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Engagement Class with Wiggle Bot Project Based Learning

Handjoko Permana*[1], Fauzi Bakri[1], Dewi Muliyati[1], M. Rizki Diva Mahendra[1], Siti Rachmawati[1], Gustama Wibawa Rachman[1], Mutoharoh[2]

[1]*Physics Education Department, Universitas Negeri Jakarta, East Jakarta, 13220, Indonesia*
[2]*Industry Engineering Study Program, Universitas Krisnadwipayana, Bekasi, Jatiwaringin, 13077, Indonesia*

*Corresponding Email: handjoko@unj.ac.id

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Abstract

This training emphasizes the implementation of the Project Based Learning model and Wiggle Bot as learning tools to enhance teacher engagement as training participants with knowledge about the STEM approach in modern education. In this training session, the teachers worked in groups to design and create a Wiggle Bot, which will then be integrated into the curriculum. After successfully making the Wiggle Bot, the teachers identified the STEM components present in it. This aims to enable teachers to create various STEM projects that align with the learning and concepts of the material taught in class, thereby capturing the students' attention and indirectly engaging them actively in classroom learning. The active involvement of teachers as participants indicates positive feedback from this training. This training not only enhances teachers' skills but also deepens their understanding of STEM concepts and approaches.

Keywords: active learning, project based learning, STEM approach

INTRODUCTION

Education today has transformed into modern education. Modern education involves creative learning and provides meaningful experiences as students study a concept or material (Melnick, 2018). On the other hand, creative and meaningful learning has changed traditional teaching into a diverse approach to learning, thereby enhancing critical thinking, creativity, and collaboration skills (Barton & Riddle, 2021). One approach that can be applied is the Project Based Learning (PjBL) model. The PjBL learning model encourages students to take an active role in their education by providing or completing real-life projects (Arifatin, 2023). Project-Based Learning (PjBL) is student-centered, where the learning process presents

challenges to students to explore complex questions, problems, or challenges within their studies, as well as to complete a project (Wu, 2024). The PjBL approach also introduces a deep understanding of a concept that requires students to implement that understanding in real-world practice (Podobnik et al., 2024). By working both in groups and individually, students can enhance their abilities such as problem-solving skills, teamwork, and communication among groups (McKay & Sridharan, 2023).

The effectiveness of the PjBL learning model has the ability to create a learning atmosphere that is more relevant and engaging (Liao et al., 2023). Compared to explaining or providing theories continuously, this learning model motivates students to explore knowledge with their own abilities. This active learning not only enhances students' abilities but also prepares them to face real-world challenges by improving critical thinking skills such as adaptability, perseverance, and self-management (Mora et al., 2020; Nansen, 2024; Owens et al., 2020). Meanwhile, Project-Based Learning (PjBL) aligns with the increasing emphasis on 21st-century skills, which include digital literacy, collaboration, and critical thinking skills (Yu, 2024). When teachers strive to equip students with the tools or materials they need to achieve success in the world of education (Carabantes & Paran, 2022). Project-Based Learning (PjBL) also offers a strong and comprehensive framework for developing students' competencies in a real and meaningful environment, while introducing them to deeper contexts of a concept by working on or completing a project (Zhang et al., 2024; Uotila et al., 2023).

Integrating tools like the Wiggle Bot into Project-Based Learning (PjBL) further enhances the impact by providing students with hands-on experiences that bridge the gap between theoretical concepts and practical application (Fitzgerald & Evans, 2024). In this context, the Wiggle Bot serves as a teaching tool that sparks students' curiosity and creativity as they design, build, and experiment with their own robotic projects. Here, the combination of PjBL and interactive technology creates an engaging learning environment, making students more likely to get involved, thereby increasing participation levels and fostering a deeper understanding among learners (Zhang & Hwang, 2022).

METHODS

The method of this training is to design research using a case study approach. This approach aims to provide a deep understanding of the implementation of Project Based Learning by integrating the Wiggle Bot tool as a learning aid, as well as how this method or approach influences student engagement in the classroom. The participants in this study are science teachers who are members of the Science Teacher Working Group (MGMP IPA) in East Jakarta Region 1. This training began with a presentation on the STEM Robotics approach by the facilitator. During or after the presentation, teachers were invited to discuss by asking questions about anything they still did not understand regarding the STEM Robotics material. After the facilitator's presentation, the teachers carried out project development. Where are the teachers as participants designing the Wiggle Bot project that aligns with the science curriculum, covering fundamental concepts such as motion, energy, and mechanical systems.

At this stage, an initial investigation into the values of the STEM components is also conducted.

RESULTS AND DISCUSSION

This research aims to test the effectiveness of the Project Based Learning model using Wiggle Bot to enhance teachers' ability to create and understand STEM components. (Science, Technology, Engineering and Mathematics). This training involves teachers as participants working in groups, equipping them with the necessary tools and guidelines to design a Wiggle Bot. Teachers participating in this training must successfully complete the process of creating a Wiggle Bot. This stage begins with the provision of material on active learning and the PjBL approach as well as STEM Robotics.

