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MEASURING LECTURER'S PERCEPTION IN STEM APPROACH BASED CONTEXTUAL LEARNING IMPLEMENTATION

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Abstract

Education in the 21st century was assigned by rapidly increasing advances in information and communication technologies. Integrated learning in science, technology, engineering, and mathematics (STEM) was one of the learning trends of the 21st century. A no-test tool has been developed that is used to measure lecturers' perception of the STEM approach. Based on the results of the analysis and data processing, the non-test instruments were reliable and valid. The results of the Cronbach alpha tests were 0.750 for the material, 0.896 for the construct, and 0.778 for the language. This Cronbach alpha number was included in the high-reliability category with a Cronbach alpha number > 0.05. The average validity value of the expert approval for the instrument, on the other hand, rose from 81.5% (good category) to 93% (very good category). Moreover, Cohen's kappa coefficients were 0.038, 0.033, and -0.019. Somehow, this means that there was little agreement between the compared experts. The results showed that the lecturers' perception of the STEM learning approach was predominantly very good. However, the willingness of the lecturers strongly influences the implementation of STEM in their learning.

Keywords – STEM, Instrument non test, Lecturer's perception.

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1. Introduction

Education in the 21st century was characterized by rapidly increasing advances in information and communication technologies. These technological advances are also having an impact on learning in elementary schools, universities, and colleges. In the educational trend of the 21st century, learning is geared towards high-order thinking skills (HOTS), which require students to have superior thinking skills. To prepare students for the 21st century, students will need other skills such as communication skills, problem-solving, critical thinking, creative thinking, and the ability to collaborate. These skills were the trend in 21st-century education that students must have today if they want to be successful in the working world of the 21st century. These five skills are closely related to integrated science, technology, engineering, and mathematics (STEM) learning.

Generally, the research on integrated STEM learning has been conducted through research surveys. The research process involved teachers and students to see the implementation of STEM in secondary schools. Research by (Parmin, Saregar, Deta & El Islami, 2020) looked at survey research to examine science teachers' perceptions of STEM in Indonesia. Previous studies have shown that STEM TVET for vocational students in Malaysia maps the student's careers into the future (Bakar & Mahmud, 2020). On the other hand, the research carried out by (Saw, Swagerty, Brewington, Chang & Culbertson, 2019; Roberts, Jackson, Mohr-Schroeder, Bush, Maiorca, Cavalcanti et al., 2018; Çalış, 2020) examine the students' perceptions about the implementation of STEM education in the United States and Turkey schools. The result shows that the United States used the informal summer learning experience to obtain data on students' perception of STEM (Roberts et al., 2018). Albeit, the proposed program is a STEM-based post-school program in the United States. The other study by Karisan, Macalalag and Johnson (2019) conducted a research survey to analyze the impact of STEM implementation on learning in schools in Turkey. There are many surveys have carried out to see the implementation of STEM in schools.

Previous research was observed that, look at STEM knowledge among students studying geography at Sultan Idris University of Education (Mohd-Najib, Mahat & Baharudin, 2020), Malaysia. Other students' perceptions of STEM research in higher education were conducted by Owston, York, Malhotra and Sitthiworachart (2020). The perception of students in the STEM and non-STEM courses was examined in a blended learning course. Much of the STEM research has sought to shape effective STEM learning in higher education. Another research was done by Chen, Bastedo and Howard (2018) reported that designed elements for online courses in STEM for a four-year public university in the southeastern United States. According to (Chirikov, Semenova, Maloshonok, Bettinger & Kizilcec, 2020), Online Design and Blended InstructionTested to improve Learning Outcomes of STEMStudents in Russia.

Conducting survey research as an integrated STEM tool should be developed before implementation. The instruments for STEM-based research and STEM-based implementation were carried out by (Wahono & Chang, 2019b). Those studies were conducted to see attitudes, knowledge, and application of STEM to science teachers in Indonesia (Wahono & Chang, 2019a). The development of STEM-based learning models was also carried out while the development of STEM instruments. The other study on the teacher survey by A. The research was conducted regarding the perception of the qualification of teachers and foreign students about the Indonesian language. The other study was conducted by (Çetin, 2021) to examine the relationship between future math teachers and science teachers in terms of STEM awareness and questioning skills. According to (Ejiwale, 2013) the STEM implementation in elementary, middle, and high schools influences the implementation of STEM in colleges and universities, which were their base and potential feeder.

