

Determining the Influence of School Administrator's toward Teacher's Successful Integration of Science Electronic Module (Sem): A Study on Orang Asli Primary Schools in Malaysia

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ABSTRACT

The effectiveness of the teaching and learning process is determined by its execution. The integration of technology into classroom instruction has celebrated individuality and the different ways of students' learning process. Hence, a Science Electronic Module (SeM) was developed in an effort to increase Orang Asli student's understanding of science topics. The influence of school administrators as a determining factor toward SeM's successful implementation was also tested. The study employed a qualitative research design, where six Orang Asli primary school teachers were interviewed. Findings from the present research inform that hands-on activity, experimentation, multimedia elements, and interactivity are key features in SeM in boosting Orang Asli primary school student's understanding of the delivered topic. The study also suggested that the implementation of SeM into Orang Asli students' classroom instruction has increased their interest in the Science subject. Support from school administrators through continuous professional development courses, encouragement, initiative, and incentive were addressed as determining factors toward the successful implementation of SeM. Considering those findings, the study concludes that technological usage in classroom instruction should be given priority. Acting as a determinant success of any education change, the role played by the school administrator is important. Various approaches and ongoing efforts need to be intensified, in ensuring that all students benefit from this technology-assisted learning modality.

Keywords: School administrator, Science education, Science Electronic Module (SeM), Orang Asli students

INTRODUCTION

Over few years, the Malaysia Ministry of Education (MoE) has been proactive in cultivating scientific knowledge across all schools. The seriousness of this effort can be seen when the national science curriculum has been revised to reflect the direction of STEM (Science, Technology, Engineering & Mathematics) education. This exertion includes science teachers' pedagogical approach that focuses on students' active participation in the solution of real-world problems (MoE, 2016). Conversely, science teachers are urged to be innovative in their pedagogy by utilizing the full potential of technological peripherals and applications, which will increase students' interest in learning the subject (Farihah et al., 2021). The benefit of integrating technology into science subject instruction has been acknowledged through students' better understanding and motivation to learn (Celin & Turkan, 2022), facilitating students to acquire new skills and knowledge (Idris & Bacotang, 2023), improving student learning outcome (Marini et al., 2022) eases teachers' teaching methods, and wider access to variety of information and materials (Lay & Chandresegaran, 2024).

In addressing this issue, the MoE should also consider a significant education gap between different groups of students, especially Orang Asli also known as Indigenous students. Being in remote areas, Orang Asli schools were reported to have limited facilities and access to learning materials (Abdullah, 2022). These inadequacies have certainly impacted teachers' instruction and students' learning processes. Furthermore, teaching Orang Asli students requires teachers to be more creative, innovative, and adaptive. Teachers are required to convey a relatedness and connectedness to every living thing, which is the foundation of Orang Asli tradition, culture, and spirituality (Idrus, Hussin & Gulca, 2023). It is also suggested that when the lessons are relevant and applicable to Orang Asli's everyday activities, their understanding and academic achievement can be improved significantly (Rahim et al., 2023). Hence, a mainstream approach is required to be customized to meet the needs of Orang Asli students (Borham et al., 2024).

Reflecting on those concerns, a Science electronic module (SeM) was developed to assist teachers in increasing Orang Asli students' understanding of science learning. Being a supplementary of teachers' current teaching materials and students' differentiated learning experience, the development of SeM has considered the integration of appropriate features in maximizing its potential. Moreover, in determining SeM functionality, the effectiveness of SeM toward students' understanding will be verified. Moreover, school administrators' support will also be tested to ensure developed SeM is successfully integrated. The results of this study may, foremost provide guidelines for teachers in conducting effective, creative, innovative, and adaptive Science teaching among Orang Asli students. Furthermore, findings derived from this present study will also highlight the influence factors of school administrators and the MoE efforts in uplifting STEM education, technology integration, and providing equity in education, especially among Orang Asli students.

Science Education among Orang Asli Students

The Malaysia MoE has determined that Science education aims to develop students' interests and creativity through everyday experiences and investigations. This effort will help to promote the acquisition of scientific and thinking skills, as well as the inculcation of scientific attitudes and values (MoE, 2019). Although this aim is seen as coincidental and well-defined, previous studies have found that teachers face various challenges in conducting Science teaching (Idris, Govindasamy & Nachiappan, 2023). Among those challenges are limited resources, dense curriculum, short teaching time (Lay & Chandrasekaran, 2024), low student interest, weak support from school administrators (Wong, Liang & Tsai, 2021), and lack of training. On the other hand, a few studies also found that students' interest and inclination in science are also deteriorating. Several factors that contribute to this problem have been identified, among which are teachers' boring teaching methods, stereotyped subject content, unattractive learning resources, and being too exam-oriented (Idris et al., 2023). These situations have called for immediate actions to be taken. Deehan (2022) has urged greater work to contextualize ideas of best practices in science education.

