



# Analyzing the Requirements for the Creation of Teaching Resources for Mechanical Engineering Practicum Courses in the Study of Mechanical Engineering Education

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## ABSTRACT

This study intends to determine the demand for instructional materials that must be created for the mechanical engineering education program at Semarang State University's Faculty of Engineering's machining practicum course. Practical exercises using manual machine tools, lathes, and milling machines are part of the machining practicum course. The management of the mechanical engineering education study program, the instructors, and the students themselves served as the research subjects. employing observation logs and student survey forms to retrieve research data. The lack of a textbook that might serve as a reference during the practicum was revealed to be the main challenge in the machining practicum lectures from the findings of observations and interviews with administrators and lecturers, It was demonstrated that one of the challenges in the machining practicum lectures was the lack of a textbook that could serve as a reference during the practicum's learning process. According to the study of the student questionnaire, textbooks are the primary teaching tools that students require, and they also offer information on machines and the procedures involved in mechanical practicum activities. This research is a preliminary investigation into the creation of textbooks for the engineering practice course.

**Keywords:** *Analysis, Teaching Materials, Machining Practicum.*

## 1. INTRODUCTION

Every human being has the right to education, which is a way of developing human resources [1]. Law on the National Education System No. 20 of 2003 states that the goal of national education is to develop the potential of students to become human beings who believe and fear God Almighty, are noble, healthy, knowledgeable, capable, creative, independent and become responsible human beings [2]. The capacity to apply theoretical skills in the lab is one of the student competencies or talents that mechanical engineering education students currently need to have. There are many ways to train hard skill talents, one of them is by having teaching resources. According to Nookhong and Wannapiroon [3], to develop learning and thinking skills students can focus on the learning media used.

One element that is vital to maximizing the learning process is the teaching materials. Teaching materials are one of the components that can facilitate the smooth

learning activities of students and students in class [4]. Teaching materials are all forms of materials used to assist teachers/instructors in carrying out teaching and learning activities in class [5]. Both printed and non-printed instructional materials are acceptable as the aforementioned teaching resources.

Depending on the requirements of the instructional design course being employed, a teaching resource or learning medium is developed over the course of multiple stages. A needs study is typically the initial step in creating instructional media [6]. The methodical process of conducting a needs analysis entails selecting priorities for action, identifying present and anticipated situations, and determining goals [7]. In order to design instructional resources that meet the needs of both students and teachers, a needs analysis is carried out to identify those materials.

The needs of students in the lab and the activities that will be carried out during the lectures for the student

engineering practicum are not met by the current teaching materials. Teaching materials, on the other hand, can be described as learning resources that assist in the attainment of an effective teaching and learning process as a beneficial learning facilitator media that makes it simpler for students to achieve the learning skills to be attained [8,9]. Teaching aids must be particularly created with students' requirements in mind using a methodical and useful design [1,10,11]. Utilizing and creating instructional materials based on student characteristics determines one of the learning outcomes' completeness [12]. There is a need for innovation in technology development to package the current learning process more effectively, one of which is the development of learning media which is an important part of the learning process and is certainly directed at meaningful learning that encourages students to develop 21st Century skills as an urgency in the field of education [13]. Textbooks serve the purpose of conveying specific knowledge and ideas to children, effectively communicating what the older generation deems important [14].

Teaching aids can make it simpler for students to comprehend teacher instructions during learning activities. The utilization of appropriate teaching resources by educators can help them make the most of their class time, transform from teachers into facilitators, and enhance student learning [15]. school children focus less on content when reading electronically in comparison print books in a controlled setting [16,17,18]. For students, the use of instructional materials can make it simpler for them to study independently and to comprehend the directions for learning tasks that must be completed in machining practicum courses.

Students at Semarang State University's mechanical engineering education study program are required to take the machining practicum course. Third semester students with a weight of 2 credits enroll in this course. The laboratory-based machining practicum course is a practicum course.

This study's goal was to identify the instructional materials that should be created for the engineering practicum course in the mechanical engineering education study program at FT UNNES in order to meet the demands of laboratory learning. In general, the term "needs analysis" refers to actions that entail obtaining data in order to pinpoint the needs of a group of students [19]. Media do not belong exclusively in the hands of teachers, who use them to enrich their teaching in their classes and seminars, but also in the hands of learners, such as school children and students [20]. Learning media is expected to be used to overcome various problems in the teaching and learning process, especially on internal problems such as student and teacher attitudes, outlook on life, pleasure, and feelings, not happiness [21,22]. The findings of the requirements analysis study are anticipated to offer preliminary

insights into the instructional materials that must be created and the learning resources required to enhance laboratory learning. In order to create instructional materials for future research, the first data from this study is utilised.

## 2. RESEARCH METHODS

This study was conducted in October and November 2022 at Semarang State University's Mechanical Engineering Education Study Program. It is a qualitative descriptive study using a survey approach. 85 students enrolled in the third semester of the mechanical engineering education study program as well as four field practitioners (lecturers) made up the population for the development research.