The learning model was a pattern used by the teacher in presenting material that covered all aspects of learning before and after the start of learning, using the facilities used either directly or indirectly. In addition (Rusman, 2011), the learning model provides a way for teachers or lecturers to help students obtain or maintain information, ideas, skills, mindsets, and ideas from the students in a conceptual learning framework that follows a systematic pattern in the Organization of learning experiences to achieve learning goals.

In the 21st century, research on the development of learning models and their implementation combines them with STEM such as inquiry-STEM (Abdurrahman, Ariyani, Maulina & Nurulsari, 2019), STEM-high order thinking skills (HOTS) (Rosidin, Suyatna & Abdurrahman, 2019), STEM-engineering design process (EDP) (Nurtanto, Pardjono, Widarto & Ramdani, 2020), and the project-based learning system (Maulana, 2020). The research on the development of learning models was carried out by (Priatna, Lorenzia & Widodo, 2020), who developed a STEM-based learning model for junior high school.

If we look at the explanation of some previous studies, the STEM-oriented Indonesian educational policy has not been fully applied in educational institutions. The problems that arose in higher education were the lack of STEM research and the lack of understanding of STEM among lecturers and students. For this reason, preliminary studies were necessary to determine the perception and understanding of lecturers in higher education with regard to the integrated STEM approach to learning.

2. Method

In this study, the development of a non-test instrument for the perception and understanding of mathematics and science lecturers, both lecturers of mathematics and science education via STEM, with the development and validation methods. According to (Adams & Wieman, 2011), this method consists of four phases, which (1) Carrying out a preliminary study to determine the objectives of the tests to be carried out (2) Developing tests, (3) running tests, and validating tests, (4) Evaluating the tests carried out. There are two phases of implementation research for development and validation.

2.1. Development Stage

2.1.1. Preliminary Studies

Preliminary studies were conducted by reviewing journals and other literature from national and international journals. The results of the study have been summarized in a conceptual definition and an operational definition. From the results of found that the knowledge and instruments of STEM mathematics and natural science lecturers' understanding, as well as the STEM understanding of mathematics and science education lecturer, were gained.

2.1.2. Arrange a Grid of Non-Test Instruments to Be Used

When developing an instrument, it is necessary to develop an instrument grid that is developed with indicators, sub-indicators and positive or negative statements. The grid of the instruments produced in this study is shown in Table 1.

Aspect	Indicator	Sub Indicator	Number of Item	Statement (+) or (-)
Lecturers' understanding and perceptions about STEM	Information sources about STEM (Science, Technology, Engineering, Math)	Sources of information about STEM	1	Positive
		STEM training that has been attended	2	Positive
	Lecturer view About learning with the STEM approach	Understanding of the meaning of the STEM approach	3	Positive
		The urgency of the STEM approach in Learning	4	Negative
STEM implementation	STEM is applied in learning activities	The ability to design learning activities with the STEM approach, especially models that are suitable for learning with the STEM approach	5	Positive
		Steps for implementing STEM in learning	6	Positive
		Contextual-based STEM application	7	Negative
		Application of STEM To train student HOTS	8	Positive
		Confidence in applying STEM in learning	9	Negative
	Supporting and inhibiting factors in implementing the STEM approach	Supporting factors for the application of the STEM approach in learning	10	Positive
		Inhibiting factors for the application of the STEM approach in learning	11	Positive

Table 1. The non-test tool grid for the STEM perception and understanding of math and science lecturers and mathematics and science education lecturers

2.2. Validation Stage

2.2.1. Expert Validation

This validation was carried out by experts depending on the field of study in which they were involved. The experts used in this research were experts in science education, especially STEM, experts in educational evaluation, and experts in learning technology. The results of this validation were calculated using a Likert scale with 4 expert validators. Validations were performed 2 and 3 times on the validator until the instrument was validated.

2.2.2. Revised of Non-Test Instrument

At this stage, the manufactured product or non-test instrument has been reviewed based on the input of the experts who will validate it. The developed instrument was an instrument for visualizing the perception and understanding of mathematics and natural science lecturers about STEM for qualitative research.

