Digital Module of Research Methodology Based on Problem-Based Learning: A Needs Analysis for Sustainability Development

Norziah Othman, Nor'Adha Abd Hamid, Nurkaliza Khalid, Noor Azli Mohamed Masrop, Naqibah Mansor
Universiti Islam Selangor
Email: norziah@uis.edu.my

Abstract
Problem Based Learning (PBL) has become a popular concept in higher education because it is good at encouraging critical thinking, problem-solving abilities, and self-directed learning. The concept of a learning society in which lifelong learning is woven into the fabric of everyday existence is becoming more acknowledged as essential to sustainable development. This paper presents a need analysis for developing Problem-Based Learning (PBL) modules in higher education, aimed at fostering a learning society for sustainable development. This study employs a needs analysis approach to gather information on the content and delivery aspects of PBL digital module to be developed. The target users of the needs analysis are postgraduate students, who are the primary beneficiaries of the proposed product. The study reveals that certain topics are particularly challenging for students, with master students finding Theoretical and Conceptual Frameworks as difficult topic, while PhD students struggle with Quantitative/Qualitative Analysis and Thesis/Proposal Writing. There are issues in teaching aspects within higher education institutions that require updating. The results emphasize how important it is to incorporate PBL into higher education courses in order to solve the problems found and enhance student learning. The creation of digital PBL modules that integrate real-world issues and useful applications can greatly improve students' capacity for critical analysis, problem-solving, and teamwork.
Keywords: Research Methodology, Postgraduate, Problem Based Learning, Sustainable

Introduction
Higher education in Malaysia is currently facing various issues and challenges that require immediate and effective solutions. With rapid changes in technology, globalization, and industry needs, higher education institutions (HEIs) in Malaysia need to adapt and change their approach to ensure their graduates are globally relevant and competitive.

HEIs in Malaysia need to take a holistic approach that includes curriculum reform, improvement of teaching staff skills, provision of better financial support, and optimal use of

technology (Ministry of Education Malaysia, 2016). Cooperation between the government, the private sector, and the academic community is needed to ensure that higher education in Malaysia can meet the needs of the future. The quality of education can be improved through teaching and learning practices carried out every day (Ramli & Mohd Tajudin, 2021). In addition to the teacher or lecturer factor, the selection of teaching and learning strategies or methods is also very necessary.

There are various methods in use now and they are always changing with the passage of time (Mohd Rashidi, Nor Azizah & Saniah, 2014). Game-based learning (Fengfeng, Xie & Xie, 2015), adventure-based learning (Setambah, Tajudin, Yaakob & Saad, 2019), challenge-based learning in the real world (Binder, Nichols, Reinehr & Malucelli, 2017) and so on. All of these approaches are generally known and capable of impacting student achievement. In order to have an optimal effect on students, these methods need to be done with careful planning.
PBL is one of effective method for promoting sustainable development within the context of a learning society. PBL's emphasis on practical issues and multidisciplinary teamwork complements the intricate, multidimensional sustainability difficulties. PBL assists in the development of skills like creativity, critical thinking, and teamwork that are necessary for tackling sustainability concerns by involving students in the active process of problem-solving (Ni, Wan, & Yang, 2021; Stentoft, 2017).

Review of Literature
One of the main challenges faced by HEIs in Malaysia is ensuring the quality of education provided is quality and relevant to current needs. Curriculum that is not updated and traditional teaching methods that are too focused on lectures can hinder the development of critical skills, problem solving, and creativity among students. HEIs need to move towards a more student-centered learning approach, such as problem-based learning (PBL), which has been proven to improve conceptual understanding and practical application.

Problem-Based Learning (PBL) is one of the teaching strategies that can be used when students are given the opportunity to solve problems related to the real world. This kind of learning is able to improve critical thinking, problem-solving abilities, and topic knowledge among students. The purpose of PBL is to provide students with authentic and relevant problem scenarios, acting as a catalyst for curiosity and improving problem-solving skills (Yanto et al., 2021). PBL encourages active learning, collaboration, and the application of theoretical knowledge to practice. This technique is particularly suitable for senior university students because it encourages individual effort, group debate, and reflective practice, which provides opportunities for them to face difficult issues and solve them.