Numerous attempts have been made to improve Science education, which focuses on learning processes that are designed as student-centered, the use of engraining teaching materials, and the adaptation of instruction to students' individual characteristics. These efforts were set in order to boost learning outcomes, and motivation in line with the evolution of technological educational resources (Suzuki et al., 2020). In the era of digital technology, teaching and learning materials are expected to be in electronic mode, where interactivity and attractively are the core components. Therefore, the introduction of electronic modules during teachers' teaching and students' learning is believed to provide maximum positive effects (Holisoh et al., 2023). The interactive features of the electronic module can assist students in increasing their understanding of the subject matter (Fadzil, 2024) and improve their independent learning (Aprilia & Suryadarma, 2020). An electronic module also is beneficial since it includes various learning approaches, activities, and features, such as viewing images, watching videos, listening to audio, and taking tests or quizzes that provide rapid automatic feedback (Saryadi & Sulisworo, 2023). These in return will ability to independently assess students' comprehension and boost students' enthusiasm for learning (Rasmi, Hendri & Azriyanti, 2023).

Concerning indigenous education, the introduction of an electronic module hopes to be able to contribute to increasing the interest and performance of Orang Asli students, especially in science subject. Under the efforts to improve Orang Asli students' success in school, the MoE has introduced several initiatives that include an adaptive curriculum, diverse and up-to-date teaching materials, continuous training for teachers, and authority

for school administrators (Ali et al., 2024). Conversely, Science teachers who teach Orang Asli students should play an important role in ensuring successful instruction and learning processes happen. As suggested by Joenez and Menendez (2021), teachers must be aware that students are more interested in science subject when it is relevant to their everyday lives, which is in line with Orang Asli's goals and needs in learning (Abdullah, 2022). Hence, the development of the Science electronic module (SeM) hopes to provide alternative and new directions for teachers in increasing Orang Asli students' understanding and motivation to learn Science subjects.

RESEARCH METHODOLOGY

The present study was carried out under three objectives. Firstly, to determine important features required in developing an electronic module, namely SeM, secondly to assess the effectiveness of SeM toward students' understanding of science learning, and finally to determine school administrator support in ensuring successful SeM implemented. A qualitative approach was implemented to acquire a full understanding and in-depth understanding of the investigated phenomena (Busetto et al., 2020). The collection of data involved semi-structured interview sessions with six Science teachers from two Orang Asli primary schools in Pahang, a state in Malaysia. These schools will later be addressed as School A and School B. Those teachers are experienced Science teachers who have more than ten years' experience teaching Science subject in Orang Asli primary schools. In the effort to determine school administrators' support toward the successful integration of SeM, interview sessions with both headmasters were also carried out. Both of them have ten and sixteen years of experience respectively in managing schools. Interview sessions were conducted in Malay language, which is the national language and medium of instruction in Malaysian local schools. It was later translated into English language for presentation purposes. Data collected were then analyzed thematically. Thematic analysis through coding, sorting, and identifying the themes and relationships from the data will be able to strengthen the research findings since different threads of data are woven together to understand the case better.

With respect to the development of the Science electronic module (SeM), the ADDIE model was applied in this study. Being one of the most popular instructional design frameworks, the ADDIE model guides instructional designers to create comprehensive and effective electronic learning materials (Chang & Abidin, 2024). The five stages of the ADDIE model guided the development of SeM, namely analysis, design, development, implementation, and evaluation. Table 1 presents each stage in guiding the design and development of SeM.

Table I Stage in Designing and Developing of The Electronic Module (Sem)

Stages	Stage Description	Action and Rationales
Stage 1: Analysis	Problem and issues identification	Limited technological learning resources and teaching materials Need of creative, innovative and adaptive learning materials for Orang Asli students
Stage 2: Design	Formulating the objective, identifying the resources and integrating learning theories	Understand the objective, content and activities for the chosen learning topic Identifying suitable learning theories and guideline in designing the learning material
Stage 3: Development	Production process of SeM	Utilizing the full potential of technological applications in delivering the chosen learning topic content knowledge and carried out the activities
Stage 4: Implementation	Employments of SeM during teachers' instruction	Application of SeM in teaching and learning of chosen topic
Stage 5: Evaluation	Assessing the effectiveness of SeM on students' understanding	Interview session with six Science teachers in determining the effectiveness of SeM in improving students' understanding in learning the chosen topic

