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How Important Learning Media for In-Service Science Teacher

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Abstract

This training on developing STEM-based teaching modules aims to equip science teachers with the knowledge and tools needed to create teaching materials, such as modules, that will be used in classroom learning. The development of modules is not only relevant to the curriculum but also capable of integrating STEM concepts. This STEM-based teaching module can enhance critical thinking skills and foster students' creativity to face the challenges of the 21st century. The method in this training session began with the presentation of material on STEM education, guidelines for module development, explanations of examples and types of teaching modules, and provided teachers with the opportunity to collaborate or discuss with the facilitators. Because the module that has been developed is expected to integrate STEM concepts into learning materials both in the classroom and during independent study. Thus, in this training, it is hoped that it can have a positive impact on both teachers and students so that it can be implemented effectively in the classroom with a more interactive and innovative approach, thereby increasing students' interest in learning and enhancing their ability to solve complex problems.

Keywords: science teacher, STEM, teaching module

INTRODUCTION

The learning media are essential tools which support teaching and learning, especially in science education where abstract concepts necessitate visual and interactive explanations (Reyna et al., 2021). The in-service teachers of science, while actively working as teachers, also pursue their training in different methods to become more effective in stimulating students (Bradbury & Wilson, 2020). The right type of teaching media allows teachers to present complex scientific phenomena with more clarity and comprehensibility (McLure, 2022). Propelled on one hand from physical models to digital resources, these solution-based methods seek (Dombrovski & Hallquist, 2021), on one hand, to bridge the gap between theory and practical applications to ensure that students achieve deeper comprehension of scientific tenets (Ke et al., 2021). One of the main advantages of teaching assistance is its application to the various types of learning styles (Thongchotchat et al., 2023). Some students thrive through visual methods while others gain knowledge through experiments or topics learned with interactive game-style components (Zhao et al., 2022). By applying to different media such formats, in-service science teachers are under pressure to develop engagement into their creation of learning (Nilsson & Lund, 2022; Kannan et al., 2022). Digital media-from virtual laboratories to multimedia presentations-offer students' opportunities to explore concepts of science in ways that traditional teaching may not (Siantuba et al., 2023). Such flexibility should ensure better cognition of concepts that pertain to complex subject matters.

However, the curriculum continues to raise various challenges when integrating learning media into science for delivery. Many in-service teachers, including the science teachers, face constraints of technology inadequacy and unavailability of proper teacher development programs and institutional settings to assist them with contemporary teaching tools (Chaipidech et al., 2022). Moreover, continued teacher professional development would become overtly taxing as technology improves rapidly. The provision of training and infrastructure is needed for teachers to make rational use of learning media in their classrooms (Schmidthaler et al., 2023). Learning media not only enhances understanding but also promote motivation and engagement in students with respect to science (Grabau, 2022). Many students struggle to keep their focus in conventional teacher-based styles of teaching (Leyton-Román et al., 2020). In these scenarios, these students are either found to be disinterested or not performing well academically. Interactive media such as animations, augmented reality, gamification, etc. can convert science instructional lessons from classic black-and-white description into exciting, interactive active engagements (Wen et al., 2023; Muliyati et al., 2024). This media make science learning enjoyable, thereby helping students foster a great desire for inquiring about science finding solutions to a problem. When teachers embrace learning media that encourage curiosity, it will depend on how the students will progress academically and probably spark an interest in a science career path (Karcher et al., 2021).

This indicates that, given the significance of learning media in scientific education, efforts should be made to explore methods for enhancing access for in-service teachers seeking to utilize learning media in their classes (Girón-García & Fortanet-Gómez, 2023; Sari & Yurnetti, 2022). Educators, governmental bodies, and other stakeholders in education must collaborate to reduce in-service training, procure educational resources, and establish support networks for teachers; this will facilitate the integration of contemporary media into classroom activities (Ramos et al., 2021; Jensen & Kimmons, 2022). Addressing challenges will enhance students' quality of scientific education and learning. The extent to which educators may modify and implement these emerging instructional resources will influence the trajectory of science education.

INTERDISCIPLINARY AND STEM WORKSHOP FOR IN-SERVICE SCIENCE TEACHERS

STEM (Science, Technology, Engineering, and Mathematics) and interdisciplinary workshops are essential for improving the pedagogical skills of in-service science educators by merging several disciplines and fostering real-world problem-solving abilities (O'Dwyer et al., 2023; Panchanathan, 2023; Nasbey et al., 2024). The workshops seek to provide educators with methods for connecting scientific principles to technological innovations, engineering concepts, and mathematics applications, so fostering an integrated approach to science teaching. Project Based Learning can combine teachers participating in hands-on activities and group projects tackling real-world scientific and engineering difficulties, the instructional strategy used in these seminars is inquiry-based learning which can encourages student curiosity in scientific topics by means of logical reasoning, research, and experimentation (Neves, 2022; Jordens et al., 2022; Muliyati et al., 2023). Workshops familiarize educators with technology-enhanced learning, encompassing computer simulations, programming, and data analysis software to render science instruction more dynamic and engaging (O'Leary et al., 2020). Engagement in these interdisciplinary and STEM-oriented workshops provides current science educators with the competencies necessary to develop dynamic (Mateos-Núñez et al., 2020), student-centered learning environments that prepare students for future careers in STEM disciplines while augmenting their problem-solving and innovative skills (Fairhurst et al., 2023).

