Improving Student Ability in Solving Problems Through Electronic Student Worksheets

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Abstract. The ability of students to solve problems is an ability that must be continuously trained and improved. The ability to solve problems in citizenship courses is the ability to analyze problems and find effective solutions to solve problems in the lecture. Through this research, researchers want to know the needs of students for questions that train them to solve problems but are packaged in an electronic student worksheet. In the previous research, the researcher packaged these questions in a book and now tries to make them in the form of electronic student worksheets. Based on the results of the questionnaire distributed via Google Forms, it is known that 95% of students need electronic worksheets because they are easier to read and use whenever they have the link. In addition, according to students, by using electronic student worksheets students can immediately obtain or see the results of the answers to the questions they are working on so that they are more enthusiastic in answering every question available in the electronic worksheet. Thus, the research team continued to develop student worksheets based on problems and accompanied by projects. Research activities are carried out using R&D research methods.

Keywords: Student Ability · Problem Solving · Electronic Student Worksheet

1 Introduction

Education as a conscious and planned effort certainly has an important goal for the survival of human life. In the scope of higher education, it is expected that education can facilitate students to be able to think critically, actively, creatively, and able to solve problems, so that learning activities and interactions between lecturers and students are expected to occur in a good and conducive manner. Good learning is certainly not only one-way, for example, lecturers only provide material and students only listen to the theories presented by the lecturer. But good and effective learning is two-way learning, namely between lecturers and students, they make a real and relevant contribution to the learning process both inside and outside the classroom because learning is a process of interaction between students and educators, with lesson materials, delivery methods, learning strategies, and learning resources in a learning environment and Learning can be interpreted as a product of the continuous interaction between development and life experiences [1, 2].

This is what underlies the current development of education, especially in tertiary institutions where learning is student-centered, so it is hoped that students will have a more active role in learning in whatever subjects they take, especially citizenship courses which in fact are compulsory subjects in higher education.

Citizenship course is one of the subjects that must be followed by all students regardless of the study program and faculty they are registered as a student. The importance of the existence of citizenship courses or by other names used by each university will certainly not eliminate the meaning that this course must contribute to the development of values, morals and attitudes of students' behavior as well as to increase their academic intelligence. Indeed, of course, this course will often come into contact with our daily lives as part of society and generally as citizens. The constitutional juridical basis for the importance of Citizenship Education being taught up to the university level is Article 37 paragraphs (1) and (2) of Law no. 20 of 2003 concerning the National Education System which states that Citizenship Education must be included in the curriculum for basic education, secondary education, and higher education which is intended to shape students into human beings who have a sense of nationality and love for the homeland in accordance with Pancasila and the 1945 Constitution of the Republic of Indonesia [3]. And based on Article 3 of the Decree of the Director General of Higher Education No. 43/*Dikti*/2006 concerning Signs for the Implementation of Personality Development Courses in Higher Education, Citizenship Education is one of a group of Personality Development Courses designed to provide students with an understanding of basic knowledge and skills regarding relations between citizens and preliminary education to defend the state as a provision to become citizens who can be relied on by the nation and state [4].

The Pancasila and Civic Education study program itself contains material on existing and developing laws and politics. Students are taught to be more democratic, more critical of the problems that are happening both at home and abroad. Not only theory is given, but also provides a touch of moral and social attitudes. Filtering culture from outside to suit the personality of the Indonesian nation, namely Pancasila. Internalizing the values in Citizenship courses is one of the efforts to raise the national spirit of the younger generation, especially students in facing the effects of globalization and strengthen the spirit of defending the country. In line with the opinion of Neldison that Citizenship Education is a subject that focuses on the formation of citizens who understand and are able to carry out their rights and obligations to become good citizens, who are intelligent, skilled, and have character as mandated by Pancasila and the Constitution of the Republic of Indonesia. Citizenship Education is a subject that focuses on the formation of a diverse self in terms of religion, sociocultural, language, age, and ethnicity [5]. The aim is to foster awareness of love for the homeland, to know about rights and obligations in the defense of the state, and to maintain the unity and integrity of the nation within the framework of *Bhinneka Tunggal Ika* because students are considered as intellectuals. In fact, in certain places, students will always be hailed as agents of change for a country and a nation. Thus, of course, there is great hope for the formation of human beings who are critical, creative in solving problems and have attitudes and behaviors that uphold their rights and obligations as a form of their love for the State through citizenship courses. Given the importance of citizenship courses for students, of

course, it requires appropriate learning models and evaluation tools to improve students' abilities in solving crucial problems both related to learning materials and problems that are used as discussion material and finding solutions in the life of the nation and state. The model is a general pattern of learning behavior to achieve the expected learning goals [6]. The learning model is wrong an important component in learning [7]. One of the learning models that can be used is a problem-based learning model, namely a learning model that uses concrete problems in everyday life as a means for students to learn at a higher level of thinking [8]. The use of problem-based learning models certainly has a strong reason to be chosen as a relevant problem model in the learning process of citizenship courses that are required for values because every individual in his life will definitely face various problems that require his ability to solve these problems. The ability to solve problems is inseparable from the ability to think where the ability to think is seen as a person's ability to solve a problem by using his reasoning [9]. In an effort to find solutions to problem solving, students always interact, both interactions between students and interactions between students and teachers [10].

