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Analysis of Creative Thinking Skills Based on Contextual Teaching and Learning in Physics Education Students

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Abstract: This study aims to analyze students' creative thinking skills based on Contextual Teaching and Learning (CTL) in basic physics 1 subject, the physics education study program at Pattimura University. The research subjects were 22 students in semester 1 class of 2022. This research uses quantitative and qualitative descriptive research types. The research design used is a one shot case study. The instruments in this study are, 1) Observation sheets, to assess student creativity during the learning process. 2) Questionnaire sheet, to see student responses related to CTL learning and creative thinking skills. Data analysis in this study was carried out using quantitative descriptive analysis. The results of the study show that indicators of creative thinking skills have percentages, namely Elaboration of 60.61%, Flexibility of 57.58%, and Originality of 56.06%. The three indicators have percentages above 50% and the average final score for creative thinking skills for physics students class of 2022 is 58.08. So it can be said that creative thinking skills are sufficiently mastered by students. Student response data to learning using the CTL model was obtained at 73.27% in the satisfactory category. Based on the results of the study, it can be concluded that students' creative thinking skills based on CTL are sufficiently mastered by students.

Keywords: Fundamental of physics 1; Creative thinking skills; CTL

Introduction

21st century skills include creativity and innovation, thinking effectively, systematically, making decisions and solving problems, communicating clearly and being able to collaborate with others, information literacy, media and ICT, flexibility and adaptability, initiative and independence, productivity and accountability, leadership and be responsible (Geisinger, 2016). Lecturers as an important component in education have a great responsibility in achieving curriculum competence (Oleksiyenko & Ros, 2019; Parker et al., 2022). Lecturers must also be able to make learning take place interactively, inspiring, fun, challenging, motivating students to actively participate (Jonsmoen & Greek, 2017; Licorish et al., 2018). According to Piaget's theory that learning is centered on thought processes or mental processes, not just on the results (Slavin, 2015; Marwaha et al., 2017).

Wati et al. (2021) emphasized that the weak learning process in Indonesia prioritizes the philosophy of 'vocal teacher, silent student'. During the learning process, students are less encouraged to develop thinking skills and place more emphasis on memorization (Leasa et al., 2016; Fenanlampir et al., 2021). Based on the results of observations, students still lack creative thinking, so that in learning it is not only more focused on mastering concepts but more on training students' creative thinking skills (Leasa et al., 2021). Students are used to learning by memorizing without understanding what they are learning, so that the material obtained is not firmly embedded in memory and also creative thinking is less trained and ultimately affects their academic achievement (Wartono et al., 2018).

Creative thinking is related to the discovery of something, regarding things that produce something new by using something that already exists (Black et al.,

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2015; Ceylan, 2020). Creative thinking is a thought that tries to create new ideas (Kim, 2011; Karam & Elfiel, 2021). Creative thinking is a series of processes, including understanding problems, making guesses and hypotheses about problems, looking for answers, proposing evidence, and finally reporting the results (Suherman & Vidákovich, 2022; Batlolona & Diantoro, 2023), so it can be concluded that creative thinking is the ability to analyze something based on data or information to generate new ideas in understanding something (Batlolona et al., 2019; Nikkola et al., 2020).

Indicators of creative thinking put forward by Torrance (1972) are as follows: 1) Fluency, including; a. Generates lots of ideas, lots of answers, lots of problem solving, lots of questions smoothly; b. Providing multiple ways or suggestions for doing things; c. Thinking of more than one answer. 2) Flexibility, including; a. Generate varied ideas, answers or questions; b. Seeing a problem from different points of view; c. Looking for many alternatives or different directions; d. Able to change the way of approach or way of thinking. 3) Authenticity, including; a. Able to produce new and unique expressions; b. Thinking in an unorthodox way; c. Able to make unusual combinations of its parts. 4) Elaboration, includes; a. Able to enrich and develop an idea or product; b. Adding or detailing the details of an object, idea or situation so that it becomes more interesting.

