



Feasibility Evaluation and Development of Educational Laboratories: Contribution to Institutional Development

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Abstract

This study aims to optimize the use of educational laboratories as a means of institutional development at the Faculty of Education, Surabaya State University. Using a development research approach with the ADDIE model, this research involved analyzing the needs of the institution, students, lecturers, and curriculum that must be met by the education laboratory. Data were collected through questionnaires and documentation studies, then analyzed to evaluate the effectiveness and feasibility of the laboratory products developed. The results showed that the education laboratory at Faculty of Education has adequate facilities and infrastructure conditions, and the products developed are considered very feasible in supporting learning objectives. Attractive and interactive product design increases student engagement, while the use of appropriate language in the product strengthens the effectiveness of material communication. Overall, the optimization of educational laboratories is proven to not only support the achievement of learning objectives, but also strengthen the institution's reputation in providing relevant and quality education. Continuous evaluation is recommended to ensure the educational laboratory remains adaptive to evolving needs.

Keywords: *Laboratory; Education; Feasibility; Institutional Development*

Introduction

The use of educational laboratories plays a crucial role in the learning process, especially in helping students practically understand complex concepts. These laboratories enable experiential learning, which can significantly improve student understanding and engagement. According to Hendratno et al. (2023), the effectiveness of using educational laboratories is influenced by various factors, such as equipment availability, lecturer skills, and the use of technology in learning. This finding is consistent with the research of Mohzana et al. (2023), which emphasizes the importance of adequate laboratory infrastructure to support the achievement of optimal learning outcomes. In addition, Koretsky and Magana (2019) revealed that technology integration in educational laboratories can increase student engagement and the effectiveness of the learning process.

The importance of effective laboratory management cannot be overlooked either. Good management includes careful planning, proper implementation, and continuous evaluation to ensure that

educational laboratories can function optimally and sustainably (Zhang et al., 2020). This is in line with the views of Opeyemi, Obeagu & Hassan (2024), who stated that structured and systematic laboratory management can maximize facility utilization and improve learning quality. Furthermore, the development of educational laboratories that are oriented toward future needs is very crucial. In this digital era, rapid technological developments require educational laboratories to continuously adapt and update the facilities and learning methods used (Vergara et al., 2022). For example, the use of computer simulations, data analysis software, and virtual laboratories are now increasingly recognized as effective tools in supporting interactive and contextual learning. A study by Dede (2014) emphasized that educational laboratories equipped with the latest technology are able to provide a richer and more in-depth learning experience for students. On the other hand, educational laboratories also have a strategic role in the overall development of the institution (Aleixo, Leal & Azeiteiro, 2018). As a center of innovation and research, these laboratories not only serve as a place of learning for students, but also as a place to develop new ideas and conduct research that can enhance the academic reputation of the institution. Related to this, Simatupang (2020) highlighted that educational laboratories that are active in research activities can make a significant contribution to the achievement of the vision and mission of educational institutions (Clark, 2023).

While previous research has highlighted the importance of educational laboratories in supporting the learning process and institutional development, there are several research gaps that need to be addressed to achieve a more comprehensive understanding (Potkonjak, 2016). First, most of the existing research focuses more on the technical and infrastructural aspects of laboratories without giving sufficient attention to the strategic and operational management aspects of laboratories. For example, how laboratory management can be optimized to ensure maximum utilization of the available technology is still rarely discussed in the existing literature. Anthony et al. (2022) have pointed out the importance of systematic laboratory management, but empirical research on the implementation and evaluation of laboratory management models in the context of higher education is still limited. Secondly, although the use of modern technology in educational laboratories has been widely discussed, little research has explored the long-term impact of this technology integration on student learning outcomes and overall institutional development. For example, although Chan et al. (2021) demonstrated the benefits of the latest technologies in laboratories, research examining how these technologies can be integrated holistically with other traditional and innovative learning methods is lacking. Thirdly, the contribution of educational laboratories to long-term institutional development still needs to be further researched. Mensah & Gordon (2020) have discussed the potential of laboratories as centers of innovation and research, but in-depth studies on how these laboratories can be catalysts for institutional change, both in terms of academic reputation and the achievement of the institution's vision and mission, are limited.

Therefore, this study not only focuses on evaluating the feasibility of educational laboratories in terms of infrastructure and technology, but also explores how the strategic management of laboratories and comprehensive technology integration can contribute to institutional development in the long term. By considering these various factors, evaluating the feasibility and development of educational laboratories is an important agenda in efforts to improve the quality of education and institutional development. In this context, this study aims to evaluate the condition and effectiveness of educational laboratories in Faculty of Education, as well as develop laboratory products that can support more interactive and effective learning. This research is expected to provide useful recommendations for the management and development of educational laboratories in the future, so that they can continue to contribute to the achievement of learning objectives and institutional development.

