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Learning Through "ARBOR Exhibition": Utilizing the Arboretum of Universitas Padjadjaran for Innovative Learning in Higher Education

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Notes

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ABSTRACT

The Arboretum Universitas Padjadjaran, as a living collection or museum, is a valuable educational resource for science education, promoting hands-on activities, student-centered learning, and rich social interaction. Aligned with the Outcome-Based Education (OBE) curriculum, the arboretum can be integrated to develop learning innovation, particularly in the "Digitalization of Biological Objects," which leads to bio-curators' competencies. Visual arts can be an excellent strategy for learning science, as it combines systematic work with creative thinking. Through this approach, the students can apply theory to real-life experiences. This study aimed to utilize the Arboretum Universitas Padjadjaran to implement innovative strategies for effective learning in higher education through exhibitions. This study used the Research and Development (R&D) method. "ARBOR: The Art and Beauty of Universitas Padjadjaran's Pollinator" is a photography talk show and exhibition providing information about pollinators, food plants, and host plants in the arboretum and surrounding campus. A total of 135 curated photographs were exhibited digitally. During the exhibition, the students guided over 250 visitors on pollinators and their role in the ecosystem. Our result shows that project-based learning, such as "ARBOR" exhibitions, increased awareness regarding biodiversity and environmental issues and enhanced the students' leadership, communication, creative thinking, innovation, and collaboration skills, demonstrating the inspiring potential projects in higher education.

Keywords: Arboretum, Living Museum; Learning Innovation

1. INTRODUCTION

An arboretum is a botanical garden and living museum that functions globally as a center for the collection of local and rare plant species and scientific research (breeding, providing seeds, and genetic sources), promotes conservation and education (ecotourism and

recreation), hydrology function, and engages in public outreach to preserve nature (Sarvašová and Kiráľová, 2018; Hirons et al., 2020; Sukma et al., 2023). In the early 1990s, the Biology Department lecturers initiated the Arboretum Universitas Padjadjaran to protect West Java plants (Arboretum Unpad 2011). Currently, the Arboretum Universitas Padjadjaran has become part of the facilities (field laboratory) to support Three Pillars of Higher Education implementation, namely education, research, and community services (SK Rektor No 659/H6.1/KEP/HK/2008). In addition, the Arboretum Universitas Padjadjaran also has other related functions, such as climatological, hydrological, aesthetic, recreational, medical, source of germplasm, and wildlife habitat. The total area of the Arboretum Universitas Padjadjaran is 12.5 ha, which is divided into several planted zones, namely the fruit plant zone, industrial plant zone, medicinal plant zone, rare plant zone, and zone of symbolic plants of the districts (*Jatidiri* plants) of West Java (Kusmoro et al., 2019). There are 72 species of plants (Nurjaman et al., 2018), 68 species of lichens (Kusmoro et al., 2019), four genera of Bamboo (Annisa et al., 2017), and 32 species of birds (Nurjaman et al., 2018) in the arboretum, which has been identified.

OBE is an education system that accommodates innovation and different learning styles. Higher education program outcomes are categorized into program outcomes (POs), program-specific outcomes (PSOs), and course outcomes (COs). Based on Bloom's taxonomy, these outcomes identify three domains of learning: cognitive, affective, and psychomotor (Rao, 2019). Project-based learning (PjBL) requires multidisciplinary and transdisciplinary collaboration on a specific issue to implement classroom theory (Zen et al., 2019). Aligned with the purpose, the arboretum can be integrated to develop learning innovation, particularly in the "Digitalization of Biological Objects," which leads to bio-curators' competencies. Visual arts can be an excellent strategy for learning science, as it combines systematic work with creative thinking. Through this approach, the students can apply theory to real-life experiences. This study aimed to utilize the Arboretum of Universitas Padjadjaran to implement innovative strategies for effective learning in higher education by creating exhibitions.

