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Exploring the World of Education Industry: Perceptions of Prospective Biology Teachers on an Academic Visit

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ABSTRACT

Field study is a contextual learning strategy that can strengthen students' understanding of lecture material, particularly in the Media and ICT in Biology Education course. This study aimed to provide an overview of students' perspectives of practical scientific learning activities through industrial visits to learning media industry in Bandung. The research method used was descriptive with a survey technique. The survey was conducted on Fourth semester prospective biology teachers who take learning media courses. The instrument used was a questionnaire filled out by the students who participated in the academic industry visit. The participants consisted of 93 students. The results showed that more than 50% of students gave positive responses by agreeing or disagreeing with the visit activities, particularly in terms of enhancing knowledge about the production of educational media, the relevance of industry to the world of education, and inspiration for innovation in designing Biology educational media. Additionally, the activity was also deemed effective in strengthening the connection between classroom theory and real-world practice. These findings recommend the importance of integrating educational industrial visits into the curriculum for prospective Biology teachers to develop more contextually relevant pedagogical and professional competencies

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Introduction

The education industry plays a crucial role in shaping future generations, and for prospective teachers, applying their academic knowledge in the real world is essential for their professional growth (Menezes & Pinto, 2016; Vlk, 2023). This study aims to explore the perceptions of prospective biology teachers regarding academic visits to Industrial

educational learning media which a leading institution in education sector. By analyzing their experiences, insights, and reflections, this study seeks to understand how such visits contribute to their understanding of educational practices, scientific developments, and the integration of theoretical knowledge with practical application in the field of biology education. Field-based plant exploration exercises are perceived as enjoyable by student biology teachers, as they provide a break from traditional classroom settings and offer a more engaging learning environment (Akpinarli & Akaydin, 2024; Kandamby, 2018). Outdoor learning environments, such as museum visits and scientific field trips, are seen as enjoyable and beneficial for concretizing knowledge and learning by doing (Uzel, 2020; Cooley et al., 2015). This research will provide valuable insights into the effectiveness of academic visits as a tool for bridging the gap between classroom learning and real-world educational experiences. In the context of biology education, field trips are very important because they allow students to experience biological phenomena firsthand, deepen their understanding of concepts, and develop scientific inquiry and problem-solving skills.

Industry-based learning programs enhance students' understanding by exposing them to real-world business operations, thus broadening their perspectives beyond textbook knowledge (Rajibussalim et al., 2016). The visit to educational learning media industry. Aimed to gain firsthand insight into the production process, innovation, and application of technology in the manufacture of educational aids. Monitoring of workplace environmental factors such as noise levels, temperature, humidity, and lighting is crucial to ensure working conditions comply with the threshold limits set by national regulations, Permenakertrans No. Per.13/MEN/X/2011. Additionally, this visit is expected to strengthen the relationship between the education sector and industry, fostering collaboration in the development of competent human resources capable of addressing global challenges.

In the era of globalization and rapid technological development, the industrial world is required to continue innovating and maintaining quality standards and work safety (Jilcha, 2023; Laudante, 2017). This presents both a challenge and an opportunity for higher education to adapt its curriculum and learning experiences to meet the needs of industry. One of the efforts that can be made is through industrial visits, which provide students with a direct insight into production processes, technology application, and professional work culture. Through these activities, students can observe firsthand how design, manufacturing, and quality control processes are carried out in the educational equipment industry. Additionally, students gain an initial understanding of how the industrial world operates and recognize the importance of collaboration between education and industry in supporting national progress.

This experience is crucial for enhancing practical knowledge, broadening perspectives on the workplace, and fostering motivation to continue innovating. In line with the statement (Bloomer & Scott, 1987), integrating an industrial perspective into teacher education helps students gain broader knowledge about the outside world and a broader perspective on the goals and processes of education. In addition, this visit also aims to introduce students to the challenges and opportunities in the educational equipment industry, while fostering inspiration and motivation to create similar innovations in the world of education. This experience is expected to broaden perspectives on the potential for innovation in education and technology, which is crucial for supporting national economic and industrial progress. The activity also serves as a platform to strengthen collaboration between higher education and the industrial sector. As a result, university graduates are expected to possess skills

aligned with the evolving needs of the industry and be able to actively contribute to advancing technology and enhancing national productivity.

The research questions that are relevant to the objectives of this study, how do prospective biology teachers perceive field trips to industrial sector in Bandung, CV Pudak Scientific Bandung?". CV Pudak Scientific Bandung is the largest manufacturer of educational aids in Southeast Asia. Not only do prospective biology teachers visit the company, but they also receive training on how to conduct science games and make bioplastics that are meaningful and enjoyable for students.