To help students develop creative thinking skills and make it easier for lecturers to teach Basic Physics I concepts, a learning approach is needed that directly relates a learning context to real experiences in everyday life. This approach is a contextual approach or contextual learning and teaching approach Contextual Teaching and Learning (CTL). The CTL approach is an approach that enables students to strengthen, broaden, and apply academic knowledge and skills in various settings of life, both at school and outside of school (Hariharan, 2009; Ambrose et al., 2013). CTL is a learning concept that helps teachers relate learning material to students' real conditions and encourages students to use their own knowledge in everyday life (Tait et al., 2018). This method will help students become more independent and natural learners in their efforts to develop their own knowledge (Suryawati et al., 2010). Contextual learning in Indonesia stands on 7 principles, namely constructivism, inquiry, asking, learning communities, modeling, reflection, and authentic assessment (Suryawati et al., 2010).

Lotulung et al. (2018) explained that the contextual learning approach has seven main components of effective learning. 1) Constructivism is the philosophical foundation (thinking) of the CTL approach. Constructivism emphasizes building self-understanding actively, creatively and productively based on previous knowledge and knowledge and from meaningful learning experiences. 2) Questioning: Knowledge possessed by a person begins with "Questioning". Questioning is the main strategy of CTL-based learning. Asking questions in learning is seen as a lecturer activity to encourage, guide, and assess students' thinking skills. 3) Finding is a core part of CTL-based learning activities. This activity begins with observing phenomena, followed by meaningful activities to produce findings obtained by students themselves. 4) Learning Society is a group of people who are bound in learning activities so as to enable students to be able to exchange experiences and share ideas between one another. 5) Modeling: modeling means that in learning certain skills or knowledge, there are models that can be imitated. The model can be in the form of how to operate something, or the lecturer gives examples of how to do something. In CTL learning the lecturer is not the only model. Models can be designed by involving students. 6) Reflection is a process of depositing experiences that have been learned by teaching back the learning events or events that have been passed. 7) Actual assessment: assessment is the process of collecting various data that can provide an overview of student learning development. The data collected through assessment activities is not to seek information about student learning. Correct learning should be emphasized in efforts to help students to be able to learn, not emphasized in obtaining as much information as possible at the end of learning.

In contextual learning, the lecturer is in charge of managing the class as a team that works together to find something new for students (Dewi & Primayana, 2019). Something new, namely knowledge and skills, comes from "finding yourself" not from "what the lecturer said" so that learning will become more meaningful for students. Thus the aim of this research is to analyze the creative thinking skills of CTL-based students in basic physics course 1, the physics education study program at Pattimura University.

Method

Research Design

Using a one shot case study research design where a group is given treatment (treatment) and then the results are observed (Yin, 1981).

Research Subject

The research subjects used were all students of the Physics Education Study Program FKIP Unpatti Class of 2022 which offered 22 Basic Physics I courses.

Research Instruments

The research instruments used were 1) observation sheets to assess student creativity during the learning process, 2) questionnaire sheets to determine student responses related to CTL learning and creative thinking skills.

Research Procedure

This study used the following procedures: (a) Conducting initial observations, (b) Preparation of proposals, (c) Preparation of research instruments, (d) Validation of Instruments, (e) Data collection, (f) Preparation of reports.

Research Data Analysis Techniques

This study aims to analyze students' creative thinking skills based on CTL (Contextual Teaching and Learning) in Basic Physics I Course in the Physics Education Study Program, University of Pattimura. The research sample used was 22 students from Batch 2022 who offered Basic Physics I courses. This study used a quantitative and qualitative descriptive research type. One shot case study research design f. Instruments in the study included 1) observation sheets to assess student creativity during the learning process, 2) questionnaire sheets to see student responses related to CTL learning and creative thinking skills. Data analysis used quantitative descriptive analysis to describe data in the form of percentages and explain data or events with explanatory sentences qualitatively. Response data and creative thinking skills are calculated using the formula:

$$\text{Achievement Value} = \frac{\text{Total score gain}}{\text{Maximum score}} \times 100 \quad (1)$$

Result and Discussion

The findings are shown in Figure 1, it can be seen that the three indicators of creative thinking skills studied have a high to low percentage, namely Elaboration 60.61%, Flexibility 57.58%, and Originality 56.06%. The percentage results for the three indicators of creative thinking skills are not too different. The three indicators have percentages above 50%, so it can be said that the creative thinking skills on the Elaboration, Originality, and Flexibility indicators are sufficiently mastered by Physics students Batch 2022.

