms of learning implementation and learning assessment. However, learning plans include advanced or optimal use. The study identified key aspects of learning management systems: weaknesses in learning implementation and evaluation. Some educators still use platforms other than Moodle for parallel learning, such as Zoom, Google Meet, Google Classroom and WhatsApp. This can be attributed to the three main factors: system quality, support features, and user features. Therefore, the use of applications in e-learning should be optimized through many sufficient support capacities. The same applies to using menus in Moodle-based learning applications for assessment. The collection of student work needs to be optimized by both the system and the user to maximize the capabilities of the existing system. The initiative by [12] investigated the effectiveness and quality of teaching as well as learning at UNINUS Bandung during the COVID-19 pandemic. Study

has shown that the effectiveness is low, with the mentions of the barriers such as difficulty in understanding materials, boredom, and loss of interest in the online learning process, inadequate tools to support online learning, and lack of internet connectivity and the decline in student's grades. In addition, the study shared several initiatives that could be used to enhance the communication during online learning, such as the use of Zoom Media and Google Meet as educational platforms and providing support to students in need due to the high cost of learning.

### III. PROJECT BRIEF

This project was developed to make it easier for PUSPA Batch 07 students to find reference materials for their exams. The level of difficulty of the subject that has a large syllabus causes many students to be overwhelmed in mastering it [13-14]. Despite the in-class learning process and tutoring during the extracurricular exercises provided, this subject requires additional materials to help students cope with the exam. These last year's exam question sets help PUSPA Batch 07 students study the entire syllabus quickly and compactly. This study established a simple and user-friendly framework-based system as shown in Fig. 1.



**Fig. 1. Jomscore Framework**

Users only need to access the Jomscore system via their laptop or desktop computer. Although it is possible to use it on smartphones, since this study is developing a system specifically for desktop OS, the display on smartphones may be complicated or may not be compatible with the smartphone OS. Once logged in the system, students will be able to select and answer any sets of available questions. After answering all questions, students can click the submit button to review their answers. Results are then displayed on the user's device. Additional features of this system are specifically designed for quick and easy navigation. The materials in this question bank can be shared with all educators and students. For educators, prepared questions can be organized into test question sets at any time, whereas for students, they can answer or download the provided question sets and scoring plans given at any time.

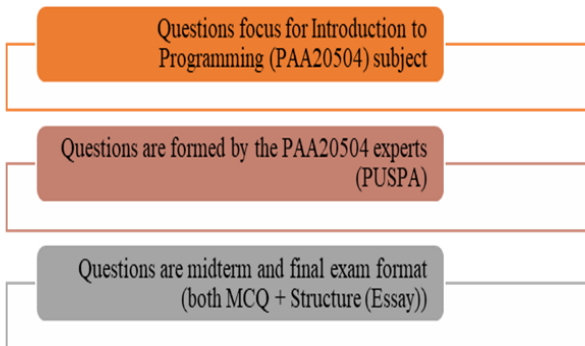
**IV. PROJECT INNOVATION**

Jomscore strives to transform teaching and learning into a modern form of innovation. In the age of technology, the term "smart" is used more and more, so this approach is appropriate and highly recommended so that the education system of the country does not lag far behind other developed countries. Both sides, educators, and students, are directly involved in and benefit from this innovation as can be seen in Table 1.

**Table 1.** Jomscore Advantages

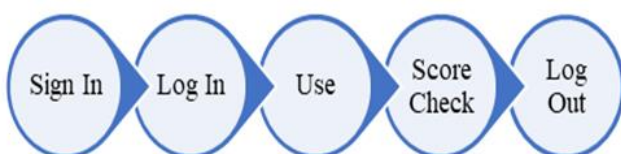
Educators	Students
Teaching via exams questions	Learn through practice answering questions
Teaching at student's request	Study the focus questions given by the educators
Teaching through e-learning technology	Learning through digitization

Fig. 2 shows the niche features highlighted by this system to ensure that the primary objectives of the research are well served with respect to the relevant subject matter.