Problem-based learning (PBL) is one of the educational methodologies that can significantly improve learning outcomes in addition to building positive attitudes through effective problem-solving skills (Tsai & Tang, 2017). By engaging students in authentic problem-solving tasks, PBL promotes a deep understanding of the concepts being learned, encourages self-directed learning, and fosters a positive problem-solving mindset. This approach not only improves students' academic performance but also equips them with essential skills for lifelong learning. Through PBL, students can cultivate resilience, adaptability, growth mindset, and persevere through complex challenges.

When PBL techniques are used, student performance also improves compared to students exposed to traditional learning techniques. This is proven by a study by Bılgın, Karakuyu and Ay (2015), when PBL techniques are used, the performance of undergraduate students in Science and Technology Teaching Courses improves compared to students who are instructed to use traditional techniques. PBL-based methods encourage students to actively participate in physical and mental activities that require them to do in-depth research to complete them. The PBL method apparently considers both the product and student output to show that they have truly understood the content of the lesson as well as the process.

Referring to the findings of a study by Simaremare and Purba (2021), using the PBL model with academic supervision is proven to increase the professional competence of teaching staff in controlling the learning process. The implementation of learning using PBL at least meets several characteristics, among others: the learning process must begin with a problem; the content and implementation of learning must be able to attract the attention of students; instructors only act as guides in the classroom; students are given time to think or search for information to get answers to problems; student creativity in thinking is encouraged in addition to creating a comfortable learning situation (Akinoglu & Tandoğan, 2007; Singerin, Huliselan & Latununuwe, 2020). PBL also has a positive impact on the teaching modules developed. A study by Fitri, Tatalia, Sartika, Yulianti and Yulisna (2019) and Danel (2022) showed that the learning module based on Problem Based Learning is valid, practical and effective.

Materials and Methods
Requirements analysis is one of the important elements that become the basis in determining the construction requirements of a module. Ramli and Mohd Tajudin (2021) argue that the construction of a module should be based on needs analysis based on current needs and future needs. Even Rafiee and Hafsah (2020) also think that needs analysis is one of the important processes in the construction of curriculum or modules to get views from teachers, students, parents and community members. This study was conducted based on the researcher's need to obtain data to produce a digital module framework based on Problem-based Learning Theory (PBL). Requirement analysis is the first phase in the study of module design and construction.

This study focuses on the process of building the framework of this module involving several phases that use different methodologies for the purpose of data collection (Saedah, Norlidah, Dorothy, & Zaharah, 2013).

The research objective for the needs analysis phase is to analyze the construction needs of the Digital Module 'Research Methodology' (MDRM). Based on the objective of the study, this research is also to get answer to what are the requirements for the construction of MDRM modules for postgraduate students based on Problem-Based Learning Theory (PBL)?

The research design used is quantitative by using questionnaire instruments. The study sample was selected randomly and aimed to involve 35 postgraduate students who had taken the Research Methodology course in all faculties at a higher education institution. Data were analyzed using descriptive statistics including frequency and percentage.

This study involved students who were purposefully selected based on the lecturer's recommendations. This is to focus on certain characteristics that suit the focus of the study. The students who answered the questionnaire were students with various postgraduate study backgrounds who had experience studying the subject of Research Methodology. Thirty-five students were contacted and voluntarily answered the questionnaire which was distributed in a google form. The online method through social media (WhatsApp) was chosen to facilitate data collection.

The instrument of this study is a Student Needs Analysis Questionnaire that was constructed and was reviewed and validated by two experts: one field expert and another method expert. Questionnaire instruments can be constructed by the researcher himself or adapted from other researchers (Azjen, 1991; Armitage & Corner, 2001). The questionnaire approach is seen as a method that can provide guidance to assess the needs of a material while meeting the objectives of the study. The questionnaire instrument is divided into five parts, which are student demographic information, the level of difficulty of each topic in the 'Research Methodology' course studied, the level of suitability of the lecturer's delivery method, the needs and suggestions for improvement of the digital module to be built.

Findings

A total of 35 respondents answered the questionnaire. Table 1 shows the demographic distribution of respondents based on gender, age, level of study and faculty.