A questionnaire with questions and the justifications for each selected response was used in conjunction with interview approaches to obtain the data. In machining practicum courses, observation sheets are used to gather information on learning activities. Open-ended surveys are used to gather information about the teaching materials that students need and the resources they have used for learning. Analyses of the data were descriptive and qualitative.

## 3. RESULTS AND DISCUSSION

### 3.1 Initial Problem Analysis

The findings of the curriculum study conducted on the machining practicum course demonstrate that CPL and CPMK have been consistent over time. Additionally, every student acknowledged that the lectures were in line with the RPS activities.

According to the findings of the study done on the sources of instructional materials used in the engineering practicum course, students still need to find other sources of books to supplement practicum activities. Students' varying levels of understanding the instructional materials for engineering practicum courses are a result of their capacity to locate book references in physical or electronic form.

The early findings of the issues that arise in this area then serve as comparison data that researchers gather to support the information provided by students in their questionnaires about learning resources, the demand for instructional materials, and the materials that students desire to acquire. According to the results of the survey, 90% of students said that practical courses needed teaching materials that were simple to use.

### **3.2 Analysis of Teaching Materials to Be Developed**

At this point, the researcher carried out an analysis of the development objectives, namely the step of choosing the learning product based on the findings of problem identification and analysis. The numerous instructional tools available, including learning media, learning modules, power point presentations, and textbooks, necessitate analysis. The creation of instructional materials takes into account the practicum learning that students engage in. To enhance learning outcomes in the laboratory, practicum activities in the lab call for a variety of learning resources connected to practicum activities. The selection of instructional materials is made after taking into account the answers provided by students to a questionnaire on implementation analysis. As a consequence of the analysis, it was determined that textbooks and reference books should be developed as teaching aids. The development of the content must take the student's subject of study and the lab's environment into consideration. When preparing students for practicum in the lab, the provision of machining practicum material connected to the main course of study would be very helpful. Due to the offered material being pertinent to their requirements, this might help enhance students' enthusiasm to learn.

### **3.3 Component Analysis of Textbook Development**

At this point, the researcher conducted an analysis of the elements needed to create the necessary teaching materials. Content sources, learning suggestions, and human resources are required for this project. Textbooks on the subject and the manuals for any tools or machines utilized in the laboratory's practicum serve as the content's primary sources. Textbooks should be related to the subject matter and compliant with any regulations that may be in place. The manual book of machines or practical tools in mechanical engineering machinery laboratories is the manual book used as a reference. The results of this study are in accordance with the research conducted by Andi and Arafah [23] that needs analysis is the basis for developing teaching materials. The process of creating a machining practicum textbook for students' abilities to complete practica and create goods in the lab begins with a needs analysis. The ASSURE model is utilized in the creation of instructional materials and acts as a useful roadmap. The systematic stages involved in the creation of instructional materials, from their identification through their evaluation, are adequately explained by this model.

## **4. CONCLUSION**

The conclusion that can be made based on the findings of the analysis that has been done is the need to

develop the most recent textbooks that suit the needs of students, are practical, effective, and which contain machining practicum materials drawn from references found in textbooks and manual books, related to subject matter and in accordance with needs, and can be used in machining laboratories, in order to facilitate some of the problems found in machining practicum. Textbooks are an important resource in learning contexts [24]. By using the proper teaching strategies and media in the lab, lecturers can give students who are practicing in the classroom a learning environment that is conducive to learning. Based on student needs, learning goals, and other factors, this academic environment can be developed for pupils.

## **REFERENCES**

- [1] U. Ruwaida, M. Amin, and U. Lestari, Analysis of the implementation of SPH II Lectures for the textbook of Mammalian EmbryoNic Development, *J. Educator. Theor. Research, and Expanders*, 4(12), 2019, pp. 1584. DOI: <https://doi.org/10.17977/jptpp.v4i12.13056>.
- [2] Depdiknas, Undang-undang RI No. 20 tahun 2003. tentang sistem pendidikan nasional. Jakarta :Depdiknas.
- [3] J. Nookhong, P. Wannapiroon, Development of collaborative learning using case-based learning via cloud technology and social media for enhancing problemsolving skills and ICT literacy within undergraduate students, *Proc. Soc. Behav. Sci.* 174, 2015, pp. 2096–2101. DOI: <https://doi.org/10.1016/j.sbspro.2015.02.007>.
- [4] R. Ardiansyah, Corebima, F. Rohman, Analisis kebutuhan pengembangan bahan ajar perubahan materi genetik pada mata kuliah genetika di Universitas Negeri Malang, *Seminar Nasional Pendidikan Saintek*, 2016.
- [5] A. Prastowo, *Panduan Kreatif Membuat Bahan Ajar Inovatif*, Diva Press, Yogyakarta, 2012.
- [6] I. T. K. Negara, T. Iriani, and Lenggogeni, Pengembangan multimedia interaktif pada mata kuliah manajemen konstruksi di S1 Pendidikan Teknik Bangunan Universitas Negeri Jakarta. *Jurnal Pendidikan Teknik Sipil*, 8(2), 2019, pp.97–104.
- [7] W. W. Lee, and D. L. Owens, *Multimedia- based instructional design* (2nd ed.), San Francisco: Pfeiffer, 2004.
- [8] Ismaniar and N. Hazizah, *Buku Ajar Pelatihan Kreativitas Deu-coupage bagi Pendidik PAUD (Deu-coupage Creativity Training Textbook for*