Method

The research method used was descriptive with survey techniques. Descriptive survey research employs various methods such as questionnaires, interviews, and observations to collect data. These methods can be administered through different modes, including postal surveys, telephone surveys, online surveys, and mixed-mode surveys, each with its own strengths and limitations (Deckert & Wilson, 2023; Tanner, 2018.). The survey was conducted on fourth semester Biology Education students at FTK UIN SGD Bandung in the Media and ICT in Biology Learning course who participated in this activity. These methods allow for a comprehensive understanding of students' attitudes and experiences, providing valuable insights into the effectiveness and challenges of integrating technology in educational settings. The use of surveys, often combined with qualitative and quantitative analyses, helps capture a wide range of student perspectives, making it a robust approach for educational research. The descriptive survey method is a research approach that focuses on collecting and analyzing data to describe current conditions, practices, and trends in education.

It is particularly useful for understanding the characteristics of a population and identifying relationships between variables (Salaria, 2012). Descriptive survey methods are often used to collect data on perceptions of educational strategies in exploring a learning experience. This method provides a comprehensive understanding of current educational practices and their impact on prospective teachers. Descriptive surveys do not establish causality or predict future outcomes, which can be a limitation when deeper analysis is required. However, they serve as a foundational step in research, offering a detailed understanding of the subject matter that can inform subsequent experimental or analytical studies. This approach is particularly beneficial in new areas of research or for new researchers seeking to establish a contextual understanding of their field of study (Deckert & Wilson, 2023; Swatzell & Jennings, 2007). This method is employed in various educational studies to gather insights into the perceptions and experiences of prospective teachers, as it allows for the collection of both qualitative and quantitative data (Brewer, 2009).

This industrial visit was held on Tuesday, June 24, 2025. The participants who were given the questionnaire were 93 fourth-semester biology education students who were enrolled in the media and ICT course. The participants who were given the questionnaire were 93 fourth-semester biology students who were enrolled in the media and ICT course. There were 11 statements and reasons for the students to respond or answer, along with one statement related to activity when industrial visitof the field trip to Pudak Scientific Bandung. Survey using a structured questionnaire distributed to students during or after the visit. Rationale for choosing this instrument and its effectiveness in capturing perceptions. Explanation of how the data will be analyzed (e.g., descriptive statistics, thematic analysis).

Descriptive research does not attempt to predict or manipulate outcomes, which distinguishes it from experimental research. Instead, it focuses on describing relationships between variables and providing a basis for further research (Swatzell & Jennings, 2007).

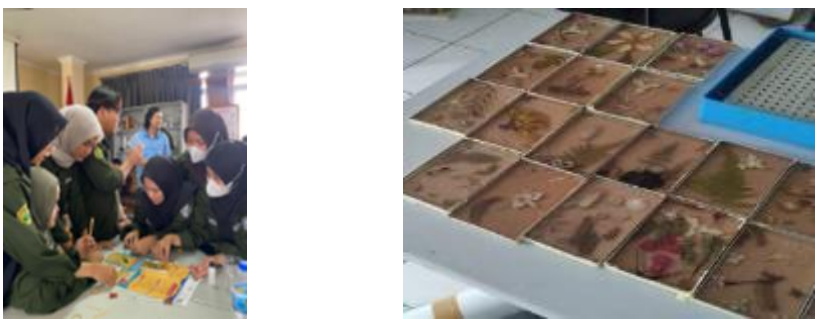
Results and Discussion

One of the objectives of the industrial visit is to enhance participants' understanding of production processes and to develop educational tools for technology and science. During the visit, participants were given the opportunity to observe firsthand how theories learned in the classroom can be applied in the workplace. Specifically, the focus was on the educational and laboratory equipment manufacturing industry in Indonesia, particularly educational and research institutions.

(a) (b)

Figure 1. Activities and exploration at CV Pudak Scientific
(a) fun science through various experiments, (b) industrial visit

Based on Figure 1(a) fun science activity after touring the industry, participants received explanations about various production processes, ranging from the manufacture of laboratory equipment such as beakers and test tubes used in practical activities to ordinary glasses (household items). In addition, participants were also introduced to the process of packaging learning media, which turned out to cover not only biology but also mathematics and other subjects. Participants were able to observe firsthand how educational tools such as chairs, tables, and various other educational materials are produced in a systematic and innovative manner (figure 1(b)).



