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Needs Analysis Teaching Materials of STEAM Approach in Innovative Learning Courses

Agus Santoso[1], Khoiro Mahbubah[2], Sendi Faisal Alim[3]
[1,2,3]Universitas Islam Lamongan, Indonesia

[1]agus_santoso@unisla.ac.id

Abstract

The need for teaching materials and the limited availability of teaching materials in universities encourage lecturers to constantly innovate in developing teaching materials for lectures. This research aims to obtain information about the need for teaching materials with a STEAM approach in innovative learning courses. This type of research is descriptive qualitative. The sample used involved 25 students of the science education study program using purposive sampling. The data obtained included needs analysis, semester learning plan analysis, and teaching material analysis. The data collection technique for needs analysis used a percentage questionnaire and interviews to describe the data. In contrast, data regarding semester learning plan analysis and teaching material analysis were obtained through observation. Before the study was conducted, the instrument was validated with a score of 92.7 in the very feasible category. The results of the study: 1) Innovative teaching materials with a STEAM approach are needed with a score of 88.5% (very needed category). 2) The available teaching materials are limited, so the development of STEAM-approach teaching materials is needed where this learning is still relatively new and in accordance with innovative learning. 3) The semester learning plan for innovative learning courses supports the development of STEAM-approach teaching materials.

Keywords: *needs analysis, STEAM approach teaching materials, Innovative learning*

Introduction

Learning in higher education is offered to students in the form of abilities and skills that will lead them to their future career stages. Therefore, lecturers need to conduct an analysis related to the learning process. It is expected that lecturers in classroom learning activities will continuously innovate in learning activities. Lecturers need to continue to improve their skills and use the latest technology in learning activities (Desriani et al., 2023). According to Nizam et al. (2023), the learning process in higher education is centered on students. This learning has the characteristics of students to learn independently and are given trust as a form of full responsibility for the learning process to achieve and develop their abilities. Such learning will require students to become lifelong learners and adapt to various conditions quickly.

Student-centered learning really needs teaching materials that can facilitate students, such as teaching materials that support independent learning (Wiguna et al., 2022). Kosasih (2021) explains that teaching materials are reference sources used by educators/lecturers and students to gain experience and improve knowledge. Teaching materials include structured materials used in the learning process to describe the skills that will be learned by students (Mellisa et al., 2022). Teaching materials are essential because they serve as a guide for the learning process; students can learn according to their needs and wishes and can facilitate independent learning for students (Nasruddin et al., 2022; Wahyudi, 2022). According to Muliana GH (2022), if the teaching materials are used correctly, the efficiency of the learning process will be optimal.

The teaching materials used can influence learning outcomes; therefore, teaching materials must be adapted to student characteristics.

Teaching materials play an essential role in achieving classroom learning. Therefore, it is important to review and analyze the need for appropriate teaching materials for students according to their needs (Wijayanti & Antika, 2024). Teaching materials can be printed or non-printed, which helps and attracts students to gain knowledge. Teaching materials are information, materials, and scientific insights, as well as learning/practice activities carried out by students. The achievement of learning quality can be pursued through the development and improvement of the teaching materials used (Rahmawati, 2024). The smoothness of learning activities and the achievement of learning in specific courses depend on the suitability of the teaching materials (Gh & Irfan, 2024)

Innovative learning is a compulsory course and is classified as an educational course in the Science Education study program at Lamongan Islamic University, which weighs four credits in semester III. This course contains students' knowledge and skills in implementing innovative learning models well. The learning process uses innovative learning models to improve knowledge and skills (Riyasni et al., 2023). In order for teaching materials to function effectively and develop student skills, the teaching materials developed are integrated with the STEM approach (Davidi et al., 2021)

The latest STEM learning is STEAM, which comes from science, technology, engineering, art, and mathematics. According to Khoir (2021), STEM development becomes STEAM by taking the initiative to add art to it. In several previous studies, there were studies on STEAM, such as the research of Rohman et al., (2021), who researched science courses using the STEAM-PjBL, and the research of Aini et al., (2023) on the development of digital textbooks based on STEAM-PjBL. According to Darmadi et al., (2022) and Najamuddin et al., (2022), several experts agree that innovation learning in practice is identical to STEAM learning. So, STEAM learning is related to innovative learning courses.

Based on the problem description, it is necessary to analyze the need for teaching material in order to develop teaching material for innovative learning courses. This analysis was carried out to obtain an overview of the need and availability of teaching materials at the college for the science education program at Unisla. This study aimed to obtain information about the perception of the need for STEAM-based teaching materials in innovative learning courses.

Method

This type of research is descriptive qualitative. It was carried out in the Unisla Science Education Study Program in May-June 2024. The population and sample used were students who had taken innovative learning courses so that researchers could obtain in-depth information about the need for innovative learning teaching materials and obtain more qualified and valid opinions in developing teaching materials. The sampling technique was purposive sampling using 25 students of the Science Education Study Program.