Methods

Research Design and Type

This study used a development research approach with the ADDIE model, which involves five main stages: *Analysis, Design, Development, Implementation, and Evaluation* (Branch, 2009). The main objective of this research is to optimize the function of educational laboratories as a means of institutional development. In the initial stage, the needs of the institution were identified, analyzing the needs of students, lecturers, and curriculum that must be met by the education laboratory. In addition, an in-depth literature review of best practices in educational laboratory development will also be conducted as a basis for designing the most appropriate development steps (Dick, Carey, & Carey, 2005).

Research Subject

The subjects in this study were students and lecturers who actively use educational laboratories in the Faculty of Education, Surabaya State University. Students and lecturers were chosen as research subjects because they are the main users of the laboratory and have deep insights related to the needs and challenges faced in using the laboratory (Creswell, 2021).

Data Collection Technique

The data in this study were collected through the distribution of questionnaires and documentation studies. Questionnaires were used to measure the feasibility and effectiveness of laboratory products. Documentation studies were conducted by examining various documents related to the use of educational laboratories, including usage guidelines, operational schedules, and laboratory activity reports. The combination of these two data collection techniques aims to provide a comprehensive picture of the use and challenges faced in managing educational laboratories.

Data Analysis Technique

Data analysis in this study involved several approaches. First, a needs analysis was conducted to identify the needs of the institution and relevant stakeholders. Secondly, prototype analysis was used to evaluate the effectiveness of the developed educational laboratory, with the aim of ensuring that it can optimally meet the needs of the institution, students, and curriculum. The use of these techniques is expected to provide valuable insights in the development of educational laboratories that are effective and responsive to user needs.

Results and Discussion

1. Condition of Educational Laboratory Facilities and Infrastructure at Faculty of Education

Educational laboratory facilities and infrastructure at the Faculty of Education, Surabaya State University is one of the important aspects in supporting an effective and innovative learning process. Currently, the condition of educational laboratory facilities and infrastructure at FIP UNESA can be considered good, along with the development of laboratories that are in accordance with the needs of study programs in this faculty.

Faculty of Education has seven study programs that are covered by this education laboratory, namely Education Management, Early Childhood Education, Elementary School Teacher Education, Out of School Education, Psychology, Guidance and Counseling, and Educational Technology. Each study program has different needs and objectives in the use of educational laboratories, and this laboratory has been developed to specifically meet these needs.

Regular monitoring of laboratory facilities and infrastructure is carried out to maintain their quality. Faculty of Education ensures that the equipment in the laboratory continues to function optimally, damaged tools are repaired immediately, and the physical environment of the room remains clean and comfortable for teaching and learning activities. Overall, the condition of education laboratory facilities and infrastructure at Faculty of Education can be considered adequate and support the development of science and learning in the field of education. Supervision and maintenance of existing facilities in education laboratories shows the commitment of Faculty of Education in maintaining high quality and sustainable education.

2. The Results of the Feasibility of Developing Educational Laboratory Products in the Learning Process at FIP UNESA

In supporting the learning process at the Faculty of Education, Surabaya State University, the development of educational laboratory products has become an important step to ensure the effectiveness, efficiency, and quality of the use of this facility. Some of the products that have been developed and play a central role in supporting laboratories at Faculty of Education include laboratory use guides, Standard Operating Procedures (SOPs) for laboratory use, and training package instruments provided by educational laboratories.

Laboratory use guide: The educational laboratory use guide is a guide that provides detailed information about laboratory use, including practicum guidelines, learning objectives, steps for using equipment, as well as rules and regulations that must be followed by lecturers and students. With this laboratory use guide, learning in the laboratory can take place more structured and efficient.

SOP for Laboratory Use: Each laboratory at Faculty of Education has a Standard Operating Procedure (SOP) that has been established in accordance with the needs and specifications of the study program it oversees. These SOPs outline the technical steps that must be followed in the use of the laboratory, including procedures for using equipment, handling hazardous materials, tool maintenance, and safety measures. The SOP is the main guideline for laboratory coordinators, laboratory assistants, lecturers, and students in carrying out each stage of laboratory use safely and according to standards.

Training Package Instruments: The education laboratory has also developed training package instruments specifically designed to support the learning process at Faculty of Education. These packages can contain interactive learning modules, digital teaching materials, simulations, and various other innovative learning aids. These instruments are designed to provide a more immersive and interactive learning experience for students, as well as support technology-based learning approaches.

Through the development of this product, the education laboratory at Faculty of Education has taken an important step towards improving the quality of learning. The manual provides clear direction, the SOPs ensure consistency and safety, while the training package instruments enable more engaging and innovative learning approaches. Thus, students can directly benefit from a more directed and effective use of laboratory facilities in supporting concept understanding and skill development. The following are the results of product development validation in the Faculty of Education education laboratory.