(a) (b)

Figure 2. Practical activities in bioplastic production
(a) Practical activities in bioplastic production, (b) bioplastic product

Based on Figure 2, a practical experiment on bioplastic production was conducted. Other activities carried out by all participants who had previously been assigned to prepare flowers or animals in groups from their respective locations with the aim of preserving the flowers or animals (making bioplastic) using resin. This is a popular handicraft technique for making decorative items, jewelry, or durable souvenirs. The manufacturing process is as follows: 1) Pour the resin onto the first layer and slowly pour the liquid resin into the bottom of the mold. Then, use a skewer and ice cream stick to spread the resin evenly; 2) Make sure the animals, flowers, and leaves are placed correctly and clearly visible; 3) Add resin gradually. Also, check if there are any air bubbles remaining in the rectangular box. If there are any, pierce the bubbles to remove any trapped air, which could damage the final appearance; 4) Curing process: The resin will harden. Depending on the type of resin and environmental conditions (temperature and humidity), this hardening process, known as curing, can take anywhere from a few hours to several days.

The bioplastic manufacturing process also requires the least amount of time. According to (Asmara, 2022), bioplastic is the preservation of animal or plant specimens in resin blocks for use as learning media. Animal or plant specimens in resin blocks, apart from serving as learning media, can also function as ornaments (Artayasa et al., 2021). Various activities were carried out during the visit, which provided students with direct knowledge. In addition, students were able to practice using bioplastics as a teaching medium.

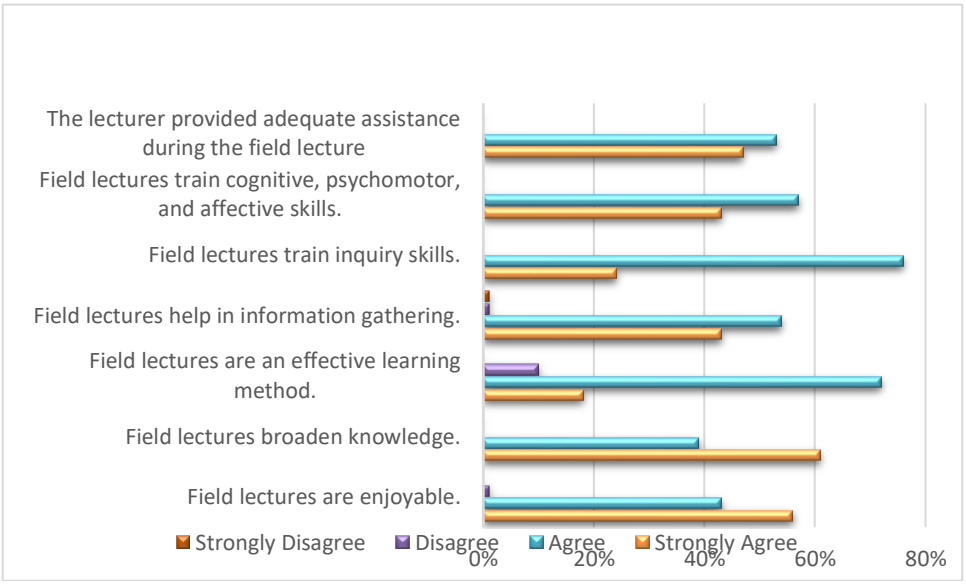


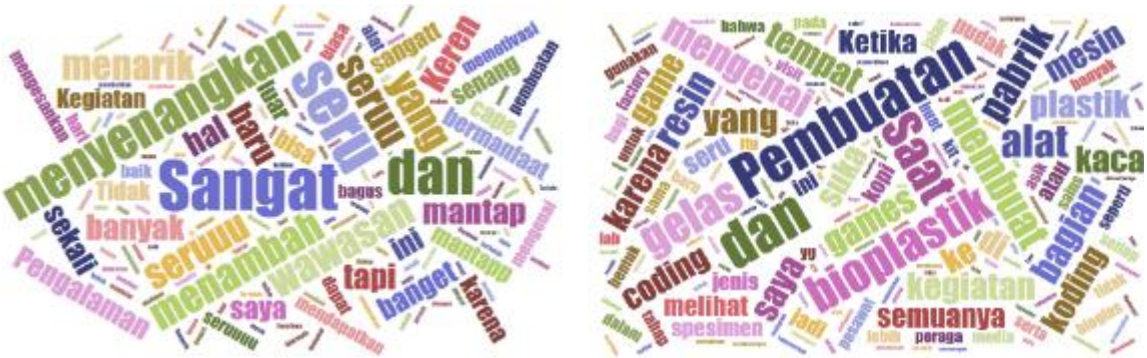
Figure 3. Survey Results of Pre-Service Teachers (93 respondent) on the Presented Indicators