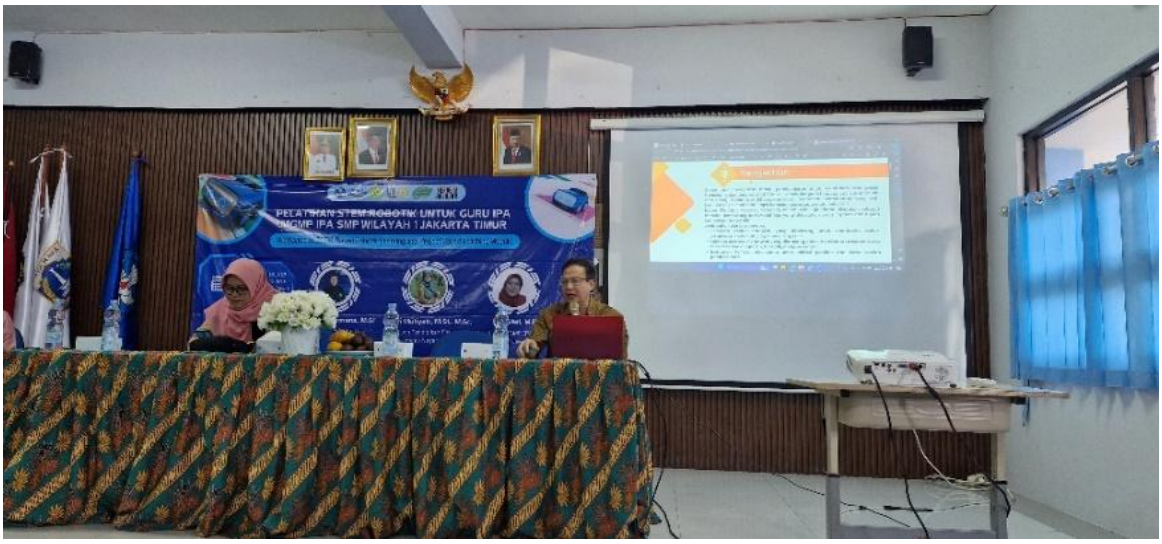

FIGURE 1. Presentation of Material and Discussion Session

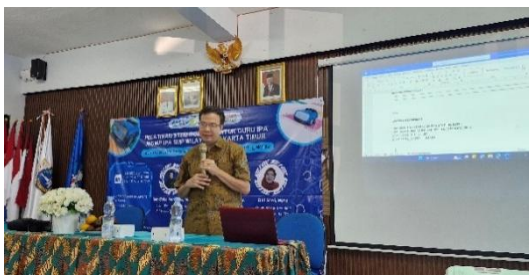

FIGURE 2. Discussion session by the Facilitator and Training Participants

After that, the teachers were introduced to the tools and materials needed for making the Wiggle Bot, up to the final assembly of the Wiggle Bot. The teachers demonstrated a good understanding of the instructions and were able to assemble the Wiggle Bot independently, with minimal involvement from the facilitator when encountering difficulties in the creation process.

FIGURE 3. Teachers working in groups to complete the Wiggle Bot.

Next, when the teachers have successfully created the Wiggle Bot, they are asked to identify the components and concepts of the STEM approach used in this project. In the discussion session, teachers can explain how each STEM component is integrated into project-based learning. Observation results show that the teachers are not only able to create the Wiggle Bot and identify its components, but also able to bridge the Wiggle Bot project with the curriculum implemented with STEM concepts into classroom practices for learning activities.

This training emphasizes teachers' abilities in the STEM approach by highlighting the effectiveness of the Project Based Learning model. The training combines the creation of a Wiggle Bot with teachers' understanding of STEM concepts. The success of teachers in assembling the Wiggle Bot demonstrates that the PjBL learning model can effectively bridge the gap between theoretical knowledge and practical application. Teachers' ability to identify the STEM components of the Wiggle Bot also shows that this training method is not only visually appealing but also effective in terms of learning. This training directly allows teachers to experience the challenges and benefits of STEM learning that can be implemented in the classroom, making classroom learning active and enjoyable with the help of engaging learning tools.

This training also received good and positive feedback from the teachers. This training is considered to enhance student engagement and motivate learners in classroom learning. The PjBL learning model demonstrates an important role in the development of teachers' abilities to design classroom learning by involving them in projects that require collaboration in groups, active participation, and the resolution of complex problems or questions encountered while working on the projects. The success of this training can be applied to various learning processes in the classroom by combining the Wiggle Bot project with a STEM approach. On the other hand, by participating in this training, teachers are expected to be able to implement it to enhance student engagement. This research is anticipated to provide opportunities for sustainable development focused on improving teachers' professional skills, particularly in active learning and the STEM approach.

CONCLUSION

The involvement of learning with Wiggle Bot as a learning tool and Project Based Learning as a learning model demonstrates the effectiveness of the PjBl learning model in enhancing teachers' understanding of the STEM approach. This training showcased the active

engagement of teachers in the design and creation of the Wiggle Bot as a learning tool, followed by the identification of the STEM components present in the Wiggle Bot. This training not only improved teachers' skills and creativity in creating learning tools but also boosted their confidence and enthusiasm in teaching STEM subjects in the classroom. This training demonstrates that Project-Based Learning (PjBL) is an effective learning model to be implemented in the development of STEM education, offering practical, effective, and engaging learning experiences. Teachers could consider integrating Project-Based Learning (PjBL) activities in the classroom to enhance students' understanding as well as improve critical thinking, problem-solving, and collaboration skills.

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