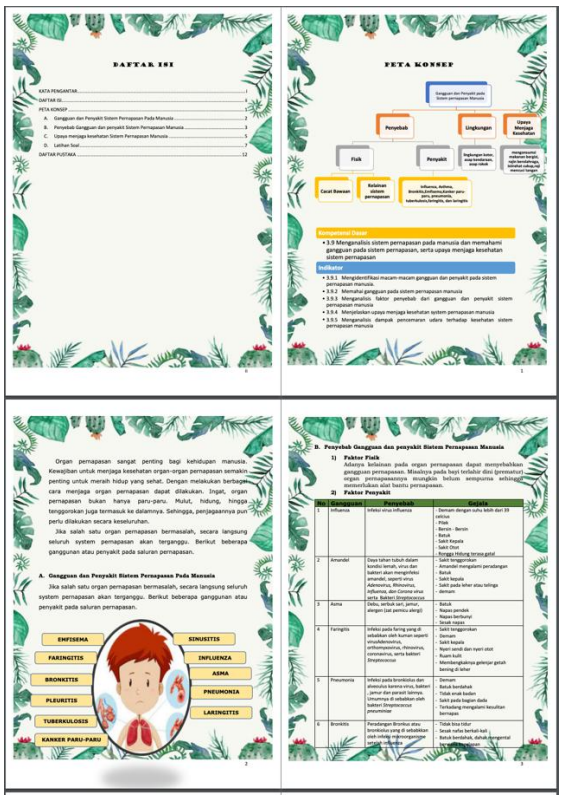
LEARNING WITH TEACHING MODULE: A MODERN APPROACH TO EDUCATION

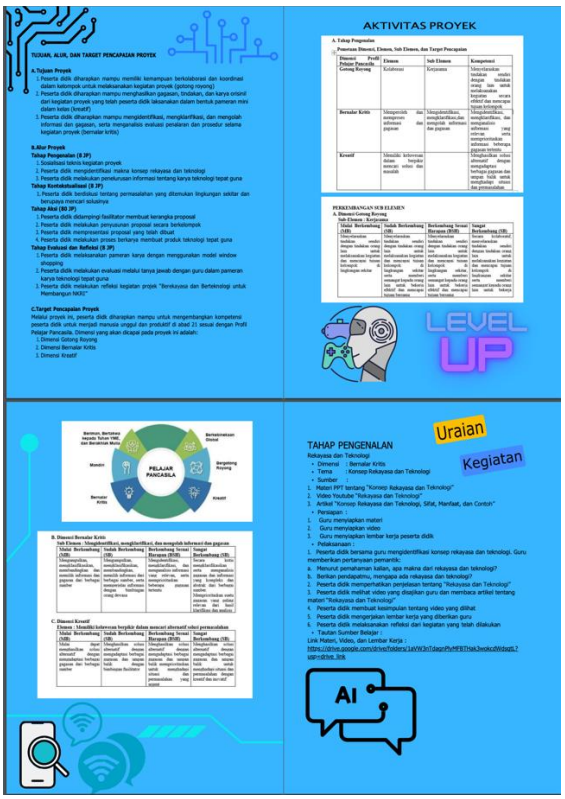
The rapid advancement of digital technology has immensely revolutionized education delivery, allowing learning to be rendered accessible, interactive, and efficient (Shehaj, 2022; Timotheou et al., 2022). Some of the most recognizable innovations are teaching module is electronic modules, referred to as e-modules, which replace print resources as the means of learning material presentation (Sofi-Karim et al., 2022; Schnieders et al., 2022). E-modules are digital learning resources including textual, visual, video, animation, and real movement quizzes to bolster learning in various subjects (Rajan & Pandit, 2022; Grant et al., 2023). The need to promote in a flexible, student-centered fashion wherever and whenever they needed it

has been behind the switch from print textbooks to E-modules (Pérez-Garcias et al., 2022; Rajabalee & Santally, 2020). Thus, the e-modules have found their way into schools, universities, and professional training courses.

E-modules reflect the key advantages of personalized, student-centered learning that allows students to action at their own pace, unlike in a regular classroom where all students have to follow a fixed schedule (Al Mamun & Lawrie, 2023). It also demonstrates flexibility, especially for students with varying learning abilities and preferences. Students take charge of time and retake anything they have difficulty with at their own pace. Moreover, there are interesting and intriguing assessments, starting from quizzes, developing onto simulations and ending with exercises that serve to reinforce and support learning engagement. E-modules promote active learning and supply immediate feedback to students, leading them toward self-assessment which, in turn, reinforces a deeper understanding of the content (Goode et al., 2022).