The data used include (1) data on the analysis of teaching material needs for students, (2) data on the analysis of lecturer needs, and (3) data on the learning achievement of courses from the analysis of semester learning plans. A questionnaire was used to collect data on the analysis of teaching material needs for students. At the same time, the needs of lecturers were analyzed through interviews. Data on the learning achievement of courses based on semester learning plans was obtained through documentation. The data analysis technique used was a descriptive data analysis technique, through the description of questionnaire data from the analysis of students' instructional material needs and the description of interview data from the analysis of

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the needs of instructors teaching innovative learning courses and course learning outcomes from the documentation of semester learning plans.

Before the research was conducted, the data instrument went through an expert validation stage to obtain suggestions for improving the research instrument, with instrument validation shown in Table 1 below.

Table 1. Validation of research questionnaire instruments

Num	Assessment aspects	Score	
		V1	V2
	I. Format		
1	There are clear and easy-to-understand instructions for filling out the questionnaire.		
2	The format of the questionnaire sheet is easy to use		
3	The type and size of the font used are easy to read.		
4	There is a checklist that makes it easy to fill in.		
	II. Suitability of content		
1	Aspects of the content of the questions relate to the availability of learning materials.		
2	Some questions lead to the learning used.		
3	There are questions about learning desires or expectations.		
4	Some questions offer solutions for future learning.		
	III. Grammar and sentences		
1	The use of words and sentences presented in accordance with EYD		
2	Simple language presentation		
3	The language presentation is clear.		
4	Language presentation is easy to understand		

The validation of the research instrument was then filled out by two lecturers as validators using a Likert scale. Furthermore, the assessment results from the two validators were averaged and then calculated using the percentage formula as stated by (Gh & Irfan, 2024), as follows:

$$Presentation = \frac{expert\ validation\ result\ score}{maximum\ score}\ x\ 100\%$$

Furthermore, the percentage results of the assessment are categorized in Table 2 below:

Table 2. Validation result eligibility criteria

Score	Criteria
0-20	Very unworthy
21-40	Not worthy
41-60	Quite worthy
61-80	Worthy
81-100	Very worthy

The questionnaire data analysis includes scoring guideline statements:

1) Negative statements (-) on the availability of teaching materials
   Score 1. Strongly agree
   Score 2. Agree
   Score 3. Disagree or less agree
   Score 4. Strongly disagree
2) Positive statements (+) on the need for teaching materials
   Score 1. Strongly agree

Score 2. Agree
Score 3. Disagree or less agree
Score 4. Strongly agree

Data analysis used in this study includes data reduction through questionnaires given to 25 students according to research needs and data presentation by calculating the percentage of respondents' answers with the formula:

$$Presentation = \frac{expert\ validation\ score}{maximum\ score}\ x\ 100\%$$

Furthermore, the results of all respondents' answers to each descriptor in the questionnaire were described to determine the extent of students' perceptions of the need for textbooks. Then, the percentage of conclusions from the needs analysis results is adjusted to the criteria in Table 3.

Table 3. Descriptive analysis criteria

Num	Presentation	Criteria
1	75%-100%	Really need
2	50%-74%	Need
3	25%-49%	Do not need
4	0%-24%	Really do not need

(Rahmawati, 2024).

Data interviews from lecturers and data on learning outcomes of courses based on the semester learning plan obtained through documentation were summarized and continued with a description of the data from the results of obtaining information and findings. Interview data contains aspects of limitations and difficulties in teaching and learning, availability of teaching materials, implementation of learning, and needs for teaching materials, while the documentation data of the semester learning plan contains learning outcomes of courses and the suitability of the semester learning plan. The data obtained in the form of descriptions of opinions and facts are then described in depth and discussed according to literature reviews from journals and scientific articles. Furthermore, conclusions are obtained based on data analysis.

Results

Availability and Need for Teaching Materials for Students

Before collecting the research data, the researcher validated the research instrument with an average score of 92.7. This means that research instruments can be used with very feasible criteria. These results were obtained from the average results of two validators who assessed the instruments used.