Based on Figure 3 as a whole, students as participants gave positive responses to the statements provided, with more than 50% agreeing or strongly agreeing. So from the created chart, it is evident that the statements "field lectures train inquiry skills" (No. 5) and "field lectures are an effective learning method" (No. 3) received very high positive responses (Strongly Agree + Agree), totaling over 100% each. Overall, the majority of respondents provided positive feedback on all aspects of the field lectures that were surveyed. Areas for potential improvement can be identified in statements with higher percentages of "Disagree" and "Strongly Disagree" responses, although in this assumed data set, these figures are relatively small. Field lectures in biology education are increasingly recognized for their significant contributions to student learning and professional development. These experiences offer unique opportunities for students to engage with real-world applications

of theoretical knowledge, enhancing their understanding and retention of complex biological concepts. Field lectures also foster critical thinking, observational skills, and environmental stewardship, which are crucial for developing competent biologists. The acceptance of field lectures in biology education is supported by various studies that highlight their benefits and challenges, as well as strategies to optimize their effectiveness. More than 50% of students stated that exploring the world of education was an enjoyable activity that broadened their horizons.

This is in line with experiential learning theory (Jullien & Kolb, 1984), which emphasizes that learning through direct experience can increase student motivation and understanding. In addition, research by (Prince & Felder, 2006) shows that learning methods involving field exploration can create a more dynamic and engaging learning environment. Financial constraints, large class sizes, and teacher commitment are significant challenges that can hinder the effectiveness of field trips. Strategies such as subsidizing costs and encouraging small group activities can help mitigate these issues (Nwokocha, 2024). In addition to industrial visits as discussed earlier, students are involved in science games through fun science with several science experiments that are like magic tricks. Science is real, like magic, but there are scientific explanations related to the supporting science theories.

Exploration of the education industry is also considered effective in improving understanding of biological concepts. According to Mayer (2004), learning that involves real-world contexts can strengthen long-term memory retention. This finding is supported by research by Freeman et al. (2014), which shows that active learning approaches (active through the application of word cloud data obtained from the most dominant survey statements related to impressions of field lectures and the most interesting parts or activities of field lecture activities are visualized in Figure 4 as follows:



(a) (b)

Figure 4 Data in Indonesian interpreted through a word cloud application
(a) Impressions gained during industry exploration, (b) Fun activities during the industry visit

In figure 4(a) Linking field lectures through industry visits is indeed a fun and effective learning experience, as it provides students with a practical understanding of theoretical concepts. This approach enhances student engagement, comprehension, and retention by allowing them to witness real-world applications of their classroom learning. The integration of field trips into academic curricula has been shown to significantly improve educational outcomes across various disciplines, including engineering, business, and science. The following sections will explore the benefits and implementation strategies of industry visits as a pedagogical tool. Industry visits allow students to interact with professionals, providing insights into career paths and industry expectations. This interaction not only enhances their

learning experience but also helps them establish valuable connections for future career opportunities (Townsend & Urbanic, 2013; Vollaro, 2002). In figure 4(b) Making bioplastics fun involves integrating educational, creative, and sustainable elements into the process of bioplastic production and application. By engaging participants in hands-on activities, leveraging DIY techniques, and emphasizing the environmental benefits, bioplastics can be made appealing and enjoyable. Encouraging the use of DIY methods for creating bioplastics from accessible materials like banana peels or fruit waste can make the process more relatable and fun. These activities can be integrated into educational curriculums to teach sustainability and material science (Galentsios et al., 2017; Oo et al., 2019).

The togetherness in field lectures can also foster closer relationships between lecturers and students because it is relaxed and informal. While field lectures offer numerous benefits, they are not without drawbacks. Traditional field trips can be logistically challenging and resource-intensive. However, they remain a valuable teaching tool that complements classroom instruction by providing students with firsthand experiences of natural settings and ecological phenomena (Lei, 2010). Additionally, the integration of interactive teaching methods, such as hands-on experiments and group discussions, can further enhance the learning experience in biology education (Egamberdiyeva, 2024). Despite these challenges, the overall acceptance and implementation of field lectures in biology education continue to grow, driven by their proven impact on student learning and professional development. Exploration of the education industry is also considered effective in improving understanding of biological concepts. According to (Mayer, 2004) learning that involves real-world contexts can strengthen long-term memory retention. This finding is supported by research by (Freeman et al., 2014), which shows that active learning approaches can significantly improve learning outcomes.

Conclusion

In conclusion, industrial visit provided participants with a valuable and immersive learning experience. It successfully bridged the gap between classroom theory and real-world applications by giving students the opportunity to watch the manufacturing of educational tools and laboratory equipment, like beakers and test tubes, and to participate in hands-on activities like bioplastic production. These experiences not only improved students' understanding of the production processes but also inspired them to be creative and innovate, especially with regard to sustainability. The positive feedback that they received from these experiences was very positive. The visit enhanced their understanding of biological concepts and fostered creativity, while the positive student feedback highlighted the value of field-based learning. Overall, the experience emphasized the importance of integrating industry exploration into education to improve comprehension and career readiness.

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