Further, the topic of plants was chosen as the topic of this study. This topic is covered throughout standards three through six, thus determining its importance. The topic of plants was also chosen due to its relation to the environment and outdoor setting, which is closely related to Orang Asli tradition and daily life, which will increase their interest in learning about it. In ensuring the maximum usage of SeM, various experiments and hands-on activities were adapted and presented through demonstration video and animation. This approach will ensure that students' understanding will be improved. In a similar vein, the SeM was also developed by utilizing the full potential of multimedia elements to maximize the understanding and memorization of the students. Diversity in presenting information will also provide flexibility to students, thus ensuring the effectiveness of the learning process. In addition to text, information in SeM is also presented through various types of visuals, such as realistic visuals, interpretive visuals, and transformational visuals. The present study hoped that systematic developmental procedures and the SeM could be a reference for instructional designers and teachers in producing attractive, effective, creative, innovative, and adaptive learning materials.

RESEARCH FINDINGS

This section will be presented in three sub-sections, based on three objectives of the study.

The Development of Science Electronic Module (SeM)

Under the objective of developing the SeM, determining the product features is crucial. Determining the characteristics that need to be applied to the learning material should be in line with its objectives, functions, and methods of use. In addition, the need to meet the desires of targeted users is also important to be taken into account. Looking at the importance, this present study has looked at the needs of the characteristics in developing the Science electronic module (SeM). As a result of the interview sessions conducted, the study found that hands-on activities are essential features that are needed in any instruction materials, including SeM. In line with this statement, Mr. KS a science teacher from school A noted that Orang Asli students are very energetic, which is why they enjoy hands-on activities hence, he employs this strategy in his lesson. Mr. KS indicates that:

If we want to discuss the best approach to teaching Orang Asli students, they are very active and like doing activities. I can say that they prefer hands-on things rather than just listening to the teacher's talking and explanation.

On the other hand, Mr. BH from school B explained that he uses hands-on activities because some of these students struggle with reading, which affects their interest in the Science subject. By engaging in a hands-on activity, he was able to attract the interest of Orang Asli students in learning Science subjects, as opposed to the standard approach of reading and writing. He mentioned that:

If they ask to read it is a little difficult, so we have to do a lot of hands-on activities.

The most effective is hands-on activity. They are more interested in learning Science when we provide them with hands-on activities. We can see their excitement to learn.

Miss TA from school B also shared the same perspective. She said that using hands-on activities increased not only the students' learning interest but also stimulated their critical thinking and problem-solving activities.

In ensuring Orang Asli students' better understanding, I have to do more activities that stimulate their thinking. So, I have to do a lot of hands-on activities. I need to foster their interest in solving problems by sharing a situation with existing materials encouraging students to solve problems with STEM activities and increasing hands-on activities.

Other important elements that were frequently mentioned in addressing the effectiveness of students' learning materials were appropriate and engaging visuals. All interviewed Science teachers were very pleased with the visuals used in SeM. They said that this alternative module is engaging and non-textbook-like content could assist teachers in diversifying their instructional strategies, as stated by Mr. SA from school A.

Lots of visuals. The visuals used are very beautiful, modern, and neat. Teachers can also diversify their teaching techniques and materials with the help of this alternative module because their activities are different from

textbooks and interesting.

In addition, Mrs. SR from the same school stated that this module differs from the textbook in terms of contrast and interesting color of visuals. She also mentioned that this module is interesting because it contains fewer sentences and more colorful visuals.

It's really interesting. Less sentences, more pictures. Interesting visuals and colors were used as compared to ordinary textbooks.

Further, Science teachers also have expressed that interactivity is a key element in the development of a learning material. Almost all teachers have emphasized the need for learning material to be controlled by the students themselves, especially the Orang Asli students. This statement has been mentioned by Mrs. SR from school A. She stated that:

Interactive learning materials are very important. They (Orang Asli students) have a unique and different approach to learning. Therefore, the learning materials used need to show the diversity of the information presented.

Similarly, Mrs. SK from the school B mentioned that:

The learning material must focus on multimedia elements. The use of multimedia elements in this module, such as video, audio, and animation in explaining information is very effective and ensures that learning materials are well received by students.