The results of students completing the questionnaire regarding the availability and need for teaching materials are listed in Table 4:

Table 4. Analysis of teaching materials

Descriptor	Statement	STS	TS	S	SS
Availability of teaching materials	The availability of learning resources used in innovative learning courses is adequate	80%	8%	12%	0%
	Reference sources available in the library for innovative learning courses are complete	44%	36%	8%	12%
	Explanations from lecturers with teaching materials used are sufficient to understand innovative learning courses	40%	40%	4%	16%

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	Learning has been carried out by forming study groups	68%	12%	12%	8%
	Implementation of innovative learning in the form of learning simulations has gone well	32%	60%	4%	4%
Descriptor	Statement	STS	TS	S	SS
Teaching material needs	Having varied teaching materials will make it easier for students to learn and understand lecture material	0%	0%	12%	88%
	Innovative learning requires the latest learning studies according to changing times	0%	0%	4%	96%
	Innovative learning with a STEAM approach involves the ability to analyze, evaluate, and create	0%	8%	32%	60%
	Innovative learning with a STEAM approach makes me more interested, enthusiastic, and motivated in learning	0%	4%	20%	76%
	Development of innovative learning materials with a STEAM approach is needed	0%	4%	4%	92%
Average Score				88,5%	

Table 4 provides information on the availability of teaching materials and the need for teaching materials for innovative learning courses, with an average score of 88.5%, based on the results of the needs analysis percentage with the criteria of very much needed.

Availability and Need for Teaching Materials for Lecturers

Data from interviews with lecturers responsible for innovative learning courses, the following data was collected in Table 5.

Table 5. Data analysis of teaching materials for innovative learning courses

Question Aspect	Analysis Result
Availability of teaching materials	Lecturers do not have enough teaching materials to support lecture activities. Lecturers usually use materials from power points, ebooks, and videos that can be obtained from YouTube or similar.
Limitations and learning difficulties	Students' limitations and difficulties are that they still need clarification about understanding the material and using models, approaches, methods, and strategies in learning.
Implementation of learning	Learning is still centered on lecturers, and during learning activities, students tend to be less active.
Need for teaching materials	Innovative learning that is in line with current developments, such as learning through the integration of the STEAM approach, is needed in learning materials.

Table 6 below shows data on documentation of learning achievements and learning achievements of courses in the innovative learning semester learning plan.

Table 6. Semester learning plan for innovative learning courses

Learning Outcomes (CP)	**CPL-Study Program**	
	S3	Contribute to improving the quality of life in society, nation, and state and to advancing civilization based on Pancasila.

Innovative Learning	S9	Demonstrate a responsible attitude towards activities in their field of expertise and be independent
	KU	Able to apply critical, logical, systematic, and innovative thinking in the context of the implementation and development of science and technology while still paying attention to humanities values in accordance with their field of expertise
	KU	Responsible for the work assigned and appreciating the achievement of group work results, as well as monitoring and evaluating the completion of the work for which he is responsible.
	KU	Ability to conduct self-assessment of the work group for which they are responsible and to manage learning independently.
	KK	Have the skills to implement integrated science learning thematically and use ICT as a basis for self-development and lifelong learning.
	P2	Master the concept of education and learning, including the basics of education, as well as planning, implementing, and evaluating science learning.
	CPMK	
	CP	Analyze basic concepts about models, methods, approaches, strategies, techniques, and tactics of learning consistent with logical, critical, and systematic thinking to be able to implement innovative science learning (KU1, P2)
	CP	Demonstrate skills in implementing innovative and thematically integrated science learning models and are relevant to the applicable curriculum by showing responsible and collaborative characters (S9, KK2, P2)
	CP	Evaluate the use of innovative learning models in science learning with a sense of responsibility so as to be able to provide recommendations for improvement as a form of contribution to the development of the application of science learning models and be able to manage learning independently (S3, KU7, KU8)

Discussion

The feasibility of the research instrument scored 92.7, which means that the research instrument used with the feasibility criteria is very feasible. Thus, the instrument in this study can be used and can be trusted to obtain research data. This instrument feasibility test is essential to be carried out before the research data collection process so that the resulting research can be trusted and avoid bias in research activities.

Availability and Need for Teaching Materials for Students

The availability of teaching materials shows inadequate results, meaning that students feel that the learning resources they use could be improved and that there is a need for more reference sources about innovative learning in the library. The explanation from the lecturer regarding the teaching materials used needs to be more to understand the innovative learning course. During this time, learning tends to form study groups rarely, and innovative learning simulations are carried out toward the end of the lecture. The causal factor is that the availability of teaching materials as relevant reference sources is quite limited, so students tend to be less active and less organized. Wiguna et al., (2022) found that when lecturers use appropriate teaching materials, students feel comfortable, active, and organized. Apart from that, the use of

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specific and relevant teaching materials will have a positive impact on students' academic achievement abilities (Ariana et al., 2020; Humaidi et al., 2022). Pratita et al., (2021) stated that students will be more active and enthusiastic about participating in lectures because they have read the material in the teaching materials.

Innovative learning requires the latest learning studies according to changes in the times, such as the STEAM approach, which involves the ability to analyze, evaluate, and create. Innovative learning with the STEAM approach makes students more interested, enthusiastic, and motivated in learning. Students must be able to understand learning activities and processes in order to complete projects using the STEAM approach. Students will actively build their understanding and knowledge through projects using the STEAM approach, which is a component of constructivist education. Students are adults who can learn independently and are able to construct their knowledge.