In response to growing needs for flexible, technology-oriented or online teaching, e-modules create a unique tool for the improvement of learning outcomes in the 21st century (Sorkun et al., 2022). As technology continues to develop, by creating more advanced and interactive e-modules, one can augment the quality of education. To get e-modules to work for purpose, teachers, policymakers, and institutions will need to work side by side, addressing existing challenges while optimizing their implementation (Stieglitz et al., 2023). In this manner, the education sector continues to embrace digital learning innovations and provide students with inclusive, engaging, and effective learning environments, preparing them for modern requirements.





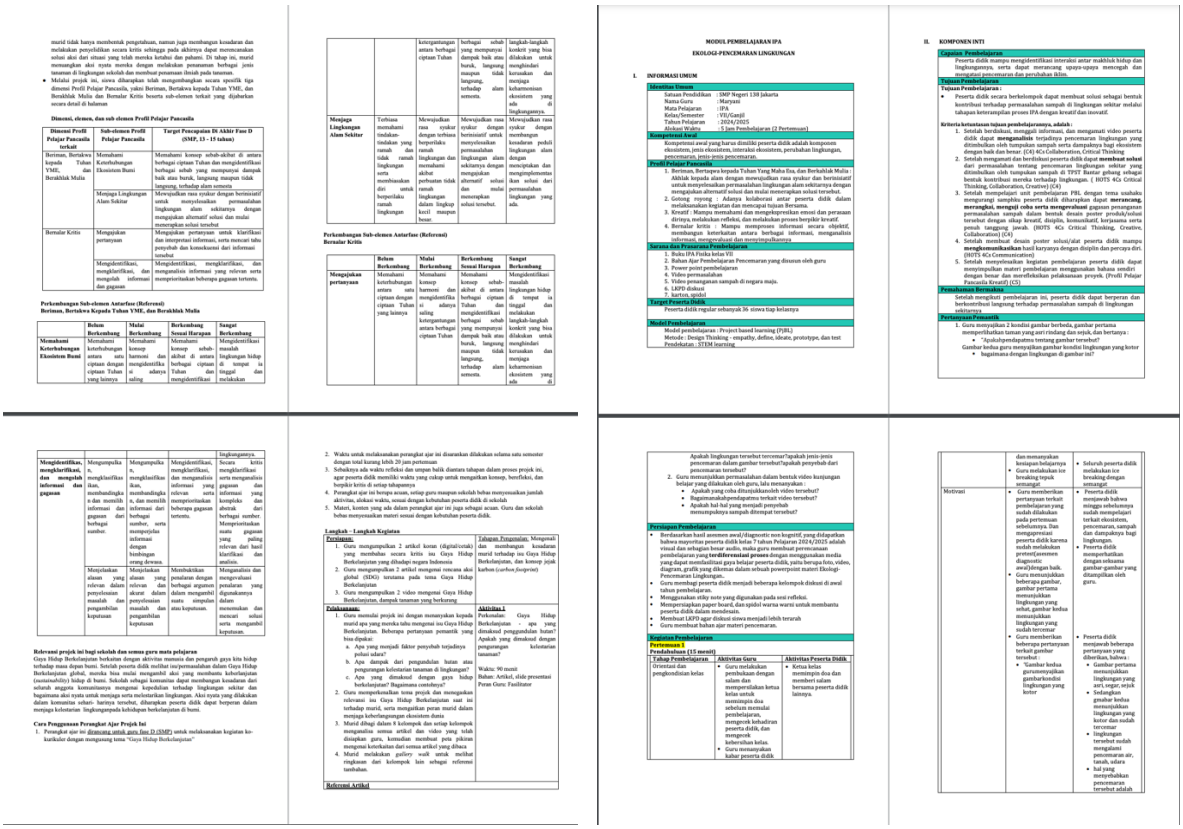


FIGURE 1. Teaching Modules developed by science teachers after participating in the Teaching Module creation training.

CONCLUSIONS

The success of professional development of current science educators is mostly defined by the application of proper educational media. A workshop series of teaching, particularly those directed towards Interdisciplinary and STEM education, give educators the chance to build pedagogical competencies and advance their comprehension of scientific principles. These workshops enable the creation of new methods for teaching while concurrently motivating educators to incorporate technology and project-based principles into the learning process. Among the different modalities of workshops that have been examined, the technology-based and experiential learning approaches have been particularly effective in enhancing the quality of science education. Practically trained teachers become more confident in teaching content and are able to facilitate a better learning process for students. Moreover, collaboration workshops strongly contribute to establishing professional networks through which teachers can exchange experiences and implement more innovative teaching. Thus, it is necessary that schools and other stakeholders keep facilitating the professional growth of science teachers by sending them to different training programs and workshops. The availability of proper resources, access to technological tools, and opportunities to learn from specialists will significantly enhance the quality of teaching science at different levels of education. Such initiatives not only result in the quality enhancement of teachers but also yield long-term dividends to the overall growth of science education.

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