2.2.3. Trials of Non-Test Instrument

During this phase, a test of non-test instruments was carried out in order to know the perception and understanding of lecturers of mathematics and science about STEM. In product trials, a questionnaire on the perception and understanding of mathematics and STEM lecturers was distributed, which was valid for respondents from Universitas Jambi and University State Islamic Sulthan Thaha Saifuddin Jambi.

2.2.4. Processing and Analysis of Data

In this phase, the results of the expert validation were processed to check the reliability and validity of the non-test instruments developed; the data processing took place with the software IBM Statistics SPSS 23. In addition, the product tests were also to examine STEM lecturers' perception and understanding of math and science lecturers. The processed data was available in the form of qualitative data.

2.2.5. Make Conclusions

For the development of non-test instruments, as concluded on the basis of the data processing performed, that the non-test instruments used were feasible or not, while inferring the results of the STEM perceptions and understanding of the math and science lecturers and math and natural science education lecturers based on respondents' answers. Collecting data from respondents' perception of lecturers was carried out using Google Form.

3. Results

3.3.1. Reliability of Instrument

This study undertook the development of non-test instruments for learning the STEM perception and understanding of mathematics and science lecturers and math and science education lecturers. After validation by the expert, the results of the reliability of non-test instruments can be obtained as in Table 2 for material, construction and language.

STEM Domain	Internal Consistency (alpha)
Material	0.750
Constructiveness	0.896
Language	0.778

Table 2. The reliability of the perceptions and understanding of the STEM of the lecturers

3.3.2. Validity of Instrument

After obtaining the reliability value of the non-test instrument, the validity value of the instrument was searched, the validation was carried out by 4 experts, so that the evaluation results as in Table 3 and Table 4 for experts 1 to 4 were obtained. Of the tool was important in building confidence that the tool was

suitable for obtaining correct data. This study used content validation and face validation performed on a 5-point Likert scale. Tables 3 and 4 show the content and face validity results which interpret how many experts agree on the existence and content of the instrument, validity is also intended to determine the readability, accuracy, and suitability of the instrument's content.

Study Criteria	Expert 1	Expert 2	Expert 3	Expert 4	Mean±SD
Material Aspects					
The questionnaire items have covered all aspects of the assessment according to the grid	4	4	4	4	4±0
Questionnaire items related to the substance of the STEM approach	4	4	3	4	3.75±0.5
The contents of the material are in accordance with the measurement objectives	4	4	3	4	3.75±0.5
Constructive Aspects					
The points were clearly formulated	5	4	4	3	4±0.82
Completeness of the sentence with the questionnaire	4	5	4	3	4±0.82
Assessment items The questionnaire instrument is equipped with clear instructions	5	5	4	3	4.25±0.96
Aspects of Language					
Communicative sentence formulation	4	5	4	3	4±0.82
Sentences use Indonesian language principles that were good and correct	4	5	3	4	4±0.82
The sentence formulation did not lead to double interpretation	5	5	3	4	4.25±0.96
The formulation of the statement did not contain words that violate ethics / offend the respondent	5	5	5	4	4.75±0.5
Total	44	46	37	36	40.75±0.67
Percentage of validity	88%	92%	74%	72%	81.5%

Table 3. The value of the measurement of the non-test instrument by 4 stage 1 experts

Study Criteria	Expert 1	Expert 2	Expert 3	Expert 4	Mean+SD
Material Aspects					
The questionnaire items have covered all aspects of the assessment according to the grid	5	5	5	4	4.75±0.5
Questionnaire items related to the substance of the STEM approach	4	5	5	4	4.5±0.58
The contents of the material are in accordance with the measurement objectives	5	4	5	4	4.5±0.58
Constructive Aspects					
The points were clearly formulated	5	5	5	4	4.75±0.5
Completeness of the sentence with the questionnaire	5	5	5	4	4.75±0.5
Assessment items The questionnaire instrument is equipped with clear instructions	5	5	5	4	4.75±0.5

Study Criteria	Expert 1	Expert 2	Expert 3	Expert 4	Mean+SD
Aspects of Language					
Communicative sentence formulation	5	5	4	4	4.5±0.58
Sentences use Indonesian language principles that were good and correct	5	5	5	4	4.75±0.5
The sentence formulation did not lead to double interpretation	4	5	5	4	4.5±0.58
The formulation of the statement did not contain words that violate ethics / offend the respondent	5	5	5	4	4.75±0.5
Total	48	49	49	40	46.6±0.53
Percentage of validity	96%	98%	98%	80%	93%

Table 4.Value of the instrument measurement by 4 stages of 2 experts

As part of this validity, the experts also provided some suggestions and comments on improving the instrument, while some of the experts' comments, which they used as references for improving the instrument, can be found in Table 5.