Table 1

Frequency Distribution and Percentage of Study Respondents

No.	Category	Sub Category	Frequency	Percentage
1	Gender	Male	16	44.4
		Female	19	55.6
		Total	**35**	**100**
2	Age	Below 30 years old	14	41.7
		31-40 years old	9	25
		41-50 years old	10	27.8
		51-60 years old	2	5.5
		Above 60 years old	0	0
		Total	**35**	**100**
3	Level of Study	PhD	13	36.1
		Master	22	63.9
		Total	**35**	**100**
4	Faculty	Faculty of Management and	13	38.9
		Faculty of Islamic Studies	8	22.2
		Faculty of Syariah & Law	2	5.6
		Faculty of Multimedia	3	8.3
		Faculty of Education	9	25
		Total	**35**	**100**

Referring to Table 1, the data shows a diverse distribution among respondents in terms of gender, age, level of study, and faculty. Although there is diversity, the majority of respondents are female, aged 30 years and below, are at the master's level and come from the Faculty of Management and Muamalah. This information is important to understand the

profile of the respondents and can help in further analysis of their needs and views on the construction of a digital module framework based on the Theory of Problem-Based Learning (PBL) for the Research Methodology course. Based on the analysis of the questionnaire, the research findings obtained from the questionnaire are as follows:

Difficulties of Topic in the Course
In higher education, particularly in the teaching and learning of Research Methodology courses, certain topics consistently pose significant challenges for students. Master's students often struggle with understanding and constructing Theoretical Frameworks and Conceptual Frameworks, which are critical for forming the foundation of their research. Similarly, PhD students face difficulties in mastering Quantitative and Qualitative Analysis techniques, as well as in Thesis and Proposal Writing. These challenges stem from the abstract nature of these topics and the lack of practical application in traditional teaching methods, making them difficult to grasp (Daniel, 2022; Nguyen et al., 2024).

The PBL approach presents a promising strategy to address these challenges effectively. By focusing on real-world problems and active, student-centered learning, PBL enhances understanding through practical application. For instance, PBL encourages students to collaboratively construct their theoretical and conceptual frameworks based on authentic research scenarios, facilitating a deeper comprehension of these complex topics. Additionally, PBL supports the development of technical skills in data analysis and academic writing by immersing students in hands-on exercises and iterative feedback processes, which have been shown to improve both confidence and proficiency in these areas (Andersen et al., 2019; Ramli & Mohd Tajudin, 2021).

By integrating PBL into Research Methodology courses, educators can provide a more engaging and effective learning environment that addresses students' difficulties. This approach not only helps students overcome specific challenges but also cultivates essential skills such as critical thinking, problem-solving, and collaboration, preparing them for academic and professional success (Nguyen et al., 2024; Trullàs et al., 2022). This aligns with Daniel (2022), findings, which highlight postgraduate students' dissatisfaction with the current design and teaching of research methods courses. Students perceive these courses as pedagogically monolithic and conceptually challenging, with little adaptability to individual career trajectories. This dissatisfaction is further compounded by the inadequate use of teaching aids, such as Nvivo software, SPSS, and other technological tools, in teaching research methodology.

Improving Teaching Technique
This study highlights the necessity of updating teaching practices in higher education institutions (HEIs). While students acknowledge that current teaching mediums, delivery techniques, and teaching aids are appropriate, they believe these elements require improvement to better align with their needs in the digital era. Students increasingly prefer learning approaches that incorporate technology, such as interactive online platforms, learning videos, and discussion forums, which make the educational process more engaging and effective. Integrating digital tools into teaching not only supports students' technological preferences but according to Nguyen et al. (2024) and Suárez et al. (2021), PBL also enhances their learning experience by offering flexibility and interactivity.

More Practical and Engaging Approaches
Traditional teaching methods, such as lecture-based delivery, are perceived as less effective in the modern educational landscape. Students advocate for more practical and engaging approaches, including PBL, collaborative learning, and simulations, which have been shown to enhance understanding and participation. These methods focus on real-world applications and encourage active learning, helping students connect theoretical knowledge with practical problem-solving (Andersen et al., 2019; Hariani & Sulistyo, 2023). Providing examples, case studies, and hands-on activities as part of the curriculum aligns with contemporary pedagogical practices, ensuring education remains relevant in a rapidly evolving world.

