

# Need Analysis of TPACK Oriented of ICARE Based Student Worksheet for Improving Students' Ability to Complete HOTS Questions

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**Abstract.** The aim of this research are: (1) to collect data required to develop ICARE based student worksheets that oriented on TPACK; and (2). to collect lecture team responses on *high order thinking skills* (HOTS) problems. The research method is survey. The subjects are Physics Education Lectures that responsible for General Physics Class at the department of Physics of Mathematics and Natural Science Unimed Medan. The instruments used for collecting data are: questionnaire, filling forms, interview, and documentation. Data analytic technique is descriptive. This research shows that: (1) the student worksheets -ICARE has a good category toward *TPACK* orientation which are consecutively the use of: SIPDA (85%), Google Classroom (55%), Schoology (40%), Webex Cisco Meeting (35%); and (2) lecture team response on providing HOTS problem as part of TPACK oriented-Student worksheet-*ICARE* in a very good is 90% which is in a very good category.

**Keywords:** Student's worksheet; ICARE; TPACK; HOTS

## 1 Introduction

The Indonesian involvement in the International Student Assessment (PISA) program is an effort to oversee the level of Indonesian education quality among the international education [1]. In reality most of the student ability is in lower order thinking skills, which are remembering, comprehension, and application, and it still few of them can answer high order thinking skills (HOTS) which are analyzing, evaluating, and creating. This trend is continued until first year students at university. Therefore we need to help students to increase their ability to deal with HOTS problems. HOTS is a transfer process of a problem, then with critical thinking skills we find the solution for the problem [2]. HOTS is divided into four categories which are problem solving, making decision, critical thinking, and creative thinking [3]. Critical thinking is the intellectually disciplined process of actively and skill fully conceptualizing, applying, analysing, synthesizing, and evaluating information gather from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to support argument and hypothesis, problem solving and make decision [4]. Creative thinking is defined as a skill lets you consider things from fresh perspective and different angle. It's an inventive thought process that results in surprising conclusion and new way of problem solving [5].

To increase student's ability equivalent to HOTS, a mutual support teaching system is needed. In relation to recent year online based learning for all level of study, a unity of aspects which are content, pedagogical, and technological. One of teaching approaches is a unity of technological pedagogical content knowledge (TPACK). In TPACK approach critical and creative thinking skills of students are required. In refer to TPACK characteristic, ICARE (introduction, connecting, applying, reflecting) teaching strategy is relevant in TPACK approach. ICARE teaching strategy puts forward characteristic: active, creative, and joyful learning [6]. ICARE student worksheet can increase student's creativity with N-gain value of 0,32 (average) [7].

To blend ICARE strategy and TPACK-based online teaching innovation of TPACK-oriented ICARE student worksheet is required. This innovation allows the use of effective technology to tech content and knowledge about aspects which make easier to study content, and how technology can help to solve problem faced by the students related to HOTS problems.

The initial steps that are required: (1) to conduct need analysis that related to the ability of field data that required for the TPACK-oriented ICARE student worksheet and (2) lecture team responses on HOTS problems. The two data are used to make innovation of initial design of TPACK-oriented ICARE student worksheet and HOTS problems. The innovation of TPACK-oriented allows the use of effective technology to teach content and knowledge aspects that make it easier to study content, and how technology can help students to solve problems related to HOTS problems.

## 2 Methods

The method used in this research is field study survey. The subjects are 20 general physics lectures and those who ever taught the subject of Physics Education Study Program of FMIPA Universitas Negeri Medan Indonesia.

The instruments used to collect data are: (a) questionnaire, (b) interview format, and (c) documentation format. The statements which are put in the three instruments involving learning resources used by both lectures and students, setting content strategy of module, test/assignment forms that put in the module, the need of test/problem variations, the use of e-learning, and the use of web application in the teaching process. Data analysis technique used descriptive analysis with percentage technique as follows

$$R = \frac{\sum \text{respondent answer of each answer choice}}{\sum \text{number of respondents}} \times 100\% \text{ [8]}$$

Where R = Respondent result

To determine the conclusion of the need level, the R score is converted into table 1 below.

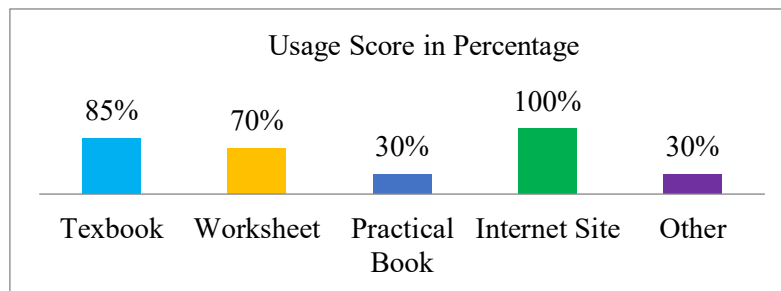
**Table 1.** Conclusion of range level.