2. METHODS

Project-based learning refers to the theory and practice of real-world works assigned with time limits, facilitating students to become independent learners (individual and collaborative learning). The teacher's role is as a guide and facilitator to help students move in the right direction, making suggestions, assisting students to negotiate conflict, and having enough self-confidence not to give up (Defillippi, 2001; Kubiatko and Vaculová, 2009). This assignment is suitable for assessing learning outcomes at the create level (Bloom's taxonomy), as well as in accordance with OBE, which was implemented in the Digitalization of Biological Object Course in the 5th semester.

The research and development (R&D) method is a model design in educational research and offers alternative models for better educational practices (Gustiani, 2019). It is conducted to check, modify, or develop new information and to find educational problem solutions through practice. Thus, R&D develops effective teaching and learning materials and media to maximize student understanding.

Borg and Gall's R&D methods in 1983 proposed ten steps, but some researchers modified them into more straightforward steps based on the research context (Gustiani, 2019). Our study used six steps: preliminary research (brainstorming), model development

design (presentation: theme, concept, etc.), data collection, curation and revision (photo, video, and information curation), implementation (exhibition), and evaluation. The "Digitalization of Biological Object" student prepared for this project, which started in mid-semester (total 9 weeks) as a final project in this course.

The project began with a phase of preliminary research, during which students carefully analyzed various aspects of the upcoming exhibition. This included identifying essential information, recognizing potential problems, and outlining the needs of the project. Their findings were then uploaded to the learning management system (LMS) and later served as the basis for a mid-semester discussion with the lecturer. Following this, the students entered the development design stage. At this point, they collaboratively planned the exhibition by determining key components such as the theme, objectives, logo, timeline, location, organizing team, target audience, sponsorship strategy, and guest invitations. Their comprehensive design proposal was formally presented to the lecturer during a class session.

With the design approved, the focus shifted to data collection and preparation. This step involved gathering various forms of content, including photographs, video footage, and supplementary information to support the exhibition's narrative. Students also took the initiative to invite speakers and prepare materials for a talk show session that would be part of the exhibition program. Simultaneously, the media team managed public communications, promoting the event through social media channels and reaching out to news outlets to maximize exposure.

The next phase, curation and revision, was critical in ensuring quality. Together with the lecturer, a student-led curatorial team reviewed all photographic materials, analyzing and processing them systematically to ensure they met the exhibition's standards. Any images that were deemed unsuitable were replaced with improved visuals after revision. After thorough preparation, the students proceeded to the implementation phase. Here, the exhibition was officially conducted, marking the culmination of the entire project. Only photographs that had successfully passed the curation process were displayed digitally, ensuring a polished and cohesive presentation for the audience.

The final stage was evaluation. Feedback was gathered by conducting interviews with several visitors, who shared their impressions through video testimonials. Additionally, student reflections were collected via Google Forms, where they provided open-ended responses about their experiences with the project. This evaluative process offered valuable insights into both the strengths and areas for improvement in the exhibition.

3. RESULTS AND DISCUSSION

The Art and Beauty of Universitas Padjadjaran's Pollinator (ARBOR) is a photography talk show and exhibition that provides information about pollinators, food plants, and host plants in the arboretum and surrounding campus. This photography exhibition was held over two days (December 21 to 22, 2024) at Pengetahuan Theater-Universitas Padjadjaran (Figure 1). On the first day, the ARBOR exhibition was opened with a video screening and continued with a talk show, "Capturing Biological Objects Digitally." The talk show was presented by Fajar Ilham Muslimin from Spectrum Unpad and Mutiara Salsabila Irawan from Ornitofotografer. On the last day, the event is an exhibition only.

A total of 135 curated photographs, including plant, animal, and micrographs, were exhibited digitally (Figure 3, see more at https://biologi.unpad.ac.id/arbor/). The photos were

collected from the Arboretum Universitas Padjadjaran (>45% of the photos) around the Universitas Padjadjaran-Jatinangor campus. Photos that pass the curation are arranged into a template design format to be displayed digitally.