Domain	Comment	Improvemnet
Material	Expert 1: Should you have a question about what you know about STEM? It should be reviewed, is it true that STEM is a learning approach. There should be questions about the advantages and disadvantages of STEM learning. Expert 2: It is recommended that an item asks about the relationship between STEM and CPL-CPMK which is narrated with the relationship to MBKM Expert 4: attach operational and conceptual definitions so that the indicators tested were clear	Making operational and conceptual definitions from the research questionnaire, adding questions about the definition of STEM, correcting STEM as a learning approach with its advantages and disadvantages in its application on campus, and a statement related to increasing student HOTS with STEM implementation
Constructive	Expert 1: It is better if the questions in the questionnaire were coherent, namely after point 1, 3 and 4 first and then point 2. Expert 2: In the instrument manual, there are 24 items even though only 12. Expert 3: The identity of the respondent only hidden so that the respondent can answer honestly and questions 11 and 12 should be combined because they have one meaning Expert 4: Proportion of ideal statements / statements namely 70-30 or 60-40, guidance must be clear or functional, positive and negative statements are reviewed to be corrected	The identity of the respondents was no longer used in the questionnaire and the proportion of the statements was 60% positive and 40% negative
Language	Expert 1: There were several typos that must be corrected, for example study and factor, which one is the real obstacle or the obstacle. Expert 2: Because this for educators, your words should be replaced by the lecturers	Typical errors and the word "brother" has been replaced with "Mr / Ms"

Table 5. Comment, Expert Advice and Improvement

In addition, Cohen's analysis of Kappa coefficients was used to see the correspondence between Expert 1 and Expert 4. This analysis was measured to determine the degree of agreement of 4 experts in evaluating the developed tools. Analysis of Cohens kappa coefficients by using the IBM SPSS 23 Statistics software with the results shown in Table 6.

Expert	Measure of Agreement (Kappa)	Significance	Hipothesis (significance 5%)
Expert1Vs Expert3	0.038	0.289	Accepted (0.289>0.05)
Expert1Vs Expert4	0.033	0.350	Accepted (0.350>0.05)
Expert2Vs Expert3	-0.019	0.435	Accepted (0.435>0.05)

Table 6. Analysis of Cohen's kappa agreement between expert 1 to expert 4

3.3.3. Lecturers' Perceptions about the STEM Approach

An instrument questionnaire was distributed to examine the STEM approach perceptions of math and science lecturers, composed of 35 respondents from Universitas Jambi, Sulthan Thaha Saifuddin Jambi State Islamic University, Universitas Mataram, and the Mandalika University of Education passed. Dimyati (2002) also conducted the participation of lecturers from Yogyakarta State University to experience their perception of the curriculum of the sports science faculty. This study found that the lecturers 'perceptions were divided into four main indicators (1) sources of information about STEM, (2) lecturers' views on learning with the STEM approach, (3) STEM application in learning, and (4) supporting and inhibiting factors in the implementation of the STEM approach. For the lecturers' responses to the indicators, the sources of information on STEM are listed in Table 7.

The indicator of teachers' view on learning with the STEM approach is shown in Table 8.

