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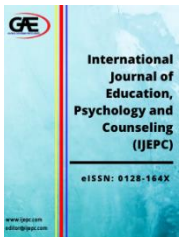

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DESIGN AND DEVELOPMENT AN ORAL QUESTIONING (P-LISAN) MODEL: A NEED ANALYSIS

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Abstract:

The current teaching methods in matriculation colleges often lack interactive and engaging approaches, leading to limited student comprehension and participation in physics. The objective of this study is to identify the elements in the oral questioning model of matriculation college Physics teachers. This study aims to explore the needs to design and development needs of an oral questioning model for physics lecturers at matriculation colleges. In this needs analysis phase, the research adopts a qualitative approach, utilizing semi-structured interviews based on themes identified in the study. The interview protocol was developed, validated, and underwent a preliminary study to ensure reliability. Informants were selected through purposive sampling, focusing on individuals with over five years of experience in education, classified as experts. This purposive sampling method ensured that the participants have relevant expertise and experience to provide valuable insights into the requirements for the P-Lisan model. The findings from the interviews revealed a consensus among all participants on the necessity of developing a questioning model. Additionally, the participants identified specific design elements and features that should be incorporated into the model to address the unique challenges faced by physics lecturers in the matriculation context in Malaysia.

Keywords:

Colleges (Matriculation), Model (Questioning), Oral Questioning, Physics, Teaching Methods

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Introduction

Education is crucial for a country's development and progress. In Malaysia, the education system is firmly committed to ensuring access to quality education for all citizens and addressing current economic and social needs (Economic Planning Unit, 2021). Since gaining independence in 1957, Malaysia has made significant strides in education, marked by higher participation rates and enhanced education quality (Ministry of Education Malaysia, 2020).

One of the primary challenges in the Malaysian education system is ensuring access to and the quality of education across the nation, including at the matriculation college level. Matriculation colleges are pivotal institutions that provide students with a pathway to pursue university education (KPM Matriculation Department, 2022). These colleges play a crucial role in establishing the academic foundation and skills of students before they enter the university environment (KPM Matriculation Department, 2022). Education at the matriculation level is essential for building the knowledge and skills base that will determine students' success at the university level and in their future professional careers.

Physics is a mandatory subject for science students in module 1 and module 2 at matriculation colleges (KPM Matriculation Division, 2022), due to its crucial role in establishing a robust foundation of scientific knowledge. Through studying physics, students not only grasp fundamental principles but also enhance their critical and analytical thinking skills, which are essential in the realms of science and technology. However, the complexity of physics necessitates the comprehension of abstract concepts and the application of these principles in various situations. This demands not only strong mathematical and logical abilities but also a profound understanding of physical phenomena.

To facilitate student understanding, modern teaching methods such as project-based learning, inquiry-based learning, problem-solving approaches, and flipped classrooms have been introduced. These methods have proven beneficial for students, especially those pursuing further studies in fields like engineering, medicine, and computer science. Additionally, the problem-solving skills developed through physics education equip students with the ability to tackle complex challenges, a key asset in the professional world (Bakar et al., 2021; Parno et al., 2020; Tongchai, 2021).

Despite these methods, one area that requires further attention is how physics lecturers engage students during the learning process, particularly through questioning techniques. Questioning is a critical instructional tool that can stimulate deeper understanding and foster interactive learning. Thus, the objective of this study is to identify the elements in the oral questioning model used by matriculation college physics teachers. By identifying these elements, the study aims to enhance current teaching practices and address the unique challenges faced in physics education, ultimately improving students' comprehension of complex topics.

Literature Review

The modern teaching techniques discussed earlier are closely tied to the use of oral questioning in the classroom. Oral questioning is a powerful pedagogical tool that enables teachers to stimulate critical thinking, deepen conceptual understanding, and foster active student participation (Mahmud & Mohd Drus, 2023; Tofade et al., 2013). For example, both the Project-Based Learning (PBL) model and the PBL-STEM model have been shown to enhance students' problem-solving skills (Parno et al., 2020). In PBL and Problem-Based Learning,

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teachers use open-ended, thought-provoking questions to guide students in problem exploration, solution planning, and reflective analysis. Additionally, the flipped classroom has demonstrated positive effects on student achievement across multiple subjects (Rahman et al., 2014). In this model, oral questioning is employed in class to assess students' grasp of material learned independently and to promote discussion and exploration of more complex concepts through direct interaction. Research also suggests that Socratic questioning significantly improves students' reading comprehension by fostering critical thinking and deeper engagement with texts. The Socratic Questioning Technique integrates oral questioning into every aspect of teaching, encouraging in-depth dialogue and inquiry. Through oral questioning, teachers can assess students' understanding, provide immediate feedback, and address misconceptions. Overall, oral questioning acts as an interactive tool that enhances active, collaborative, and student-centered learning. However, its effectiveness depends largely on the teacher's ability to frame and administer questions effectively.