**Fig. 2.** Jomscore Niche Features

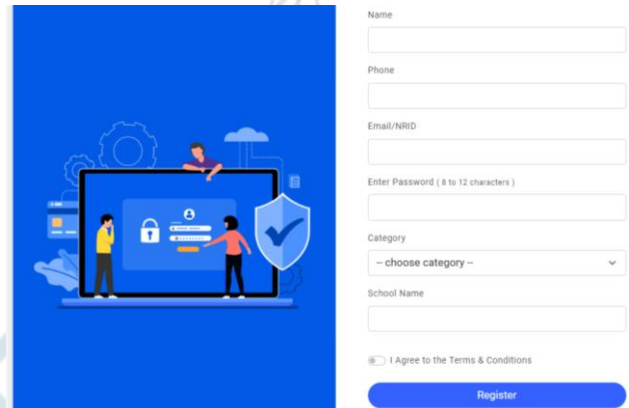
Like most other systems, Jomscore framework also only involves a few important steps as shown in Fig. 3. It includes registering to enter the user's personal information, then logging in to access the system, using the main feature in the system which is selecting and answering or downloading past exam questions before checking the results if the questions are answered directly on the system. If the student downloads the questions from the system, the student can download the marking scheme as well. Once all matters are completed, students can log out of the system.



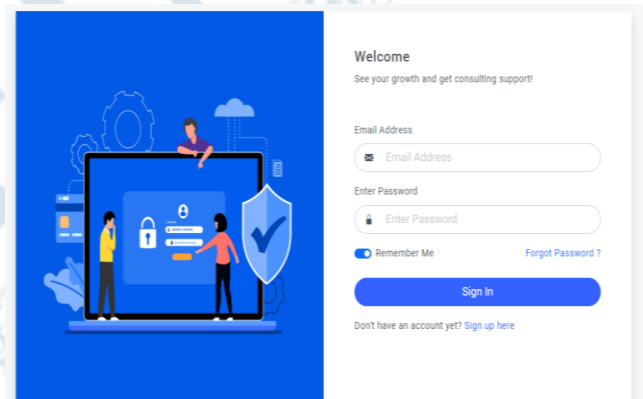
**Fig. 3.** Steps to Access Jomscore

**V. DISCUSSION**

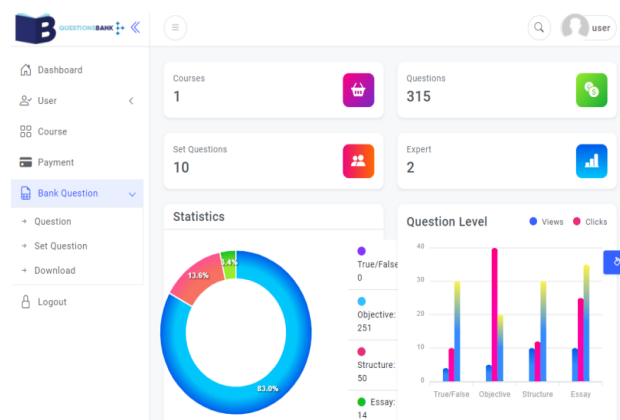
The figures below are the system that has been built for Jomscore. Fig. 4 shows the interface for those who want to log into the system. This system cannot be accessed by those who have not registered. So, the system will direct the user to the user registration process as shown in Fig. 5. Fig. 6 shows a user dashboard that will show how well students are using the system.



**Fig. 4.** Sign In/Registration Page



**Fig. 5.** Login Page



**Fig. 6.** Dashboard Page

Jomscore was tested in secondary school level (Form 5 of Science subject) in SMK. Belara, Manir, Kuala Terengganu, Terengganu, Malaysia and Pre-University level (Pusat Asasi Sains dan Perubatan UniSZA-PUSPA Batch 07). The Sijil

Pelajaran Malaysia (SPM) 2022 results of Science subject is achieved and illustrated in Fig. 7. The graph in Fig. 7 depicts the result before and after using Jomscore system.

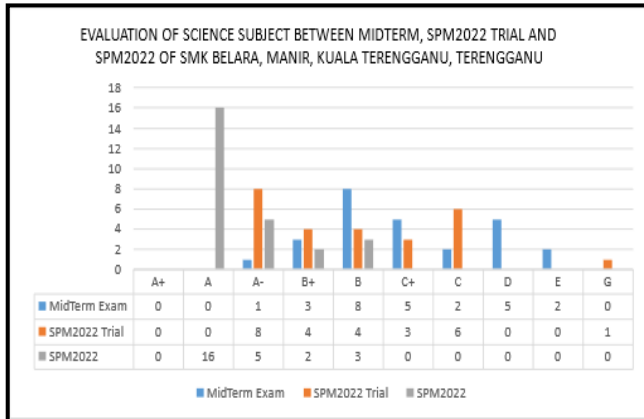


Fig. 7. Result of 26 Jomscore respondents in SPM2022 Science subject in SMK. Belara

Fig. 7 shows the comparison result of Science subject between MidTerm Exam, SPM2022 trial exam and the real SPM2022. There are 16 students who scored A and 5 students scored A- in SPM2022 compared to 0 and 8 scorers for A and A- respectively in SPM2022 trial exam prior to using the proposed question bank (Jomscore). While for Pre-University level, the C Programming subject is tested by 10 students of PUSPA Batch 7 and the pre-survey reveals 47.4% strongly agree that Jomscore facilitates reflection, analysis and critical thinking and 62.5% agree that Jomscore is easy to use during educational process.

