What do physics teachers need? A need analysis of interactive multimedia to train creative thinking in static fluid

N E Susilowati¹*, A Samsudin¹, Muslim¹

¹Universitas Pendidikan Indonesia, Bandung, 40254, Indonesia

*nurendahsusilowati@gmail.com

Abstract. The purpose of this study was to analyze the needs of physics teachers in Lampung regarding interactive multimedia. Because many studies have proven the importance of using media in learning, it is necessary to conduct studies to reveal what media are needed to support static fluid learning according to the perceptions of physics teachers in Lampung. The analysis was carried out by providing a needs analysis questionnaire regarding learning media for static fluid material to 32 physics teachers in Lampung. Respondents were physics teachers with educational qualifications for Strata 1 and Strata 2, with 12 male respondents and 20 female respondents. Data presented in descriptive quantitative. Based on the results of the analysis, it is known that 88% of physics teachers need learning media that contains writing, pictures, animation, video, and audio to facilitate various learning styles and can train students’ creative thinking skills during online learning. Based on these findings, it is necessary to develop interactive multimedia to train creative thinking skill on static fluid topic.

1. Introduction

Creative thinking, which is often said as one of the most needed skills of this century [1], is a form of higher-order thinking skills which the activities are related to producing something original, new, different or unique, effective, meaningful, or beyond target [2]. However, it is not limited to ‘producing’ activities, creative thinking activities have a broader meaning. Referring to the creative thinking framework developed by the OECD, creative thinking activities are not only limited to producing different and creative ‘brilliant’ ideas, but also include evaluating, developing, and refining an idea [3]. Based on the Cognitive Flexibility theory, effective learning depends on the context. Thus, it is important to build students’ knowledge based on the representation of the information they are good at [4]. Unfortunately, the process of conveying information from teachers to students in practice is often only through one representation, verbal or oral [5]. So that students tend not to be actively involved in learning. Passive student involvement certainly has a negative effect on student learning outcomes [6]. Especially in the Covid-19 pandemic era, learning cannot only depend on the process of transferring information from teachers to students [7]. Therefore, learning media that also acts as a learning resource is needed, so that students become freer in learning with their own learning styles and representations. Interactive multimedia is a collection of several learning media that are arranged based on certain concepts and can be accessed using computer or gadget [8]. Interactive multimedia can help stimulate students’ thinking skills [9,10], because it contains various representations of concepts that can make it easier for students to learn according to their respective learning preferences [11]. Interactive multimedia
contains various types of media that are arranged interactively so that it allows students to learn abstract concepts [12].

Physics is a science that contains many abstract concepts. In understanding the concepts of physics, students must be able to use their imagination properly so that the concepts of physics can be accurately portrayed in their minds. Because the concept of physics explains natural phenomena through empirical evidence. How interactive multimedia works to help students understand the concepts of physics and practice students’ thinking skills is described in Figure 1.

![Interactive Multimedia Diagram](image)

**Figure 1.** How interactive multimedia works on students’ thinking abilities

In Figure 1, it can be seen that interactive multimedia generally consists of two important parts, material containing natural phenomenon, physics concepts, and applications in technology that are presented in various representations, like images (can also be in the form of graphics and tables), video, and sometimes animation. And student activities that include experimental activities, simulations, practices, evaluations, all of which are accompanied by feedback, so that activities do not only go in one direction (students towards the media) but also vice versa (media provide feedback to students). With this combination, students will be more independent in learning because interactive multimedia provides learning from various representations, and provides various activities that can be accessed independently by students.

Based on previous research, interactive multimedia has been shown to be able to train higher-order thinking skills [13], including creative thinking [9]. However, to ensure that the interactive multimedia that will be developed is in accordance with the needs of teachers, it is necessary to carry out a needs analysis.

### 2. Method

This research is a descriptive study with a qualitative approach [14]. This study aims to describe the physics teacher’s need for interactive multimedia to train students’ creative thinking skills during online learning. Respondents of this study were 32 high school physics teachers who taught class XI in Lampung. With the characteristics: 12 male physics teachers and 20 female physics teachers. 22 of them are bachelor’s graduates of Physics Education, 4 of them are bachelors of Natural Physics, and 6 of them are masters of Physics Education.

The instrument used in this study was a needs analysis instrument with 10 main indicators. From these ten indicators, 31 statements were developed. However, in this analysis, only 4 scales were used, namely strongly agree, agree, disagree, and strongly disagree. Neutral or doubtful scales are not used.
with the intention of making the teacher take sides. The example of statements developed from the indicator can be seen in Table 1.