During the exhibition, the students guided over 250 visitors through a discussion of pollinators and their role in the ecosystem. Visitors who attended came from both Civitas Academica Unpad and non-Unpad. In addition, this exhibition was covered by Unpad TV/Divia and KaMU (Figure 4, see video https://shorturl.at/RqC0A and https://shorturl.at/KPGeA).

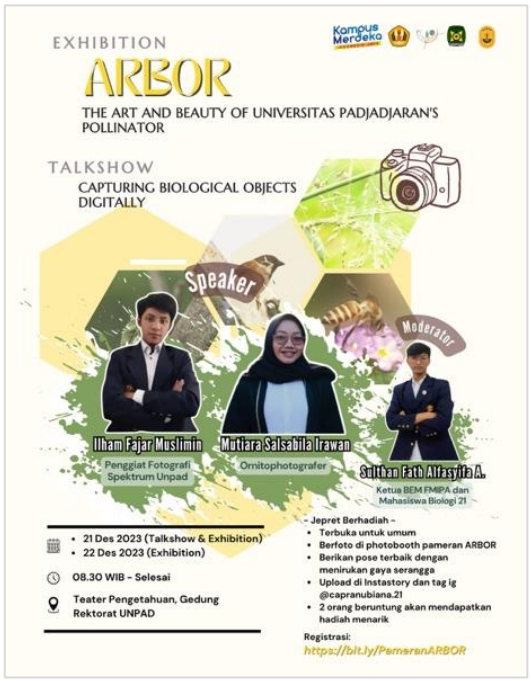

Figure 1. Poster design of Arbor Exhibition

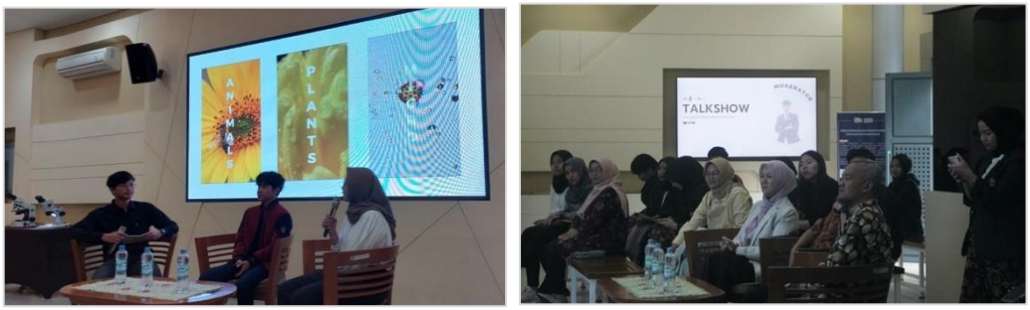

Figure 2. Documentation of photography talk show at ARBOR Exhibition

Several visitors shared positive impressions of the ARBOR exhibition, considering it a valuable way to apply knowledge and increase interest in the natural sciences. They also noted that this activity provides insight into the extensive biodiversity at Universitas Padjadjaran, particularly highlighting the variety of insects and plants, including host and food plants.