Another critical finding is the need for timely and effective support from research supervisors. Students emphasized that early and accessible guidance significantly improves their learning experience and research quality. This aligns with Daniel's recommendation for adopting a research-led approach to teaching, bridging the gap between theoretical knowledge and practical application. Providing structured support and fostering collaborative learning environments can enhance students' academic outcomes and research experience (Daniel, 2022; Nguyen et al., 2024).

Addressing these challenges requires a comprehensive overhaul of teaching practices in HEIs. By incorporating digital technology, practical data collection methods, and ensuring timely supervisor support, institutions can create a more effective and relevant learning environment. These changes will not only improve student satisfaction but also enhance their ability to apply research methodologies effectively, preparing them for both academic and professional challenges in an evolving global landscape (Zakaria et al., 2025; Andersen et al., 2019).

This study also found that some issues in teaching aspects in higher education institutions need to be updated. The majority of students think that the teaching medium, delivery techniques, and teaching aids used by lecturers are appropriate but need to be improved. This may refer to the use of platforms or delivery methods that are less in line with the needs of today's students. In this digital era, students are more inclined to use technology in their learning. Therefore, HEIs should consider integrating digital technology in their teaching. The use of interactive online learning mediums, such as learning videos, and discussion forums can make the learning process more interesting and effective.

Delivery techniques by lecturers also need to be improved. Traditional teaching techniques that focus on lectures may no longer be relevant in the modern era of education. Students suggested that more case examples and practical exercises be included in the teaching. More interactive delivery techniques such as problem-based learning (PBL), collaborative learning, and the use of simulations can help improve student understanding and engagement.

Daniel's study suggests that the teaching of research methods is often disconnected from practical problems, focusing more on abstract concepts with limited opportunities for practical application. This gap in teaching methodology indicates a lack of practical knowledge application in research methodology education, which can hinder students' ability to effectively apply research methods in their academic pursuits. Our findings support this view, as students expressed the need for exposure to more focused data collection techniques,

particularly those that use artificial intelligence applications to make the research process more efficient and relevant to current technological developments.

The Use of Technology
Research further indicates that traditional approaches to teaching research methodology often emphasize abstract concepts with limited opportunities for practical application. This gap hinders students' ability to apply research methods effectively in academic and professional settings. Daniel's study (2022) supports this observation, highlighting the importance of integrating practical tools and techniques, such as artificial intelligence (AI), into the teaching of research methods to make learning more efficient and relevant to technological advancements. Our findings echo these views, with students expressing a desire for more targeted exposure to advanced data collection techniques that align with current technological trends (Zakaria et al., 2025).

To address these challenges, it is essential to transform research methodology courses by incorporating advanced software, AI tools, and practical problem-solving approaches. Both our study and Daniel's research emphasize the importance of aligning teaching methods with technological developments to improve the practical application of research methodologies. This integration not only enhances student engagement but also equips them with the skills needed for academic and professional success (Nguyen et al., 2024).Students also think that the teaching aids used are insufficient. The use of technology such as Nvivo software, SPSS, etc. is important in teaching research methodology. This shows the need for lecturers not only to have knowledge in the subject being taught but also to master the skills in using relevant teaching aids. Training and professional development courses for lecturers in the use of assistive technology can help address this issue.

Exposure to students of more focused data collection techniques is also needed. Teaching data collection techniques that are more specific to problem statements with the help of artificial intelligence applications or Artificial Intelligence (AI) can make the research process more efficient and relevant to current technological developments. The students also suggested that the IPT ensure that research supervisors are available and ready to help as early as possible in order to save time and improve the quality of guidance received by students.

Discussions and Conclusion
The findings indicate a strong demand for digital PBL modules that incorporate real-world problems and enhance students' critical thinking, problem-solving, and collaborative skills. The paper discusses the potential of PBL in higher education to equip students with the necessary competencies for contributing to a sustainable society. Recommendations include integrating PBL approaches in curriculum design, providing training for educators, and utilizing technology to create interactive and engaging learning environments.

Higher education institutions can better equip students to contribute to a learning society focused on sustainable development by attending to these needs. In turn, this can contribute to the attainment of the more general objectives of sustainable development by giving people the abilities and perspective required to handle and overcome challenging global issues.

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