Preliminary research shows that many teachers face challenges in formulating effective questions (Abubakar et al., 2021; Bulent et al., 2016; Forster and Penny, 2020; Indrawati et al., n.d.; Zainudin et al., 2019). Additionally, there is a significant variation in the skill levels and experience of teachers using oral questioning as a teaching tool (Abdul and Silor, 2024). This situation may stem from a lack of clear guidance on questioning techniques that can stimulate critical and analytical thinking among students (Agustina et al., 2021; Espina, 2022). The best way to address these challenges is through teacher professional development, which should emphasize a deep understanding of how to design questions that not only test knowledge but also develop students' critical and analytical thinking skills. An effective teacher professional development program requires a model that aligns with the actual educational environment. This model should be tailored to the local context and the specific needs of teachers and students. This discussion underscores the need to develop a model of oral questioning specifically for matriculation college physics teachers.

The requirements analysis study is a crucial part of the design and model development process. Research design and model development are based on problem-solving for specific situations or general research procedures (Richey and Klein, 2007). The needs analysis phase involves gathering information within the specific context and environment to be studied (Saedah Siraj et al., 2013). In this study, the needs analysis aims to identify the differences in the criteria for effective oral questioning by comparing findings from existing studies with those from the current context and environment. Additionally, this analysis seeks to highlight discrepancies between the elements of oral questioning identified in the literature and the actual practices of teachers in the studied environment. Ultimately, the needs analysis will inform the final findings that support the development of an oral questioning model tailored for matriculation college Physics teachers

Research Problems

Education plays a major role in the development of quality human resources to ensure the country's progress (Tahim Bael et al., 2021). In this context, the teacher's role is a key factor in ensuring the effectiveness of teaching and learning (Titik Rahayu et al., 2019). Studies on the effectiveness of teaching and learning in physics education in higher education institutions have been done a lot (Behroozi, 2019; Espinoza, 2020; Giliberti et al., 2019; Gunstone et al., 2009; Jelicic et al., 2017; Narjaikaew et al., 2010; Nordin, 2019; Nordin & Awang, 2021).

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However, research on the effectiveness of teaching in the context of matriculation colleges is limited.

The oral questioning model proposed in this study aims to provide a comprehensive guide for teachers in formulating and implementing oral questions in their teaching. This model will cover various aspects of questioning, including techniques to stimulate critical thinking, ways to assess student understanding, and strategies for providing effective feedback. This model will also take into account the specific needs and challenges faced by physics teachers in matriculation colleges. In order to meet the characteristics of this comprehensive model, this needs analysis study was conducted. This analysis will help identify the need to develop a model of oral questioning of matriculation college Physics teachers and elements in questioning students orally. Thus, the introduction to the title of this study provides a solid foundation for further research in the development of oral questioning models that are relevant and effective in improving the quality of teaching and learning of Physics at the matriculation college level.

This study was conducted based on the need to obtain data to develop an oral questioning model for matriculation college Physics teachers. Needs analysis is done to identify the needs of the model before the model is developed and evaluated in the next phase (Saedah Siraj et al., 2013).

Research Methodology

In this needs analysis phase, the researcher used a qualitative approach. A semi-structured interview protocol was developed based on the themes identified through the highlights of the study. The interview protocol has gone through content validity as well as the validity of language experts. In addition, a preliminary study was also conducted using the interview protocol. This needs analysis was made to get teachers' and experts' direct views on the need to develop an oral questioning model. This is in line with the opinion of Creswell and Creswell (2018), that face-to-face interviews allow the researcher to obtain information related to the informant's view and a more in-depth study can be conducted in addition to the researcher being able to control the discussion.