- ECCE Educators), Padang: Department of Non-Formal Education, 2019.
- [9] N. Saidah, Development of Statistical Textbooks as a Support for Lectures, *Reflexes. Edukatika*, 6(2), 2016, pp. 103–111. DOI: <https://doi.org/10.24176/re.v6i2.600>.
- [10] N. Daulay, T. Gultom, and M. Restuati, Analysis of the needs for the development of mendel genetics textbooks in genetics courses at Medan State University, *J. Biolokus*, 3(2), 2020. p. 342. DOI: <https://doi.org/10.30821/biolokus.v3i2.799>.
- [11] R. E. Fadhilah, Analysis of the need to develop a general biology textbook on researchbased biotechnology materials for S1 students of biology education, *Institute of Technology and Science Nahdlatul Ulama Pasuruan, Educ. Hum. Dev. J.*, 4(1), 2019, pp. 89–95, 2019. DOI: <https://doi.org/10.33086/ehdj.v4i1.1087>.
- [12] I. Sabri and S. Yanuartuti, Needs analysis of materials development in a postgraduate course for cultural arts education, *IJCAH 2022, ASSEHR 724*, 2023, pp. 1851–1855. DOI: [https://doi.org/10.2991/978-2-38476-008-4\\_200](https://doi.org/10.2991/978-2-38476-008-4_200)
- [13] F. Daryanes, et al, The development of articulate storyline interactive learning media based on case methods to train student’s problem-solving ability, *Heliyon*, 9, 2023), <https://doi.org/10.1016/j.heliyon.2023.e15082>
- [14] T. Gokmenoglu, I. Yavuz, C. Sensin, Exploring the interplay between curriculum and textbooks in disaster risk reduction education: Insights and implications, *International Journal of Disaster Risk Reduction* 96, 2023, 103949. DOI: <https://doi.org/10.1016/j.ijdr.2023.103949>
- [15] H. Irawati and M.F. Saifuddin, Analysis of needs development material learning program introductory profession of biological teacher in biology education Ahmad Dahlan University Yogyakarta, *BIO-PEDAGOGI: Jurnal Pembelajaran Biologi*, 7(2), pp. 96-99.
- [16] M. Krcmar, D.P. Cingel, Parent–child joint reading in traditional and electronic formats, *Media Psychol.* 17, 2014, pp. 262–281.
- [17] J. Parish-Morris, N. Mahajan, K. Hirsh-Pasek, R.M. Golinkoff, M.F. Collins, Once upon a time: Parent–child dialogue and storybook reading in the electronic era, *Mind Brain Educ.* 7, 2013, pp. 200–211.
- [18] G.A. Strouse, P.A. Ganea, A print book preference: Caregivers report higher child enjoyment and more adult–child interactions when reading print than electronic books, *International Journal of Child-Computer Interaction* 12, 2017, pp. 8-15, <http://dx.doi.org/10.1016/j.ijcci.2017.02.001>
- [19] M. H. Songhori, Introduction to need analysis, *English for specific purposes world*, 4, 1-25.
- [20] T. Knaus, Emotions in Media Education: How media based emotions enrich classroom teaching and learning, *Social Sciences & Humanities Open* 8, 2023, 100504. DOI: <https://doi.org/10.1016/j.ssaho.2023.100504>
- [21] D. Jones, Z. S. See, M. Billingham, et al, Extended reality for midwifery learning: MR VR demonstration. In: *The 17th international conference on virtual-reality continuum and its applications in industry*, 2019, pp. 1–2.
- [22] A. R. Hasyim, et al, Enhance midwifery student skills about active management third stage labor via learning media, *Gac Sanit*, 2021, pp. 35(S2):S284–S287. DOI: <https://doi.org/10.1016/j.gaceta.2021.10.035>
- [23] K. Andi and B. Arafah, Using needs analysis to develop english teaching materials in initial speaking skills for Indonesian College Students of English, *Turkish Online J. Des. Art Commun. TOJDAC*, 2017, pp. 419–437. DOI: [10.7456/1070ASE/045](https://doi.org/10.7456/1070ASE/045)
- [24] J. D. Ambara, S. Akter, M. Mariani, Digital transformation of higher education in Australia: Understanding affordance dynamics in E-Textbook engagement and use, *Journal of Business Research* 149, 2022, pp.283-295. DOI: <https://doi.org/10.1016/j.jbusres.2022.05.048>

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