The Effective of Science Electronic Module (SeM) toward Students' Understanding

In assessing the effectiveness of SeM, students' understanding of the topic of Plants was determined. The SeM was given to Orang Asli students as additional learning materials after teachers' classroom instruction. Findings on the effectiveness of SeM were derived from teachers' feedback. Based on interview sessions conducted, almost all interviewed teachers indicate that SeM has brought many benefits to students' learning process, especially in their understanding. For instance, Mr. SA from school A has expressed his view by mentioning that a variety of forms of information and unique presentation styles in SeM have helped students understand the information better. He stated that,

SeM is a good learning material. The method of presenting information through visuals, videos, and animations is very helpful for students' understanding. The uniqueness of the presentation style causes students to quickly grasp what they want to convey. Orang Asli students learn best by looking at visuals.

Similarly, Miss TA from school B has acknowledged the advantages brought by multimedia elements to Orang Asli students' learning process. She specified that video and animation are able to present complex scientific processes in an interesting manner. This has made students to better understand and memorize the process. She hopes for more interactive module teaching and learning materials to be introduced to ease students' learning and facilitate teachers' teaching process.

With multimedia elements, such as video and animation, complex scientific processes will be presented in an easy and interesting way. They are really excited when seeing animation and video as their learning materials. This will then improve their understanding. This will also make it easier for them to remember the content knowledge shared with them.

I hope more interactive learning materials like SeM will be introduced. Before this, it was difficult for us as teachers to explain and make students understand the complex process of science. But with this kind of interactive learning material, the process is easy and quick to understand. This will not only help students' learning but also support the teacher's teaching process.

On the other hand, many interviewed teachers also indicated that flexibility and interactivity in SeM have impacted students' learning process. They agreed that flexibility has allowed Orang Asli students to learn at their own pace and time, while interactivity features in SeM have given students full control of their learning process. This freedom and self-determination in learning have positively impacted their understanding and mastering of

the content knowledge. One of them was Mr. KS a science teacher from school A. He mentioned that,

This interactive and flexible learning material is very helpful for Orang Asli students. They can take full control of their learning according to appropriate level and time. Some of them can quickly understand the content but some can't. Thus, freedom in controlling the learning process will ensure that students are able to understand and master the information presented depending on their capability.

Conversely, Mrs. SR from school A has shared her concern on information shared in SeM. She felt that the information was too dense with varied and simplified presentations feared to interfere with student understanding. She also stated that this learning material should be used together with students' main learning material, which is the textbook. The information presented should be parallel rather than confusing students. Mrs. SR shared her concern by stating that,

Too much and varied information can affect students' understanding. This is especially true for information that has been summarized and presented through various methods and styles. The information should also be parallel to the content in the textbook, which is the main learning material in school. I worry that too much information will make students confuse.

The School Administrator Supports

The successful integration of any technological application will be influenced by many factors. Considering this statement, the study will determine the effect of school administrator support in ensuring successful SeM integration happens. Interview sessions with the Science teachers and school administrators were carried out to get collective findings from both the implementer and the provider. Findings derived from the interview sessions with the teachers informed that administrators support are one of key indicators towards successful technology integration. Being a leader themselves, school administrators were acknowledged as catalysts to any changes happening in school. This statement was highlighted by Mrs. SR from school A where she said:

School administrators are the main indicators of the success of changes in schools. If they give encouragement and support, we as teachers will just follow and obey. If incentives are given to those who follow, that is better.

In support of that view, all interviewed teachers indicates that their schools' administrators always encourage teachers to integrate technology during classroom instructions. For instance, Mrs. SK and Mr. BH from school B agreed that school authorities' support is crucial in making sure any initiatives happen successfully in schools. They mentioned that:

My school administrators often give encouragement to continue improving knowledge, skills, and usage of technology in teaching. Apart from providing continuous training through LADAP, we are also provided with appropriate facilities for use in the classroom. Even administrators themselves are enthusiastic about optimizing the use of technology in their teaching.

Our school principal is very inclined to the application of technology in the teaching and learning process. In addition to continuous training for teachers, he will also ensure that the budget to purchase and maintain these technological tools is satisfactory. This causes us to move in the same direction.

Those statements have also been agreed by the school administrators from both schools. They understand their responsibility and function in making sure teachers under their supervision are required to update themselves with technological advancement in line with students' needs and interests. Apart from adhering to the Ministry of Education acts, teachers' successful integration of technology is also one of the criteria for their yearly appraisal and promotion. As an authority, both headmasters understand that they need to provide sufficient facilities and continuous support in making sure that the effort will be successfully implemented. For instance, HZA from school A mentioned that:

As a leader, I have to set a good example. I also need to be in line with the policies and recommendations of the ministry. The application and development of technological learning materials have also become a requirement for teachers to be promoted. This is to meet the interests and needs of the students. We know our students are indeed exposed to technology, the outside world requires technology, therefore these Orang Asli students also

need to be moved in line with those needs.