## VI. POTENTIAL RECOMMENDATIONS

The purpose of the development of this system is to provide a platform that can collect and store PAA20504 past exam questions along with the scoring scheme, to help PUSPA Batch 07 students facing the exam season. The effect of establishing this system is effective for both educators and students. This tool works as an alternative mechanism in enriching the cognitive level of students. By making a routine of prepared questions, students will often use previously obtained findings to solve problems and assignments and train their cognitive skills to familiarize themselves with the facts that have been learned. Jomscore is also built on a convenient platform as it is online based. In today's sophisticated world, gadgets are no longer a desire, but a necessity for various things including education. It supports Online Digital Learning (ODL) where everyone can learn and earn a degree at their own pace. Assessments can also be carried out in detail as the user can adjust to select the targeted cognitive level for the level of mastery.

### Acknowledgment:

A special thanks to the Centre for Research Management and Innovation (RMIC) of Universiti Sultan Zainal Abidin (UniSZA) for funding support under the grant code

UniSZA/2022/SoTL/07. Thank you for the great contributions towards this publication, especially to Dr. Wan Aezwani Wan Abu Bakar as the writer, Prof. Madya Dr. Mustafa Man as the idea creation, Dr. Mohd. Kamir Yusof as the system developer, Dr. Noor Asidah Bt Mohamed as the data collector and lastly to Miss Nur Laila Najwa Bt Josdi as the format checker and to all collaborators from UniSZA and UMT.

## REFERENCES

- [1] S. Chen, B. Mulgrew, and P. M. Grant, "A clustering technique for digital communications channel equalization using radial basis function networks," *IEEE Trans. on Neural Networks*, vol. 4, pp. 570-578, July 1993.
- [2] Y. Zhao, and J. Watterston, "The changes we need: Education post COVID-19," *Journal of Educational Change*, 22(1), pp. 3-12, 2021.
- [3] K. H. Lau, T. Lam, B.H. Kam, M. Nkhoma, J. Richardson, and S. Thomas, "The role of textbook learning resources in e-learning: A taxonomic study," *Computers & Education*, 118, pp. 10-24, 2018.
- [4] B. Fnot, "Are exams the best way to test students? Superprof. UK," from <https://www.superprof.co.uk/blog/are-exams-the-best-way-to-test-students/>, last accessed 2022/01/11.
- [5] F. James, "The challenges and advantages of conducting exams during the covid-19 crisis," <https://www.qs.com/the-challenges-and-advantages-of-conducting-exams-during-the-covid-19-crisis/>, last accessed 2022/01/11.
- [6] Teachmint@wp.: Question bank - complete meaning-glossary. Teachmint. <https://www.teachmint.com/glossary/q/question-bank/>, last accessed 2022/01/11.
- [7] M. Irfan, B. Kusumaningrum, Y. Yulia, and S.A. Widodo, "Challenges during the pandemic: use of e-learning in mathematics learning in higher education," *Infinity Journal*, 9(2), pp. 147-158, 2020.
- [8] Y. Zhao, M. C. Sánchez Gómez, A. M. Pinto Llorente, and L. Zhao, L, "Digital competence in higher education: Students' perception and personal factors," *Sustainability*, 13(21), 12184, 2021.
- [9] M. D. B. Castro, and G. M. Tumibay, "A literature review: efficacy of online learning courses for higher education institution using meta-analysis," *Education and Information Technologies*, 26, pp. 1367-1385, 2021.
- [10] R. Harrison, L. Meyer, P. Rawstorne, H. Razee, U. Chitkara, S. Mears, and C. Balasooriya, "Evaluating and enhancing quality in higher education teaching practice: a meta-review," *Studies in Higher Education*, 47(1), pp. 80-96, 2022.
- [11] A. Brown, J. Lawrence, M. Basson, P. Redmond, "A conceptual framework to enhance student online learning and engagement in higher education," *Higher Education Research & Development*, 41(2), pp. 284-299, 2022.
- [12] I. Makruf, A. A. Rifa'i, and Y. Triana, "Moodle-Based Online Learning Management in Higher Education," *International Journal of Instruction*, 15(1), pp. 135-152, 2022.
- [13] R. Z. A. Syam, and W. Achmad, W, "Online learning in higher education: analysis during the pandemic covid-19," *Jurnal Mantik*, 5(4), pp. 2256-2261, 2022.