Analysis of ICARE Components in Learning Physics with Student Worksheets for Improving Learning Activities

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Abstract. Science process skills can be applied to students to gain hands-on experience guided directly by the teacher during the learning process. At this time science, and process skills cannot be applied with hands-on experience because learning is carried out online. Student Worksheet-based ICARE can help students in discovering, developing, and also applying material concepts. ICARE has five stages, namely Introduction at this stage explains the outline of the content of the subject matter as a whole, the goals achieved and the time and material needed. This research is aimed at analyzing the ICARE components contained in the student worksheet in improving learning. The analysis used in the form of descriptive statistics aims to see a description of each indicator of ICARE activity. Each indicator is analyzed based on an overview of the data distribution. The descriptive results of the data are continued with linear regression analysis with the Connecting indicator as a dependent variable and other indicators as independent variables. The results show that the ICARE component that plays the most role in learning is Connecting. This component has a very good performance among other components. In addition, the results of the regression test show that there is a positive relationship between the applying and extending components to the connecting component. This is harmony in the implementation of learning as a core activity for students.

Keywords: Worksheet; ICARE; Activity; Learning.

1 Introduction

The development of education in Indonesia cannot be separated from the development of science, technology, and art along with the development of constructing factual, conceptual, procedural, and metacognitive knowledge through scientific activities such as observing, questioning, formulating hypotheses, trying experiments, analyzing data, concluding and

communicating [1]–[3]. According to a survey from the Ministry of Education and Culture that most students do not understand the subject matter in distance learning during the Covid-19 pandemic, especially in science subjects such as Physics subjects which need teacher guidance in their learning to follow learning through experimentation, observation and active experimentation which later in learning can raise students' awareness and creativity [4], [5].

Science process skills can be applied to students to gain hands-on experience guided directly by the teacher during the learning process. At this time science, and process skills cannot be applied with hands-on experience because learning is carried out online. The indicators of students' science process skills in online learning have not been fully achieved as a whole to the maximum, this is due to the constraints of not doing experiments and the lack of direct guidance from teachers, and when doing their practicum individually by students, the tools and materials needed in the experiments are still minimal and students only use simple tools and materials at home [6], [7].

Teachers often use package books as teaching materials in learning. The Student Worksheet used by teachers in learning still has its drawbacks, namely only focused on achieving knowledge and Student Worksheet is designed and has not been developed based on a learning model, only contains a summary of the material, and practice questions, and does not use interesting designs or drawings and is rarely associated with daily life [8]–[11]. Therefore, a quality Student Worksheet is needed so that it can form the skills to find, develop and apply the concepts learned by these students, namely using Student Worksheet-based ICARE [12]–[15].

Student Worksheet-based ICARE can help students in discovering, developing, and also applying material concepts. ICARE has five stages, namely Introduction at this stage explains the outline of the content of the subject matter as a whole, the goals achieved and the time and material needed. Connecting this stage explains the concepts, facts, and processes related to the subject matter to be studied [13], [16]–[18]. Applying this stage presents a challenge for students to be able to apply the Connect stage by providing problems related to daily life. Reflect on this stage where students will reflect on what they learned and the experience gained at the Connect and Apply stage and Extend (continue) this stage where students will be allowed able to expand their knowledge gained by providing a broader problem such as providing enrichment and remediation.

2 Methods

The analysis used in the form of descriptive statistics aims to see a description of each indicator of ICARE activity. Each indicator is analyzed based on an overview of the data distribution. The descriptive results of the data are continued with linear regression analysis with the Connecting indicator as a dependent variable and other indicators as independent variables. This analysis is intended to see the relationship between indicators on the use of technology on student worksheets used in learning. For data processing, the IBM SPSS Statistics 27 software is used to help facilitate the analysis of data as a whole.