In a similar vein, Mr. MH a school administrator of school B agreed with that statement. He added that the Ministry of Education has put lots of effort, initiatives, and budgets into making sure that all school students will be exposed to technological tools and applications during their learning process. This effort should be translated into teachers' instruction process, thus making sure that all students, including Orang Asli students, will be technology literate. He stated that:

I, as a school administrator, must support the ministry's efforts in increasing the use of technology in the teaching and learning of these Orang Asli students. The ministry has allocated diverse resources and high incentives to teachers who optimize the use of technology. Orang Asli students should not be left behind in changes to technology-based teaching and learning systems. They also need to be tech-savvy and technology literate.

RESEARCH DISCUSSION

The advancement of technology integration for teaching and learning has urged teachers to maximize its potential in their instruction process. Conversely, instructional designers are expected to develop effective, creative, innovative, and adaptive learning materials. Thus, determining systematic procedures and features presented in students' learning materials is essential. Findings derived from the present study suggested that hands-on activity, attractive visuals, and interactivity as important features in assisting Orang Asli's learning of science subjects. This result is consistent with the findings of Fernandez et al. (2023), who found that hands-on activities foster a passion for lifelong learning and inspire students to explore and discover new information. Xoliyorova et al. (2024) also noted that when students are actively involved in hands-on activities, they are more likely to value and understand the content of the lesson. Incorporating hands-on activities not only helps to boost students' enthusiasm for learning but also stimulates their critical thinking and problem-solving skills. Through hands-on exercise, students gain knowledge, apply the given concept, and generate a workable solution to the problem (Al Ansi & Al Ansi, 2023). In addition, attractive visuals and interactivity features in Orang Asli students' learning materials need to be highlighted. The use of visuals helps to capture and maintain the attention of students in order to convey the message and stimulate excitement of learning topics. The use of visual and integrative multimedia elements also promotes imaginative thought, sensory exploration, psychomotor skills, and visual scanning (Gulannova, 2024).

Looking at the importance and role of the above characteristics mentioned, the integration of SEM as a learning material for Orang Asli students has shown a positive effect, especially on their understanding of science topics. The findings of the study found that the integration of multimedia elements such as video and animation facilitated students' understanding of complex Science processes. Due to the need for visual perception among students, Abdulrahman et al. (2020) emphasize the significance of video components for enhancing students' engagement in science class. On the other hand, the addition of audio as one of the sources of learning in SEM has enriched and expanded the learning experiences of students. As suggested by Sharhboz (2023), audio delivers a verbal message to boost the learning process for students with limited reading abilities.

Obviously, there are many factors that impacted the effectiveness of SeM integration among Orang Asli students. One of the main factors is the full support from the school administrator. Acting as a determinant of any education change, the role played by the school administrator is significant to technology implementation into teachers' classroom instructions (Kanariah & Adiyono, 2023). Establishing working procedures, adequate financial allocation, continuous guidance, motivation, and incentives for teachers are among the things that an administrator can play in ensuring the success of SeM integration.

RESEARCH CONCLUSION

The outcome of this study provides information on teaching approaches and factors that influence Science teachers' teaching approaches in order to promote learning interest in science subjects among Orang Asli students. The present study concludes that hands-on activity, experimentation, and the use of technology are the crucial approaches that should be utilized by science teachers in boosting Orang Asli students understanding and interest in the subject. A fundamental implication of this study is the need to encourage students' natural sense of curiosity through hands-on experiments and exploration activities that are able to increase their thoughts on

the topic shared. The findings also demonstrate that providing simple and clear visuals, utilizing the potentials of multimedia elements, and implementing design principles are essential in developing the Science electronic module (SeM) in ensuring Orang Asli student's better understanding of shared topic and thus enhance Orang Asli students' learning interest.

Hence, based on the present findings urging the need for an alternative module to aid interest in science subject, it calls for the Ministry of Education to relook at the Orang Asli student's current sources of learning. The focus should be given more to the utilization of visuals and interactivity provided for the students in ensuring more attractive, effective, creative, innovative, and adaptive learning materials provided for Orang Asli students. Not to mention, more training and aid on teaching skills should be provided to better equip teachers with better abilities when creating their lesson plans so that teachers may have a bigger impact on their student's learning with the necessary support and training. Therefore, it is time for educational experts and instructional designers to consider developing electronic modules for Orang Asli students in order to improve their education. The use of one-way and rigid teaching and learning materials is no longer suitable for students who are technology-savvy. They are more interested and directed toward interactive and personalized learning materials, that will influence their interest, understanding, and success in the learning process.

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