Question	Lecturer Answer
Have you ever heard / received information about the STEM approach? If so, where did you get this information from?	7 lecturers never heard information about STEM and 28 lecturers have heard information about STEM from training, seminars, books, journals, internetacsess about STEM, ELPSA Project UC – AUSAID, guide students thesis Physics Education study Program and community dedication lecturer UniversitasMataram
Have you ever attended STEM training? If yes, in what level?	4 lecturers have attended STEM training but it not explained at what level, 4 lecturers have attended STEM training on national level, basic level and study program level, and 27 lecturers never attended STEM training

Table 7. Lecturer answers about information of STEM indicators sources

Question	Lecturer Answer
According to Mr / Ms, what is meant by the STEM (Science, Technology, Engineering and Mathematic) approach in learning?	6 lecturers said they did not know about the STEM approach. Meanwhile, others provide a definition of the STEM approach as follows "A learning approach that integrates science, technology, engineering, and mathematics and can be observed and applied in everyday life Learning with real facts and theories" "Learning was carried out by linking the interrelationships between each field and its application" "A learning process experienced by students with the STEM approach then STEM appears in learning" "An approach that combines all students' abilities to learn" "Integrating the concept of science whose data analyzed with mathematics by manipulating technology" "Applying science, technology, engineering and mathematics at the same time in the concepts being taught" "Integrating elements of science, technology, engineering, and mathematics in a teaching and learning process to achieve learning goals" "Approach the learning process with science and technology" "Collaborative learning between these elements. One example was a virtual laboratory" "Learning that collaborates between science, technology, engineering, and mathematics" "The learning process that examines problems by involving elements of science, technology, engineering and mathematics at the same time" "STEM was an interdisciplinary learning between Science, Technology, Engineering and Mathematics"

Question	Lecturer Answer
	"Interdisciplinary learning" "A learning approach that applies four aspects of scientific disciplines, including science, technology, engineering, and mathematic" "STEM was an integrated learning between science, technology, engineering, and mathematics to develop students' creativity through the process of solving problems in everyday life. Learning with STEM technology was an approach to learning that brings students to know the equipment around them by knowing the STEM elements in it" "A combination of Engineering Science Engineering and Mathematic"
Do you think that implementing the STEM approach is difficult to apply in campuses at this time?	6 lecturers said it was difficult to apply STEM to learning on campus, 1 lecturer said did not know and 28 lecturers said it was not difficult depending on the willingness and material of the lecture as well as the conditions of the COVID 19 pandemic

Table 8. Lecturer answers about STEM, indicators of lecturers' views about learning with the STEM approach

Whereas STEM indicators applied in learning activities can be seen in Table 9.

Question	Lecturer Answer
Have you ever designed learning activities using the STEM approach? If yes, what learning model was suitable to be designed using the STEM approach?	11 lecturers said never design, 11 lecturers answered ever design STEM approach with project-based learning, case method, and problem-based learning and the other not respond
Have you ever applied the STEM approach in learning activities? If so, what are the steps for implementing STEM in learning?	8 lecturers said they never applied STEM in learning, 16 lecturers did not respond and 11lecturers answered that they had applied by introducing and applying the concept of science, engineering technology and mathematics example basic electronic course. The concept being taught, starting from observation, new relevant ideas, innovation and creation needed and the values that are expected, and starting by giving a problem in the form of a project that will be made then reviewing the STEM elements that it making the project.
According to Mr / Ms. Is it difficult to teach a contextual-based STEM approach on campus today?	14 lecturers said it was not difficult, 8 lecturers said it was difficult by reason of the COVID 19 pandemic and the others said they did not know and did not respond
Do you think the STEM approach can train students' HOTS (Higher Order Thingking Skills)? Give 2 reasons	5 lecturers said that they do not know, 8 lecturers said that they could but there was no reason, 22 lecturers said the STEM approach could increased student HOTS with the following reasons: a) hone creativity and rational thinking b) train students to think the connectedness of the fields presented, then students can think that the theoretical knowledge used can be applied c) The approach can classify learning parts d) stimulate curiosity and improve student abilities e) The assignment is project-based using the concepts he has learned f) There were data analysis by manipulating technology g) The STEM approach is an activity to analyze concepts / phenomena. h) The STEM approach can also be in the form of creating a concept / product i) each stage of STEM makes it possible to stimulate HOTS j) online learning slightly reduces the student's field experience and with STEM hopefully it will be a solution to enrich the student experience. k) Learning outcomes are achieved l) Deep into his field m) Sharpen analysis and logic n) train students to think critically and creatively o) STEM applying technologist p) STEM can be exemplified in everyday life because HOTS requires a high level of analysis and stem makes students able to determine which science, engineering technology and mathematics are in development.