**Table 1. Example of statement items on need analysis instrument.**

| Indicator                                           | No. of item | Statement                                                                                                         |
|-----------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------|
| Information related to the learning system during the pandemic                              | 1           | Physics teachers do online learning                                                                               |
|                                                    | 2           | Physics teachers implemented Physics learning according to the 2013 revised curriculum                           |
| Suggested aspects should be contained in interactive multimedia                              | 31          | Physics Teachers hopes that Interactive Multimedia on the topic of static fluids to be developed includes:         |
|                                                    |             | - Attractive themes and appearance                                                                               |
|                                                    |             | - User manual in simple language that is easy to understand                                                    |
|                                                    |             | - The learning objectives are in accordance with the indicators                                                |
|                                                    |             | - Attractive and appropriate background songs                                                                     |

The data were analyzed using interactive analysis by Miles and Huberman [15], with the stages of data collection, data reduction, data presentation, and conclusion.

3. Result and Discussion

Based on the results of the needs analysis questionnaire, it is known that 94% of the total respondents (high school physics teachers in Lampung) do online learning in this pandemic era, while 6% are still doing blended learning (face-to-face and online). Regarding the difficulties of teachers and learning approaches during online learning are presented in table 2.

**Table 2. Teacher difficulties and learning approaches during online learning (%).**

| Indicator                                           | Statement                                                                                                         | SA | A  | DA | SDA |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----|----|----|-----|
| Problems in online learning                         | Physics teachers feel the need to adjust to online learning                                                     | 56 | 32 | 9  | 3   |
|                                                    | Online learning is often passive and one-way                                                                    | 59 | 31 | 6  | 3   |
| Learning Approach (teacher-centered/student-centered?) | In learning, physics teachers do not act as the only source of information                                       | 69 | 25 | 3  | 3   |
|                                                    | Physics teachers give students the freedom to find other learning resources (apart from information from the teacher) during online learning | 56 | 38 | 6  | 0   |

**Note:**

SA: Strongly Agree  A: Agree  DA: Disagree  SDA: Strongly Disagree

Based on Table 2, it can be seen that more than 50% of respondents chose to strongly agree and more than 30% chose to agree that in online learning, learning only goes one way even though the teacher has given freedom for students to look for other learning sources besides the information provided by the teachers. This happened because the teacher cannot control nor meet face to face with students so that the teachers did not really know the student’s activities while learning. Moreover, in online learning, teachers also find it difficult to practice students’ creative thinking skills, this statement is guaranteed through the results of the questionnaire shown in Figure 2.
Based on the results of the questionnaire in Figure 4, it is known that more than 50% of respondents strongly agree with every statement regarding difficulties in training creative thinking skills in online learning. In the statement ‘In online learning, physics teachers emphasize the completion of the lessons rather than achieving learning objectives’, 78% of respondents strongly agree and 16% of respondents agree. In the statement ‘In online learning, the physics teachers emphasize the completion of lessons rather than training students’ creative thinking skills’, 56% of respondents strongly agree and 41% of respondents agree. This shows that most teachers feel that in online learning, it is very difficult to pay attention to the development of students’ creative thinking skills, learning is more focused on ‘lessons completion’ than on achieving learning goals. In fact, creative thinking skills are needed to learn physics concepts [16].

Based on the results of the questionnaire, it is also known that 78% of respondents (65% strongly agree and 13% agree) stated that they have used media, but the media is not interactive and has not been able to train students’ creative thinking skills. 88% of respondents stated that they need interactive multimedia that is able to train students’ creative thinking skills on static fluid topics. These results are shown in figure 3 (A and B).

Figure 3. (A) the media used in online learning is not interactive and ineffective to train students’ creative thinking skills, (B) teachers need interactive multimedia that is able to train students’ creative thinking skills on static fluid topics.
These results indicate that most physics teachers in Lampung agree that they need interactive multimedia that is effective to train creative thinking skills in online learning. Furthermore, the researcher also collected teacher opinion polls regarding what aspects are needed in the interactive multimedia that will be developed. Based on the results of a survey of 32 high school physics teachers, the results were as described in Figure 4.

Figure 4. Must-have aspects in interactive multimedia.