Respondents Result (RR)	Conclusion
90 - 100	Very Needed
80 - 89	Needed
70 - 79	Enough Needed
>70	Not Needed

Adapted from the Universitas Negeri Medan Guidebook [9]

### 3 Results & Discussion

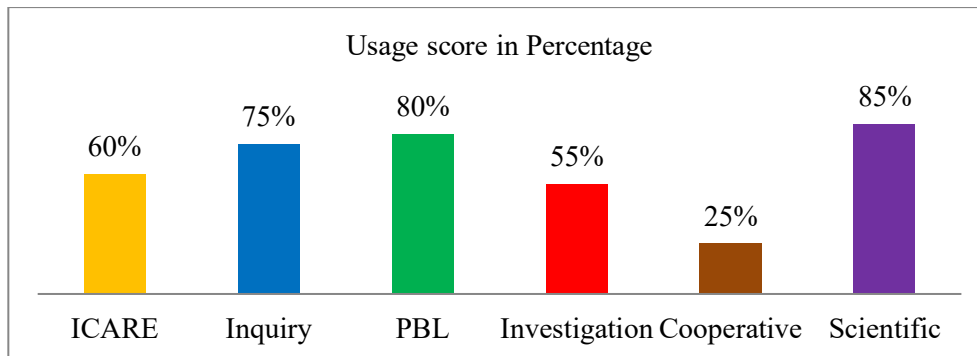
The need analysis result of the effect of TPACK oriented of ICARE based student worksheet on improving students' ability to complete HOTS questions are shown in several figures.



**Fig. 1.** Learning resource variations.

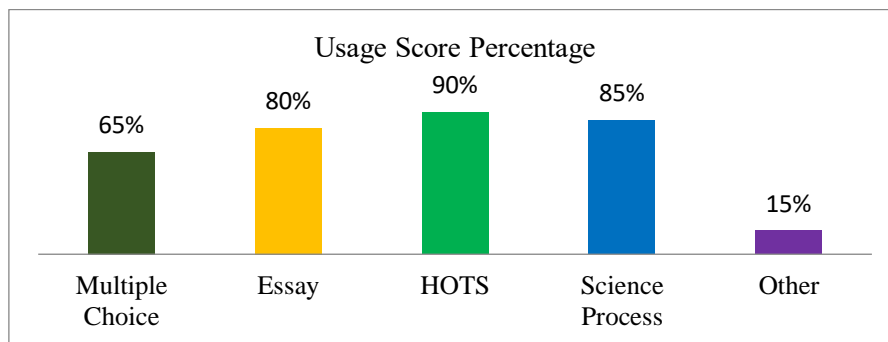
Figure 1 shows that the students have used several learning resources at General Physics subject. All lectures have used internet site as the main learning resources (100 %). In addition to internet site also used textbook (85%), worksheet (70%), practical book (30%), and other (30%). Learning resources such as textbook, worksheet, practical book, and have been commonly used traditional education, however due to covid 19 pandemic teaching and learning process is conducted online, and therefore the need of using internet site learning resources increasing sharply. The advantages of using internet site as the learning resources because it has unlimited items depends on the lecture management. Several researches show that the use of internet site can increase the student's learning outcome [10-11].

Content design is shown in Figure 2. It shows in teaching and learning of general physics several pedagogical aspects have in used. Inquiry, PBL, and scientific have been used in content design however student's achievement with standard test is still low. Therefore, innovative content design is using pedagogical aspect is still required. Several research results showed that teaching content setting that used ICARE strategy can increase pretest –posttest score with N-gain score is 0.38 in the medium category [12]. The use of ICARE based student worksheet is good enough improving student's skill on physics introduction level [13].



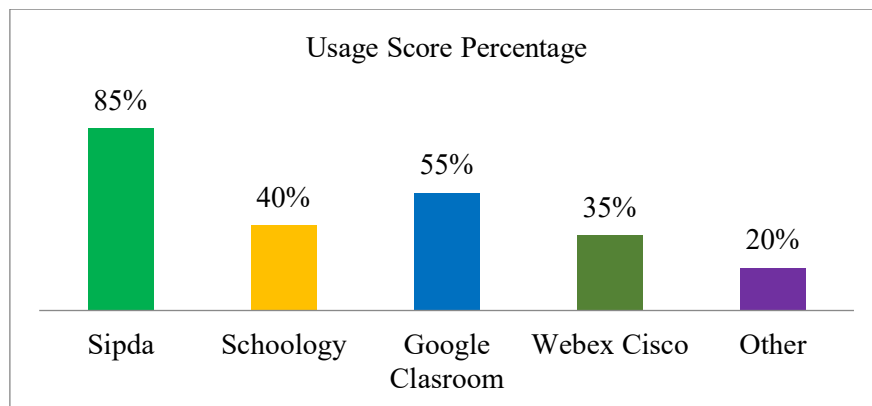
**Fig. 2.** Teaching material content setting strategy.

Figure 3 describes the variation of instrument assessment that was used to measure the student's achievement that is required by each lecture. The result shows that the based on the responses given by the lectures that the availability of HOTS-based tests is mostly needed (90%). HOTS-level tests can increase student's critical thinking and creativity [14].



**Fig. 3.** The need for variations in tests/assignments for students.

The research finding that related to the variation of the use of web application by general physics lecture team are given in Figure 4.



**Fig. 4.** Variations in the use of web applications by the lecturer team.

The figure 4 shows several web applications have been used by the general physics lectures with different percentage. This result shows that that capability of the lectures at Universitas Negeri Medan to support online class is sufficient. The percentage of lectures that using SIPDA application is 85%.

#### 4 Conclusion

Based on the results and discussion, the finding of this research are: 1) the student worksheets -ICARE has a good category toward *TPACK* orientation which are consecutively the use of: Sipda (85%), Google Classroom (55%), Schoology (40%), Webex Cisco Meeting (35%); and (2) lecture team response on providing HOTS problem as part of *TPACK* oriented-student worksheet-*ICARE* is 90% which is in a very good category.

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