Informants in the field of education who have more than five years of experience in the current field can be classified as experts (Berliner, 2001, 2004a, 2004b). The selection of informants using sampling aims to meet the criteria that have been set. Semi-structured interviews were conducted face-to-face online through the medium of Google Meet with three teachers from matriculation colleges and two lecturers in science education from Public Institutions of Higher Education (IPTA). Interviews were recorded with the informant's consent and transcribed verbatim. The transcriptions were also confirmed by all informants first before analysis. The methodology of this study is as shown in the **Figure 1**.

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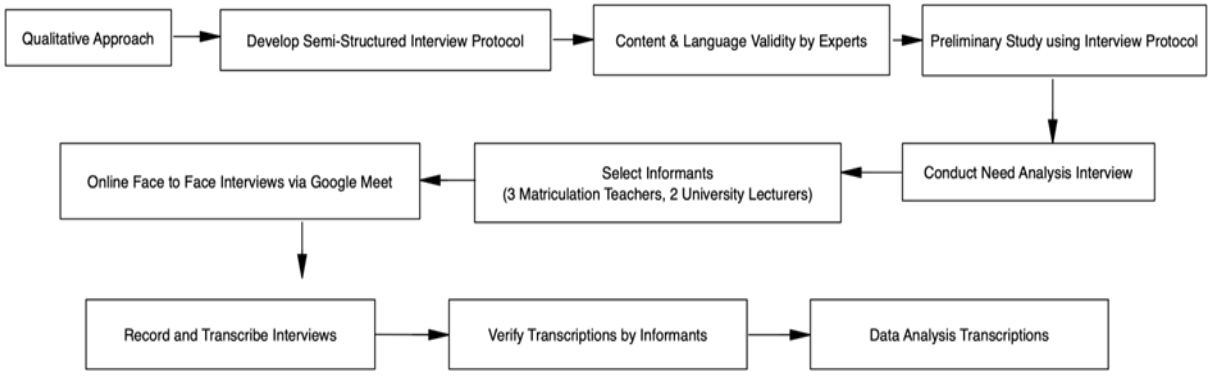

Figure 1 Methodology Flowchart for Needs Analysis and Data Processing

Findings

Based on the analysis of verbatim transcriptions, the informants have unanimously agreed on the need to develop an oral questioning model for physics teachers in matriculation colleges.

Demographics of the Study Respondents

Three Physics teachers from matriculation colleges and two lecturers from public universities were selected to provide insights on the need to develop an oral questioning model. Table 1 details the study participants, each labeled as R1, R2, R3, R4, and R5, with "R" stands for respondent.

Table 1 Demographics of Informants

Participant	Gender	Experience	Position
R1	P	20	Physics Lecturer
R2	P	12	Physics Lecturer
R3	L	8	Physics Lecturer
R4	P	26	University Lecturer
R5	P	28	Former University Lecturer

Table 1 presents the findings from the study participants. The participants include R1, a female physics teacher with 20 years of experience teaching physics at a matriculation college; R2, also a female physics teacher, with 12 years of experience in the same field; and R3, a male physics teacher with 8 years of experience at a matriculation college. Additionally, R4 is a female Professor with 26 years of experience in science education, and R5 is a former lecturer with a Doctor of Philosophy degree and 28 years of experience in science education.

The Need to Develop a Model of Oral Questioning (P-Oral) of Matriculation College Physics Teachers

The findings of the needs analysis confirm the necessity of developing an effective oral questioning model for physics teachers in matriculation colleges. The conclusion reveals that all study participants uniformly acknowledged this need. This finding directly supports the research question, indicating a clear requirement for an effective oral questioning model for these teachers. This conclusion is substantiated by statements from interviews with participants R1, R2, R3, R4, and R5 as refer to Table 2.

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Table 2: Response Interview

Participant	Line Numbers	Question	Response
R1	400-405	What are your thoughts on the development of this model?	I believe it can enhance students' understanding. I really like the idea because we need tools that can contribute to teaching and learning.
R2	236-241	What is your view on the development of an oral questioning model in matriculation colleges?	Personally, I don't think this aspect has been developed yet.
R2	238-239	Is there a need for it to be developed?	Absolutely, there is a need for it.
R3	188-190	What is your opinion on the development of the oral questioning model?	There has to be one.
R3	189-190	Can you justify why?	To make it easier to convey concepts to students.
R4	457-471	What is your opinion on the development of this model, Professor?	It is significant, as it highlights the importance of your existing study.
R5	843-846	Is it necessary to develop this model?	Yes, there is a need for it. For example, what are the criteria for effective oral questioning?