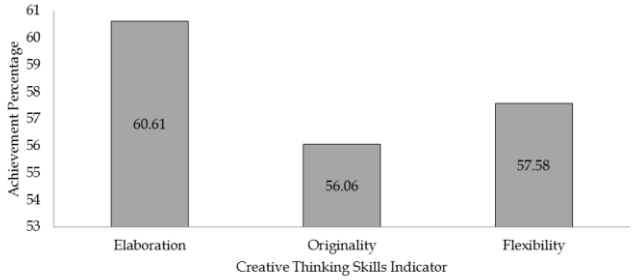

Figure 1. Percentage of achievement of indicators of creative thinking skills

Figure 2 can be seen that there were 8 students who got the final score in the quite satisfactory category with a score of 66.67 – 88.89 or it can be said that 36% of students got the final mark on creative thinking skills in the quite satisfying category. While as many as 64% of students get the final score of creative thinking skills unsatisfactory. The average final score for creative thinking skills for Physics students Batch 2022 is 58.08.

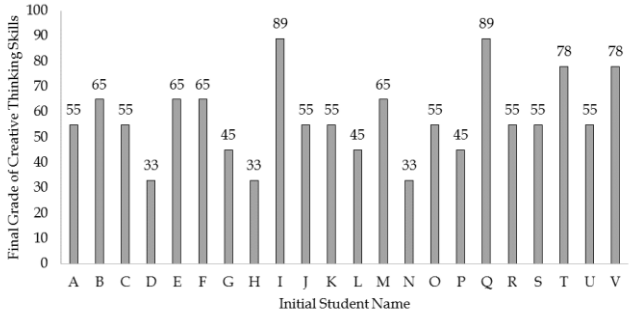

Figure 2. The final value of creative thinking skills for each student

Table 1. Percentage Response Questionnaire Results per Answer

Statement	Strongly Agree		Agree		Doubtful		Don't agree		Strongly Disagree	
	F	Percentage	F	Percentage	F	Percentage	F	Percentage	F	Percentage
1	4	18.181	10	45.454	2	9.0909	5	22.727	1	4.545
2	5	22.727	10	45.454	5	22.727	2	9.090	0	0
3	8	36.363	10	45.454	4	18.181	0	0	0	0
4	3	13.636	8	36.363	4	18.181	4	18.181	3	13.636
5	2	9.090	13	59.090	5	22.727	2	9.0909	0	0
6	4	18.181	8	36.363	6	27.272	4	18.181	0	0
7	6	27.272	9	40.909	3	13.636	4	18.181	0	0
8	4	18.181	8	36.363	6	27.272	2	9.0909	2	9.090
9	9	40.909	9	40.909	4	18.181	0	0	0	0
10	4	18.181	8	36.363	4	18.181	2	9.0909	4	18.181

Student responses regarding the CTL model used during the learning process using a questionnaire consisting of 10 statements are shown in Table 1 and Figure 3. Table 1 can be seen that the number of students who answered strongly agreed was mostly found in statement number 9 with a percentage of 40%, the most agreed answers were found in statement number 5 with a percentage of 59.09%, the most doubtful answers were in statements numbers 6 and 8 with a percentage of 27.27%, the most disagreeable answers are in statement number 1 with a percentage of 22.73% and the most strongly disagree answers are in statement number 10 with a percentage of 18.18%.

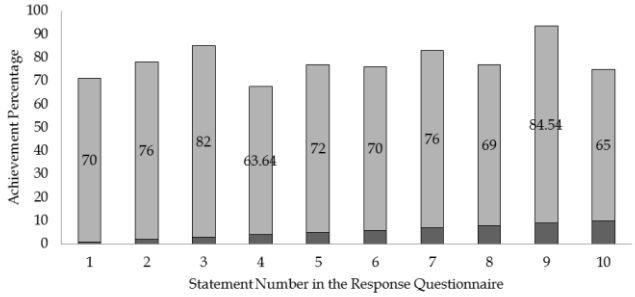

Figure 3. Percentage response questionnaire results per statement

Based on Figure 3, it can be seen that the statement with the highest percentage value is found in statement number 9, namely learning using the CTL learning model with learning resources with a percentage of 84.54% and the statement with the lowest percentage value is found in statement number 4, namely learning using the CTL learning model more emphasis on problem solving or problem solving with a percentage of 63.64%. In general, the average percentage value in the ten statements is 73.27%, so it can be said that student responses related to learning using the CTL model are in the quite satisfactory category.