Question	Lecturer Answer
Do you think that the STEM approach is difficult to apply to all the materials in the subjects that you teach?	9 lecturers said that it was not difficult, 6 lecturers said that they did not know, 20 lecturers said it was difficult by reason of depending on the characteristics of the material, meaning that if the course did not meet the STEM elements it was relatively difficult to do.

Table 9. Lecturers' perceptions about STEM indicators applied in learning activities

In addition, indicators of supporting and inhibiting factors in the implementation of the STEM approach are presented in Table 10.

Question	Lecturer Answer
According to you, what are the supporting factors in implementing the STEM approach in learning on campus today? Give 2 answers	4 lecturers said that they don't know. Most of them said that the supporting factors for the implementation of STEM learning were 1. Workshops. 2. Adequate internet access ability 3. Academic atmosphere of all technology-based courses is easy to make engineering and technology stages 5. Questions and assignments from lecturers 7. Students master the concepts that will be used to work on project assignments from lecturers 8. The ability of lecturers and students in exploring and implementing adequate STEM 9. MBKM curriculum 10. Advice on complete infrastructure and quality human resources 11. Teaching materials as a source of knowledge and training student skills 12. Technology & campus policy
According to you, what are the factors that hinder the implementation of the STEM approach in learning on campus at this time? Give 2 answers.	4 lecturers said they did not know, while most of the lecturers said the factors inhibiting the implementation of STEM in campus were 1. Electricity on campus which often died. 2. Skilled technicians and laboratory assistants Do not understand and have little knowledge. Socialization of missing approaches and tools It is difficult to determine the engineering stage of the approach. 3. Assignments from lecturers are rarely project-based 4. Students are not trained with problems that require higher-order thinking 5. Weak technical literacy of students, and lack of STEM model training for lecturers and prospective teachers 6. Relatively low basic student input skills 7. Knowledge level of some lecturers about STEM is not very big yet. 8. Weak learning innovation (lecturers) Lack of motivation from lecturers to apply STEM9. Awareness signals from students to attend lectures lack of facilities, lack of attraction for platform students 10. The time needed to carry out more STEM learning and low student willingness and ability 11. Covid pandemic & campus policies

Table 10. Lecturer perceptions about STEM Indicators of supporting and inhibiting factors in the implementation of the STEM approach

3.3.4. Interviews Lecturers' Perceptions about the STEM Approach

In addition, to strengthen and data triangulation the results of lecturers' perceptions about STEM learning, interviews were conducted with 3 lecturers from Universitas Jambi and the University State Islamic Sulthan Thaha Saifuddin Jambi. The results of interviews with the first, second and the third lecturer like

Q: Have you ever heard / received information about the STEM approach? If so, where did you get this information from?

A: *"The first respondent said that he had heard information about STEM from seminars and conducted research on STEM. The second respondent said that he had heard information about STEM from journals or articles he had read. Meanwhile, the third respondent said that she had heard information about STEM from workshop about STEM and research STEM in her study program.*

Q: Have you ever attended STEM training? If so, at what level?

A: *The first respondent said that she had attended a national training on STEM at Universitas Jambi. The second respondent said that he had never attended any STEM training. Meanwhile, The second respondent said that she had attended a national training on STEM at Universitas Jambi and national level.*

Q: In your opinion, what is meant by the STEM (Science, Technology, Engineering and Mathematic) approach in learning?

A: *The first respondent said STEM was a learning approach that is fun for students because it relates to everyday life. While, the second and the third respondent said that STEM was a learning approach that contains elements of science, technology, engineering and mathematics in learning.*

Q: Do you think that applying the STEM approach is difficult to apply in campuses at this time?

A: *The first respondent said STEM did not difficult to implement at campus because STEM was project-based. The second respondent said STEM did not difficult to implement at campus. While the third respondent said STEM did not difficult to implement at campus. It depended content of subject curriculum study program.*

Q: Have you ever designed learning activities using the STEM approach? If so, what learning model is suitable to be designed using the STEM approach?

A: *The first respondent said that she had implemented STEM with a project-based learning model. The second respondent said that he never designed learning with a STEM approach. While, the third respondent said that she had implemented STEM with a problem-based learning model.*

Q: Have you ever applied the STEM approach in learning activities? If so, what are the steps for implementing STEM in learning?