Table 1. Feasibility Results on Educational Laboratory Product Development

Aspects	Indicator	Score				
Content Feasibility	The developed product supports the learning objectives of educational laboratories					
	The material in the product is relevant and in accordance with the needs of students					
	Accuracy in presentation of material					
Design Feasibility and Interactivity	Product design is attractive and invites student interest					
	The product offers interactivity that allows students to be actively involved in learning.					
	Navigation in the product is easy for users to understand and use					
Total		26				
Total Score		86,6%				
Category		Very Feasible				

Table 2: Results of Language Feasibility in Education Laboratorium Product Development

Aspects	Indicator	Score				
		1	2	3	4	5
Language	the language used in the product is easy for students to understand					V
	language use supports clarity and effectiveness of material communication				V	
	grammar, spelling, and punctuation in the product are at an appropriate level				V	
Writing Style	the product uses a writing style that is appropriate for the learning objectives					V
	consistency in writing style and use of terms in the product				V	
	The language in the product avoids jargon or technical language that is difficult for students to understand.					V
Total		27				
Total Score		90%				
Category		Very Feasible				

Table 1 shows the feasibility results on the development of educational laboratory products from the aspects of content feasibility, design, and interactivity. The developed product is considered to be very supportive of the learning objectives of educational laboratories, with material that is considered relevant and in accordance with student needs. The presentation of the material is considered very appropriate, while the product design is considered attractive and able to generate student interest. The interactivity of

the product is also considered good, allowing students to be actively involved in learning. The product is considered easy to understand and use by users. With a total score of 86.6%, the product is categorized as very feasible.

Table 2 illustrates the results of language feasibility in the development of educational laboratory products. The language used in the product is considered easy to understand by students, supporting the clarity and effectiveness of material communication. The grammar, spelling, and punctuation in the product are considered to be at an appropriate level. The writing style of the product was considered appropriate to the learning objectives, with consistency in the use of terms. The language in the product is avoided from jargon or technical language that is difficult for students to understand. With a total score of 90%, the product in the language aspect is considered very feasible.

The results of this study indicate that the development of educational laboratories at the Faculty of Education, Surabaya State University has reached a very good level of feasibility, covering various aspects such as content, design, interactivity, and language use in the products developed. An assessment of the condition of the educational laboratory facilities and infrastructure shows that they have been well designed and maintained, which is crucial in supporting effective and innovative learning processes. Regular monitoring by the faculty ensures that the laboratory equipment continues to function optimally, and the physical environment of the laboratory remains conducive to teaching and learning activities. Adequate laboratory infrastructure is an important foundation in achieving optimal learning outcomes (Wilson et al., 2018). In addition, in the context of laboratory product development, feasibility results indicate that the products strongly support learning objectives. These products are designed to meet the specific needs of existing study programs, such as Education Management, Early Childhood Education, Elementary School Teacher Education, Out of School Education, Psychology, Guidance and Counseling, and Educational Technology, each of which has different needs in the use of educational laboratories.

Attractive and interactive product design is proven to be able to increase student engagement in the learning process. Product feasibility results from the content aspect confirm that the materials presented in the products are relevant and in line with students' needs, which is in line with Martin & Bolliger's (2019) findings on the importance of material relevance in increasing student engagement. Appropriate and structured presentation of materials also plays an important role in ensuring that learning objectives are well achieved. In terms of interactivity, the developed products offer features that allow students to actively participate in learning, which can improve their understanding of the concepts taught. In addition, the navigation in the products is considered easy to understand and use by students, which supports the effectiveness of using the laboratory as a learning tool.

Furthermore, the use of language in the product also received an excellent rating, where the language used is easily understood by students and supports the clarity and effectiveness of communication of the material. This is important because, as stated by Lee & Hannafin (2016), the use of appropriate language in learning materials can increase student understanding and engagement. A consistent writing style that is free from technical jargon also helps in effectively conveying the material to students (Conrad, 2017).

Overall, these findings underscore the importance of optimizing educational laboratories as a means of institutional development and improving the quality of learning at Faculty of Education. This optimization not only helps in the achievement of learning objectives, but also enhances the institution's reputation in providing quality education that is relevant to the needs of industry and society (Miotto et al., 2018). Therefore, effective and sustainable development of educational laboratories should be a top priority for higher education institutions that want to improve the quality and relevance of their learning.

Conclusion

The development of educational laboratories at Faculty of Education has proven to be very feasible and effective in supporting the learning process, with relevant and interactive products, and well-maintained facilities and infrastructure. The optimization of these laboratories not only increases student engagement and understanding, but also strengthens the institution's reputation for providing quality education that meets industry needs. Continuous evaluation is required to ensure educational laboratories continue to be adaptive and meet evolving needs.

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