3 Results and Discussions

Based on Figure 1, the achievement of each ICARE indicator almost shows a normal distribution for student learning outcomes. This is seen from the results of observations of the activities carried out by following the instructions in the worksheet. The instructions on the worksheets are part of the stage deployment according to the ICARE indicators [6], [12], [16], [17]. This leads students to focus more on learning activities to achieve learning objectives. ICARE indicators direct students to form scientific skills which are a nurturing effect on the learning that is carried out. The results show that the ICARE component that plays the most role in learning is Connecting. This component has a very good performance among other components.
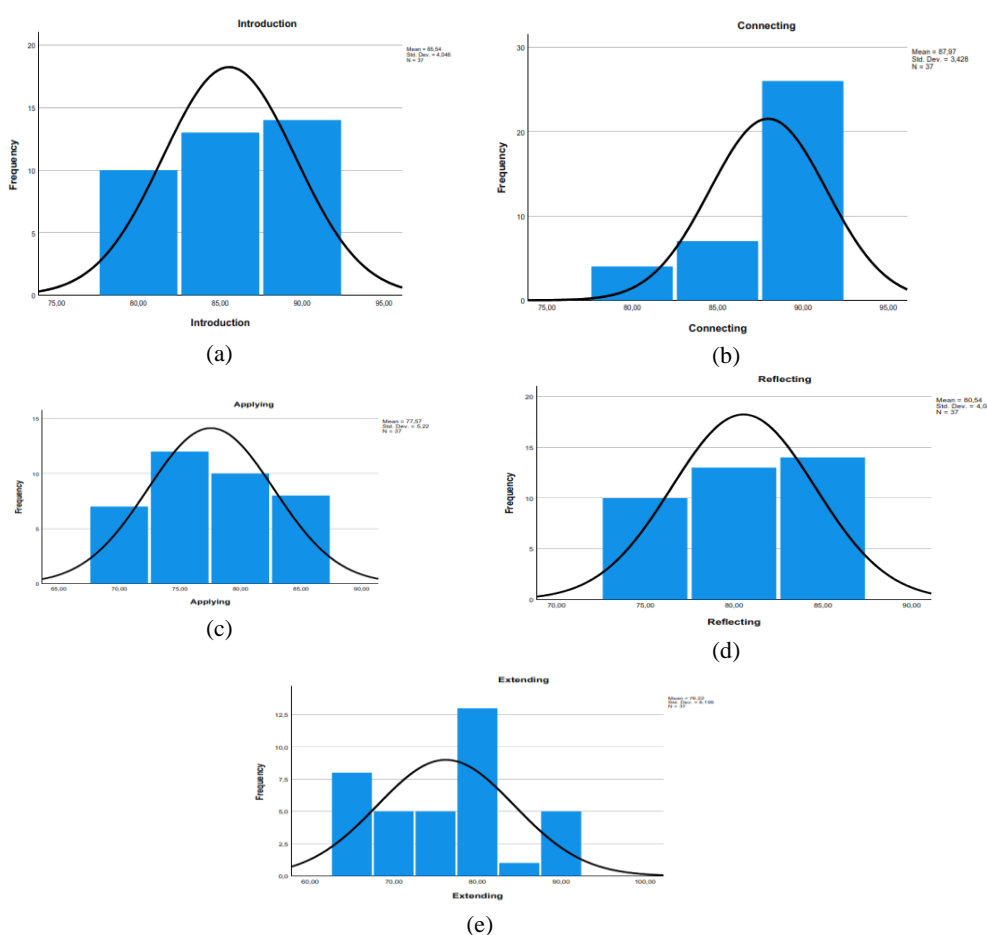

(a)

(b)

(c)

(d)

(e)

Figure 1. The Component data description ICARE; (a) Introduction; (b) Connecting; (c) Applying; (d) Reflecting; (e) Extending

Connecting has a better improvement value than the others because this activity is assisted by the use of learning media [19]–[21]. The use of learning media is the basis for forming students' understanding of the material. With the learning media, the delivery of material to students

becomes easier. It also makes learning more effective. In making learning effective, there are many things that educators can do [2], [4], [11], [12], [14], [17]. The use of this media is the most appropriate thing to explain Physics concepts that cannot be represented through facts that can be observed. Media selection is a key to success in learning because inappropriate media will become an obstacle to the connecting process to the materials and concepts being taught.

Table 1. The Correlation Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	,513[a]	,263	,171	3,12028	,263	2,861

Based on table 1 shows the results of the analysis of the relationship between ICARE learning indicators has an R square of 0.263. This correlation value is still relatively low, even though it has a positive influence on changes that occur during learning. This is because the difference between the ICARE indicators is not too significant and much different. This also underlies the reason the Connecting indicator becomes more dominant than the others [22], [23]. This is also evidenced by the Anova analysis which shows that there is a difference between the ICARE indicator relationships according to table 2. Table 2 shows a significant value that is less than 0.05. This proves that the differences between Connecting and other ICARE component indicators have a positive effect even though they have different strengths.

Table 2. The Anova Analysis

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	111,416	4	27,854	2,861	,039[b]
	Residual	311,557	32	9,736		
	Total	422,973	36			

a. Dependent Variable: Connecting

b. Predictors: (Constant), Extending, Applying, Reflecting, Introduction

The results show that the ICARE component that plays the most role in learning is Connecting. This component has a very good performance among other components. In addition, the results of the regression test show that there is a positive relationship between the applying and extending components to the connecting component. This is harmony in the implementation of learning as a core activity for students. ICARE is a strategy used to optimize learning [9], [12], [16]. This is a special emphasis to be able to apply ICARE simultaneously and in harmony between the comparisons of each component. This needs to be done because the equality of each

component is the basis for strengthening student activities. However, in some conditions, some of the ICARE components can be more dominant than others.

Learning with ICARE-Worksheet makes it easier for students to focus on learning activities carried out through instructional activities. These activities make students' skills trained in accordance with ICARE indicators. Students are more focused on developing their skills with the direction and use of learning media included in the use of worksheets. The cooperation that each group has makes social learning and students' social abilities more developed. Social skills are needed to be able to communicate effectively and smoothly. This is one of the advantages for students to show their existence and performance. The skills needed in the 5.0 era are a trigger that can be achieved in learning using ICARE worksheets.

The ICARE worksheet in its development continues to try to achieve broad learning outcomes. The breadth of these achievements is the key to developing the application of ICARE worksheets to meet learning needs. The need for ICARE worksheets is very important as student skills training can be developed and applied through various possibilities of technology-based learning media.

Technological advances that encourage learning using media and learning resources require users to have technological skills. These skills are also trained through the steps contained in the ICARE worksheet. The use of media and technology in learning is closely related to learning in the 5.0 era. Learning that carries the convenience of technology and thinking technologically makes technology the main thing in learning.

4 Conclusion

The results show that the ICARE component that plays the most role in learning is Connecting. This component has a very good performance among other components. In addition, the results of the regression test show that there is a positive relationship between the applying and extending components to the connecting component. This is harmony in the implementation of learning as a core activity for students. The equalization of functions in each ICARE component needs further analysis to prepare certain treatments in strengthening each indicator. This should be the basic topic of research development on ICARE.

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