A: *The first respondent said that the first implementation of STEM was a survey project for the material to be taught using STEM. The second respondent said that he never applied the STEM approach to learning. While, the third respondent said that the first implementation of STEM was observation, research, inquiry, and communication.*

Q: According to Mr / Ms. Is it difficult to teach a contextual-based STEM approach on campus today?

A: *The first and the third respondent said that contextual-based STEM could be applied depending on condition and time preparing of the lecturer. The second respondent said it was not so difficult to apply contextual-based STEM related to the science, technology and society learning model to create problems about STEM.*

Q: Do you think the STEM approach can train students' HOTS (Higher Order Thinking Skills)? Give 2 reasons

A: *The first, second, and third respondents said that STEM can increase student HOTS because STEM characteristics perform analysis based on bloom taxonomy. It made students to think critically and solving a problem.*

Q: Do you think that the STEM approach is difficult to apply to all the materials in the course that you are studying?

A: *The first ,second and the third respondents said that all material, especially science, can be taught using STEM depending on your preference*

Q: According to you, what are the supporting factors in implementing the STEM approach in learning on campus today? Give 2 answers

A: *The first and second respondents said the supporting factor, namely the human resources of lecturers who have an average minimum of master's education. The third respondents said that Capacity of internet, lecturer creativity and campus facility influence STEM implementing in campus.*

Q: According to you, what are the factors that hinder the implementation of the STEM approach in learning on campus at this time? Give 2 answers

A: *The first and second respondents said the inhibiting factor for the application of STEM was the willingness of lecturers to apply STEM in their learning. The willingness of the lecturer in learning the STEM approach will greatly assist*

the lecturer in teaching their learning using the STEM approach. The third *respondents said that ability lecturer in manage their time and give motivation in students influence implementing STEM in campus.*

4. Discussion

In this study, the Cronbach Alpha model was used to measure the reality of an instrument that was not a test, as seen in Table 2, the reliability tests to get the Cronbach Alpha used IBM Statistic SPSS software 23. Questionnaire used in the study (Murniati, Purnamasari, Ratnaningsih, Advensia, Sihombing & Warastuti, 2013). The higher Cronbach's alpha, the more reliable the instrument used in the study.

The Cronbach-alpha test showed that reliability with a higher number than the Cronbach alpha value column, the better reliability of the data, and it can be concluded that the instrument was reliable (Murniati et al., 2013). Cronbach's alpha was 0.750 for the material, 0.896 for the construct, and 0.778 for the language; this Cronbach's alpha number was included in the category of high reliability with a Cronbach's alpha> 0.05 (alpha), furthermore it can be used to answer the questions in the questionnaire used conclude in this study.

Non-test instrument validation Based on Table 3 and Table 4, level 1 and level 2 were in level 1 and level 2, the average validity value of the approval level of the experts was 81.5%, according to BSNP (2016) the rating was 81.5% which is in a good level. There were item criteria with a scale of three, i.e., there were experts who did not agree on the form and content of the instrument, although according to Table 4 in level 2 of the validation the value Average validity of the expert approval was at 93%. According to (BSNP, 2016) the score 93% at a very good level, this validity value increases compared to the validity value of level 1, the form and content of the certificate has been agreed.

The agreement between each of the experts is compared, presented in Table 6. It was obtained that the coefficients Cohen's kappa value was 0.038; 0.033; and -0.019. This means that there was low agreement between each of the experts being compared. While, the significance value was 0.289; 0.350; and 0.435 respectively. For a significance value greater than the 5% significance level used, the hypothesis was accepted and there was no significant agreement between the experts compared to the 5% significance level. According to (Warrens, 2015) and (Landis & Koch, 1977) used Cohen's kappa statistic for his research. There were five criteria for Cohen's kappa statistic about agreement expert like 0.00 - 0.20 indicates slight agreement, 0.21- 0.40 fair agreements, 0.41-0.60 moderate agreement, 0.61-0.80 substantial agreement and 0.81-1.00 indicates almost perfect agreement.