The Importance of Oral Questioning Model Development (P-Oral) of Matriculation College Physics Teachers

The study participants believe that an effective oral questioning model can assist new teachers in their teaching and learning process and help students improve their knowledge. This perspective is supported by interview excerpts from R2 (line 246) and R3 (line 190) as follows:

246 The model greatly assisted the new teachers. If he's a senior lecturer, that means he's a capable individual, right? He seems to be independent-minded, which indicates he has the ability to support students. I believe he is someone who not only aids new teachers but also helps students, God willing.
190 Ah, so that it becomes easier to communicate with students... Having assistance like that makes conveying information easier

The study participants also expressed the opinion that the developed model can enhance theoretical understanding and pedagogical content knowledge (PCK) in physics education, focusing on specific topics. This perspective is supported by R4 (line 464) statement:

464 This could be a contribution to theory or PCK, as I mentioned, pedagogical content knowledge across various levels within the domain of physics education. Within physics, there

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are numerous subjects like force, electricity, and abstract concepts, each with its nuances. Therefore, this contributes to that realm. For instance, there might be a novel approach to questioning related to the topic of energy, or a comparative method specific to this PCK topic, which delves into particular subjects and themes.

R5 (line 847) also articulated a perspective on the development of a tailored oral questioning model specific to this topic, as evidenced by the following statement:

847 When we concentrate on a particular topic, the outcomes are directly relevant to that topic, similar to how I presented the model for oral questions in electrochemistry, right? Those are the themes that emerge.

From the analysis findings demonstrating robust endorsement from study participants for the development of an efficient oral questioning model, it is evident that there is a pronounced demand to create a model that aligns with their requirements and aspirations for implementing effective oral questioning in educational settings. Participants also offered diverse perspectives on the significance of such a model.

Discussion And Implications

The integration of structured oral questioning models into physics education in matriculation colleges promises to significantly enhance both teaching practices and student outcomes. Modern teaching techniques such as Project-Based Learning (PBL), Problem-Based Learning, and the Flipped Classroom model heavily rely on effective oral questioning to stimulate critical thinking, deepen conceptual understanding, and encourage active student participation. Oral questioning, as used in these pedagogical approaches, serves as an interactive mechanism that promotes active, collaborative, and student-centered learning. However, the success of these techniques is contingent upon the teacher's ability to formulate and administer impactful questions.

Current research indicates a notable challenge faced by many teachers in crafting effective questions that stimulate critical and analytical thinking. The variation in teachers' skill levels and experiences in using oral questioning as a teaching tool further complicates this issue. This underscores the necessity for professional development programs specifically designed to equip teachers with the skills to design and utilize questions that not only test knowledge but also foster deeper thinking.

A needs analysis within the specific educational context is crucial to developing an effective oral questioning model for matriculation college physics teachers. By comparing findings from existing studies with the current context, discrepancies can be identified, and specific needs can be addressed. This analysis will highlight the differences in criteria for effective oral questioning and the actual practices of teachers, guiding the development of a tailored model. Such a model would align with the local educational environment, addressing specific challenges and leveraging the unique context of matriculation colleges.

Ultimately, the findings from this study are poised to enhance physics education by providing a structured framework for oral questioning. This framework can be used in teacher training and professional development, ensuring educators have the requisite skills to employ oral questioning effectively. Furthermore, these insights can assist educational policymakers in

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offering the necessary resources and support to empower physics teachers, thereby improving teaching standards and preparing students for academic success at the university level and beyond.

Conclusion

An investigation into the development of oral questioning frameworks for physics educators in matriculation colleges revealed a pressing need to enhance techniques for oral questioning in physics instruction. The research identified several key issues, including teachers' familiarity with effective questioning methods in matriculation settings and the limited depth of research in this area. The findings underscored that proficient oral questioning can significantly enhance students' grasp of intricate physics concepts, thereby elevating the overall quality of teaching and learning at the matriculation level.

By implementing a structured oral questioning model tailored to the specific needs of both teachers and students, it is anticipated that this initiative will contribute to advancing physics education quality. Consequently, the immediate focus will be on meticulously developing and assessing the efficacy of this model in authentic classroom settings. This endeavor aims to fortify physics education in matriculation colleges, ensuring adherence to rigorous educational standards and furnishing students with a robust foundation for future studies in scientific disciplines, particularly in physics.

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