Note:
A: Attractive theme and appearance
B: User manual in simple and easy to understand language
C: The learning objectives are in accordance with the indicators
D: Attractive and appropriate background music
E: Applications that are easily accessible with a laptop
F: Attractive and legible font and font size
G: Images/animations/videos related to physics phenomena related to the concept of static fluids
H: Problems that stimulate creative thinking skills
I: Examples of static fluid concept applications in technology
J: Practice questions, assignments, along with discussion
K: Tutorials to solve problems related to creative thinking skills (feedback)
L: Learning activities such as simulations and experiments that practice creative thinking skills
M: Evaluation
N: Scoring Guidelines

Along with the rapid development of technology, students are growing familiar with digital technology, so, online learning should not be something that is considered as a problem. However, based on survey results, more than 80% of physics teachers in Lampung agreed that online learning was often ineffective because it was one-way. Therefore, interactive multimedia involvement is needed to stimulate students to actively learn independently. Based on the survey results, 79% of teachers stated that they had used the media in learning but the media used were not interactive, so they could not stimulate students to take an active role in learning. Additionally, the learning media used also do not train students’ creative thinking skills, while online learning is also not able to develop students’ creative thinking skills. In fact, creative thinking skills are needed to master physics concept [17]. Because the concept of physics cannot be seen directly but must go through a process of thinking and imagining, this statement is supported based on Sari’s research and which stated that to master the concepts of physics, higher thinking skills are needed [10]. For example, in static fluids topic students can mention the concepts of floating, drifting, and sinking, but to understand the concept of buoyancy, students need the
creative thinking ability, because buoyancy cannot be seen directly but through a process of deep thought and observation. Therefore, mastery of creative thinking skills is very important in learning physics [16]. Therefore, interactive multimedia that is able to train creative thinking skills on static fluid topic is needed.

4. Conclusion

Based on the results of the study, it is known that 94% of high school physics teachers in Lampung do online learning, and more than 80% of high school physics teachers in Lampung state that online learning is often one-way, making it difficult to develop creative thinking skills. 88% of teachers stated that they needed interactive multimedia that was able to train students’ creative thinking skills on static fluid topic. So it takes the development of interactive multimedia to train students’ creative thinking skills on static fluid topic in online learning.

5. References

[1] Akpur U 2020 Critical, Reflective, Creative Thinking and Their Reflections on Academic Achievement Think. Ski. Creat. 37
[2] Beghetto R A 2019 Rev. Educ. 2 311
[3] OECD 2021 PISA 2021 Creative Thinking Framework (Third Draft) Oecd 53 pp. 1689–1699
[4] Zajączkowska M and Abbot-Smith K 2020 “Sure I’ll help—I’ve just been sitting around doing nothing at school all day”: Cognitive flexibility and child irony interpretation J. Exp. Child Psychol. 199
[5] Rachmadtullah R, Zulela M S and Sumantri M S 2018 Int. J. Eng. Technol. 7 2035
[6] Aulia R M, Suparman and Hairun Y 2020 Univers. J. Educ. Res. 8 559
[7] Helma H and Murni D 2021 Study of factors affecting student learning outcomes in Real Analysis lectures during the Covid-19 pandemic J. Phys. Conf. Ser. 1742
[8] Talidong K J B and Toquero C M D 2021 Facing COVID-19 through Emergency Online Education Anchored in Khan’s Framework: Case of Philippine Teachers in Xi’an, China Eur. J. Interact. Multimed. Educ. 2 e02104
[9] Kartika Y, Wahyuni R, Sinaga B and Rajagukguk J 2019 Improving Math Creative Thinking Ability by using Math Adventure Educational Game as an Interactive Media J. Phys. Conf. Ser. 1179
[10] Hakim A, Liliasari L, Setiawan A and Saptawati G A P 2017 Pendidik. Fis. Indones. 13 33
[11] Rachmadtullah R, MS Z and Sumantri M S 2018 Intericiencia 47 13
[12] Irwandani I, Umarella S, Rahmawati A, Meriyati M and Susilowati N E 2019 Interactive Multimedia Lectora Inspire Based on Problem Based Learning: Development in the Optical Equipment J. Phys. Conf. Ser. 1155 0–11
[13] Mursid R, Sitompul H and Saragih A H 2019 Atlantis Press 384 759
[14] Athifah D and Syafriani 2019 Analysis of students creative thinking ability in physics learning J. Phys. Conf. Ser. 1185
[15] Matthew B M, A M H and Johnny S 2014 Qualitative data analysis : a methods sourcebook (Thousand Oaks, Californinia: SAGE Publications)
[16] Wicaksono I, Wasis and Madlazim 2017 J. Balt. Sci. Educ. 16 549
[17] Eadkong T 2020 Unraveling the vertical motion of Dipterocarpus alatus seed using Tracker Phys. Scr. 95