Research about teacher perceptions about STEM done by El-Deghaidy and Mansour (2015). They used instrument focus groups, teacher-reflection, and an interview protocol. Whereas, in this research about lecturers perception about STEM. It used a questionnaire and an interview protocol. The other research about teacher perception in STEM was conducted by Akiri, Tor and Dori (2021). They used 125 STEM coordinator subjects and teachers to see their perception of STEM learning with a questionnaire and an interview. According to Vennix, den Brok and Taconis (2017) conducted their research with students, teachers, and guides to see their perception of STEM. The data was obtained from 729 students, 35 teachers, and 12 guided activities STEM learning in the United States and Netherland. It used a questionnaire to get the data.

In this research, we conduct regarding lecturers' perception about STEM. The Lecturer's perception of the STEM approach can be seen in Table 7, Table 8, Table 9, and Table 10. It can be seen in Table 7 that most of the lecturers of mathematics and natural sciences and mathematics and natural sciences education at Universitas Jambi, the University State Islamic Sulthan Thaha Saifuddin Jambi, Mataram University, and Mandalika Education University understand about the STEM approach. However, most of them never attended STEM training either. The responsibility of individuals and stakeholders for the individual lecturers' quality in tertiary of their institutions if they want to teach courses with the STEM approach.

It can be seen in Table 8 that most of either the lecturers of mathematics and natural sciences or mathematics and natural sciences education at Universitas Jambi, Universitas Islam Negeri Sulthan Thaha Saifuddin Jambi, Universitas Mataram, and Mandalika Education University could define the STEM approach have not attended STEM training. Most of them also said that the STEM approach could be applied on campus depending on the willingness of lecturers and the COVID 19 pandemic. The responsibility of individuals and stakeholders in higher education influences courses with the STEM approach. Learning with the STEM approach can be done by looking at the steps of the STEM approach through books, journals, and others.

It can be seen in Table 9 that most of the lecturers of mathematics and natural sciences and mathematics and natural sciences education at Universitas Jambi, Universitas Islam Negeri Sulthan Thaha Saifuddin Jambi, Universitas Mataram, and Mandalika Education University never applied learning with the STEM approach and designed STEM-based learning. Most of them also said the STEM approach was difficult to apply to the material depends on the characteristics of the learning material. The characteristics of STEM learning can improve students' HOTS abilities. Several reasons lecturers were in accordance with the STEM theory. It was very easy. Science required mathematics in its calculations, technology in its implementation, and engineering to get the best way of application. If the lecturer wants to teach STEM, it actually depends on the willingness of the lecturer himself. Selection of teaching materials, instructional media and lesson planning can be designed using the STEM approach.

It can be seen in Table 10 that most of the lecturers of mathematics and natural sciences and mathematics and natural sciences education at Universitas Jambi, Universitas Islam Negeri Sulthan Thaha Saifuddin Jambi, Universitas Mataram, and Mandalika Education University can provide answers to supporting and inhibiting factors in the application of the STEM approach in learning. Only 4 lecturers said that they didn't know about STEM approach in learning. Most of the lecturers said that the supporting factors for STEM implementation were adequate facilities and infrastructure in the form of workshops, internet access and others. Meanwhile, the inhibiting factors for the implementation of STEM mostly said that human resources were still low and the COVID-19 pandemic.

In addition, from the interview results of the third lecturer, it can be seen that the third lecturers understand in detail about STEM approach in learning. The third of lecturers interviewed, two lecturers had implemented and designed STEM in their learning process, and one never did it. It means that the willingness of the lecturers greatly influences the implementation of STEM in their learning. **STEM approach can implementation on campus depending on the lecturer's perception of the STEM approach.**

5. Conclusion

From the results of data analysis and processing, it can be concluded that the non-test instrument used to measure lecturers' perceptions about the STEM approach was reliable and valid. The test results obtained by Cronbach's alpha were 0.750 for the material, 0.896 for the construct and 0.778 for the language. This Cronbach alpha number included in the high reliability category with a Cronbach alpha number > 0.05. Meanwhile, the average validity value of the expert approval level for non-test instruments increased from 81.5% in the good category to 93% with the very good category. While the coefficients Cohen's kappa value was 0.038; 0.033; and -0.019. It means that there were low agreements between each of the experts being compared. In addition, the lecturers' perceptions about the STEM approach in learning were mostly very good. However, the willingness of the lecturers greatly influences the implementation of STEM in their learning.

Declaration of Conflicting Interests

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