Figure 3. Photos and designs of the ARBOR exhibition display

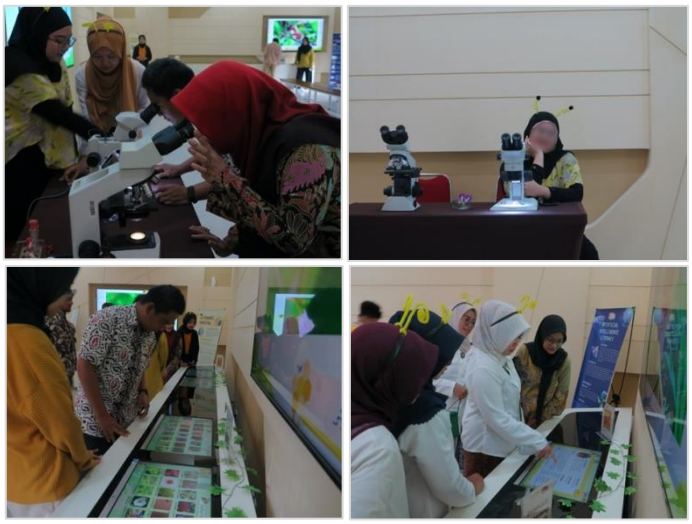

Figure 4. Documentation of ARBOR exhibition activities

A total of 21 students (45% of the total) provided testimonials and shared their impressions of the ARBOR exhibition project with open-ended responses. They mentioned that integrating theories into practice through photography exhibitions offers several benefits, such as increasing interest in and understanding of photography and design, fostering curiosity and confidence due to appreciative works from visitors, and developing skills in innovation, cooperation/collaboration, leadership, public speaking, patience, and hard work. In addition, this project supports students' branding, making it valuable for future career opportunities.

Our result showed that the Arboretum Universitas Padjadjaran can be integrated into the higher education learning process through Project-based learning (PjBL) assessment. The PjBL design engaged students in authentic investigations, collaborative work, communicating ideas and solutions, learning technologies, etc. (Kubiatko and Vaculová, 2009). This assessment gives students something to do/solve a real problem at the end of a learning experience. The exhibition activity aligned with higher education program outcomes in OBE

and learning domains: cognitive, affective, and psychomotor (Rao, 2019). Additionally, the 21st century skill set in the field of education must include critical thinking, communication, creative problem-solving, and collaboration. Museums have taken up collaboration skills on how exhibitions are developed (McKenna-Cress and Kamien, 2013).

The Arboretum is a living museum that allows students to explore and capture biodiversity digitally. It promotes hands-on activities, student-centered learning, and rich social interaction for effective science learning (Çil et al., 2016). Through the ARBOR exhibition, the students adapt the arboretum to various engaging media, including photos and videos. The activity encouraged creative thinking, innovation, collaboration/competition, and a fun way to explore design (Guertin et al., 2020). Based on students' testimonials and impressions, the ARBOR exhibition is valuable for future career opportunities as it offers numerous opportunities to practice soft skills.

Additionally, Dale et al. (2021) explained that museums take many different forms to facilitate critical knowledge mobilization and transfer through various communication channels. Exhibits related to current environmental issues, such as biodiversity, have proliferated to increase public interest and engagement (Novacek, 2008). Kromba and Harms (2008) explained that a combination of large-size photos, drawings, animation, and films is important to promote biodiversity and sustainability.

The critical role of species in providing ecosystem services, natural beauty, pleasure, and sustaining human life is a message that must be delivered to visitors (Novacek, 2008). The ARBOR exhibition demonstrates the importance of pollinators for humanity and sustainability. This event can also educate visitors about nature, protection, and preservation through photos and videos. Based on visitors' impressions, the ARBOR exhibition provides insight into the biodiversity, especially at Universitas Padjadjaran.

4. CONCLUSION

Arboretum Universitas Padjadjaran, as a living collection or museum, is a valuable educational resource that can be integrated into various learning processes in many courses, such as the "Digitalization of Biological Objects" course. Our result shows that project-based learning in this course, such as "ARBOR" exhibitions, increased awareness regarding biodiversity and environmental issues and enhanced the students' leadership, communication, creative thinking, innovation, and collaboration skills, demonstrating the potential of such projects in higher education.

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AUTHORS' CONTRIBUTIONS

Eneng Nunuz Rohmatullayaly: Writing oiginal draft preparation. **Budi Irawan:** Ideas; formulation or evolution of overarching research goals and aims. **Madihah:** Ideas; formulation or evolution of overarching research goals and aims.

CONFLICT OF INTERESTS

We state that there are no known conflicts of interest linked with this publication, and that there has been no significant financial assistance for this work that could have influenced its outcome.

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