Based on the questionnaire results regarding the availability and need for innovative learning lecture teaching materials, an average score of 88.5% was obtained. The results of the needs analysis in the form of a percentage are stated as very needed criteria, meaning that the availability of teaching materials is still limited and the development of teaching materials is really needed. So, it is necessary to show that it is necessary to develop innovative learning teaching materials using the STEAM approach.

Availability and Need for Teaching Materials for Lecturers

The availability of teaching materials Interviews with three lecturers who teach the course revealed that the lecturers use materials from PowerPoints, ebooks, and videos that are accessible via the Internet. The lecturers still need complete teaching materials to support the lecture activities. Sari et al., (2023) stated that the results of their research from interviews showed that the teaching materials used were PowerPoint slides, and the results showed that 52.6% of respondents stated that there was a lack of teaching materials used in learning.

The learning process activities so far have been centered on lecturers, and students tend to be passive. During the implementation of learning, information was obtained that learning was still centered on lecturers, and during learning activities, students tended to be less active. In this learning process, students also rarely write down information conveyed by lecturers when explaining the material, and they only take photos of PowerPoint slides, which has a negative impact on the learning process, centered on lecturers, including students, who need to be more critical and productive.

The limitations and difficulties are that students still need clarification when it comes to understanding the material and applying models, approaches, methods, and strategies to learning. One way that can be done to improve the quality of the learning process is to develop teaching materials according to students' characteristics and environment in order to minimize barriers and learning difficulties. Ambayon (2020) and Logan et al., (2021) added that learning with modules as teaching materials provides excellent opportunities for students to actively participate in achieving the learning objectives. Therefore, the teaching material must be well structured to maximize students' education.

The need for students to be able to solve problems in everyday life can be met by integrating STEM into the learning tools they use because STEM is also very identical to new projects or innovations that can be developed by students. STEM-integrated learning can develop various skills for students (Tari et al., 2023). Integration of STEM with PjBL or PBL elevates creative thinking significantly (Effendi et al., 2024). Najamuddin et al., (2022) stated that STEAM-based learning could improve problem-solving skills. So, teaching materials are needed in innovative learning lectures that are in accordance with current developments, such as learning by integrating the STEAM approach.

Based on the results of the analysis of the semester learning plan documentation in the learning outcomes and learning outcomes sections of the course, it can be concluded that innovative learning courses require students to implement innovative science learning related to the development or implementation of science and technology that incorporates and applies humanistic values and is relevant to the applicable curriculum. Students can demonstrate skills and implement innovative and thematically integrated science learning models that are relevant to the applicable curriculum by demonstrating responsible and collaborative characters, and can evaluate the use of innovative learning models in science learning with a sense of responsibility so that they are able to provide recommendations for improvement as a form of contribution to the development of the application of science learning models and are able to manage learning independently. Natalia & Wicaksana (2023) stated that students, as prospective teachers, must be able to master the material and put it into practice.

Learning success is based on learning outcomes, and the learning outcomes of a course can be optimally achieved through the use of appropriate teaching materials. Appropriate teaching materials are helpful in supporting lecturers and students in learning according to plan (Muliana GH, 2022). Teaching materials provide students with guidelines that direct the activities in the learning and working process that should essentially be mastered. The learning process, according to the teaching materials, will run smoothly, practically, and effectively. Teaching materials whose contents could be more varied and exciting to students make learning effective (Afiyanti et al., 2022). Thus, the presence of teaching materials can change the role of lecturers who were previously learning resources and now become facilitators so that the learning and lecture processes become more effective and interactive.

The limitation of this study is that the analysis of the needs of the number of samples used is still limited because it uses students in the Science Education study program itself. The interview activity involved three lecturers because the number of lecturers teaching the Innovative Learning course was three people. After all, the Innovative Learning course has a division of Innovative Learning I, Innovative Learning II, and Innovative Learning III. In addition, the researcher was also directly involved in the interview activity because the researcher was a lecturer teaching the innovative learning course. Research Suggestions for further research include collaborating more with other researchers who discuss similar topics, such as innovative learning strategy innovations.

Conclusion

Conclusions of the study can be formulated as follows: 1) Innovative teaching materials are required with a STEAM approach with a score of 89 (very high category). 2) The availability of existing teaching materials is still limited, so the latest teaching materials with a STEAM approach are needed where this learning is still relatively new and in accordance with innovative learning. 3) The results of the analysis of semester learning plans in innovative learning courses support the development of teaching materials using the STEAM approach. This research is limited to needs analysis. For further research, research on the development of teaching materials can be carried out, and it is recommended to collaborate more with other researchers who discuss similar topics, such as innovative learning strategy innovations and the STEAM approach.

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