According to Copping (2018) the low ability to think creatively results in students having difficulty solving problems encountered in learning. Each indicator has 3 criteria (Elaboration, Originality, and Flexibility) that must be met to get the maximum observation value. Elaboration has 3 criteria to get a maximum score, including: 1) being able to enrich and develop an idea, 2) adding or detailing the details of an idea object and 3) being able to conclude a problem. These three things are difficult if seen quite difficult to show by students especially semester 1 students, even though the material provided is relatively easy, namely measurement, but there are levels of thinking or problem solving that are classified as HOTS, so these 3 things are assessed in exploring a problem solving. Most students at the time of research are better able to add or detail the details of an object. Yarbrough (2016) states that solving problems in a systematic, sequential, more detailed, and full of explanations is a tendency for someone who has good elaborative thinking skills. While the thing that is quite difficult for students to show in the learning process is to conclude a problem because students must understand the contents of a problem so that they can make a more specific conclusion.

Originality has 3 criteria to get a maximum score, including: 1) being able to produce new and unique expressions, 2) making unusual combinations to show oneself, and 3) looking for new approaches to solving problems in their own way. The thing that is quite mastered by students is the criteria for making unusual combinations to show themselves. While the things that are difficult for students to show are the criteria for finding new approaches to solving problems in their own way and being able to produce new and unique expressions. In this indicator the researcher provides an overview of the problems regarding measurement material that is classified as HOTS, so that from these problems students must be able to demonstrate the three criteria seen in the Originality indicator. According to Batlolona et al. (2019) the originality indicator is the main feature in assessing a product of creative thinking which must be different from before.

Flexibility has 3 criteria to get a maximum score, including: 1) generating varied ideas, answers or questions, 2) looking at a problem from different perspectives, and 3) looking for many different alternatives or directions. The criteria that are often indicated by students are generating varied ideas, answers or questions. While the criteria that are quite difficult to show are seeing a problem from different points of view. The Flexibility indicator is a person's ability to generate ideas that consist of different categories or the ability to view an object or problem from various points of view (Wenno, 2021). Students must be able to analyze and solve a problem based on their creative ideas, besides that students are able to categorize an object or problem according to everyday life (ElSaid & Fuentes Fuentes, 2019).

From the results of the analysis of student response data, statement number 9 which received the highest percentage was regarding learning resources where during the learning process the researcher freed students to explore various matters regarding material from various learning sources not only in literature studies but also from students' daily lives. Glynn et al. (2004) stated that the Contextual Teaching and Learning (CTL) learning model is an educational process that can help students see meaning in the academic material they study by connecting academic material with the context

of everyday life. Furthermore, statement number 4 which gets the lowest percentage is regarding the emphasis on problem solving where during the learning process various problems classified as HOTS are given to be able to emphasize the specifications of the problem solving, but not all students are able to solve a given problem.

Conclusion

Based on the analysis of the research data, it can be concluded that 2 things are: 1) Students have sufficient mastery of creative thinking skills in the CTL model setting, this can be seen in the average final student score of 58.08 and the percentage of achievement on the three indicators (Elaboration, Originality and Flexibility) above 50%. 2) Student responses were obtained at 73.27% belonging to the quite satisfactory category, so it can be concluded that students gave positive responses to learning using the CTL model. From the results of this study, the authors recommend educational institutions to pay more attention to developing the quality of education so that it can produce various innovations and qualified higher education graduates. Thus, the authors suggest that researchers in the field of education can continue to train students' creative thinking skills and develop teaching materials related to these skills.

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Author Contributions

All authors were directly involved in this research, which started from the preparation of the proposal to publication in the journal.

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Conflicts of Interest

The author declares there is no conflict of interest with anyone

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