The problem-based learning model has a way of overcoming problems in real-life learning, emphasizing problem-solving investigative activities [11]. Therefore, students need a problem-based learning model to strengthen students' ability to solve problems. Students must be equipped with problem-solving skills so that they can make careful and right decisions. Through learning with this model, students will get used to solving problems by considering various perspectives. The problem-solving ability in learning with a problem-based learning model consists of six procedural aspects, namely the ability to (1) identify problems, (2) formulate problems, (3) analyze problems, (4) draw conclusions, (5) evaluate, (6) solve and solve problems [12].

Of course, even if the problem-based learning model has been used in learning, it requires an evaluation tool as a follow-up to measure the achievement of students' ability to solve problems. Based on the results of research conducted by previous researchers regarding the development of a HOTS-based civic education question bank that is packaged in the form of a book where one of the abilities measured is the ability to solve problems, the N-Gain results are 0.57 medium category, with an increase in the average pre-value. -posttest is 0.17% which means the question bank developed by the team is valid and effective and has a potential effect in training students' higher-order thinking skills, including problem solving. Through this research, researchers will package these questions using electronic student worksheets. This electronic student worksheet itself contains material and questions that will be used by students in improving their problem-solving abilities. By analyzing the literature and previous research, the researcher is eager to know the opinions of students regarding the need to increase students' ability to solve problems in citizenship courses through the use of electronic student worksheets, considering technological developments, communication, and information in Indonesia encourages the educators to use IT as a source media to support the learning process [13]. The researchers realized this desire by distributing questionnaires via google form to students.

2   Method

The research method used in this study is the R & D method with the ADDIE approach, namely at the needs analysis stage by distributing questionnaires through google forms and literature studies. The results of the needs analysis in this study will serve as a guide for further research, namely the development of problem-based student worksheets and projects in citizenship courses. The ADDIE development model has a procedure that includes several steps including (a) analysis, (b) design, (c) development, (d) implementation, and (e) evaluation [14]. Where in the first stage that must be analyzed, namely students/students (Learners), learning includes goals, media to convey teaching materials or resources [15].

The purpose of this research is to find out the right product to be developed according to the needs of students and the problems found in learning citizenship. The research was carried out in March 2022. The research subjects were 50 students who had taken citizenship courses in the even semester of 2021/2022. The data collection technique used was in the form of a needs analysis questionnaire for the development of problem-based electronic student worksheets and projects in the citizenship course which was developed based on analytical indicators at the ADDIE development model stage. The questionnaire was distributed to respondents via google forms. The data obtained were then analyzed using descriptive analysis based on the results of the number of answers given by the respondents.

3   Result and Discussion

Research and development activities are of course based on needs in the field. This need is certainly an imbalance between the desired conditions and the current conditions.

Table 1. Analysis of student characteristics

No	Variable Analysis	Description	Percentage
1	Students' initial knowledge of worksheets	Have knowledge of the use of electronic student worksheets in learning	82,5%
2	Perception of electronic worksheets	Have a positive view of the use of electronic student worksheets in learning	85%
3	Ability to use IT	Have a habit of using digital resources in daily life	87,5%
4	Motivation	Have an interest in the use of electronic student worksheets in learning	92,5%
5	The potential for the presentation system	Students need electronic student worksheets so that they can be used as a means to improve their ability to solve problems in citizenship courses	95%

Thus, the steps to overcome these problems are to improve the quality of the required capabilities through needs analysis. Analysis of the needs of increasing students' ability to solve problems in this study is an analysis of the needs of teaching materials to determine the types and models of teaching materials needed by students in order to increase student abilities. Information gathering needs is done by distributing questionnaires to respondents about the needs in the field. From the results of the questionnaire, all student needs are described and analyzed as the first step in developing products in the form of problem-based electronic student worksheets and projects in citizenship courses to improve students' ability to solve problems. In the ADDIE development model, there are several important parts that need to be analyzed including (a) analyzing learner characteristics (b) analyzing resources, and (c) analyzing learning objectives [16].

3.1 Student Characteristics

Based on the results of the needs analysis that has been carried out by researchers, the following data are obtained. The analysis of student characteristics contains an analysis of students' prior knowledge of worksheets, perceptions of electronic worksheets, initial ability to use IT, motivation, potential for presentation systems, learning styles, and group characteristics using a questionnaire via google form. The substance of student characteristics is offered to students and becomes the answer choice in the distributed questionnaire. Respondents are given a link that is integrated into the google form, then choose the answer options that have been provided. The results of the needs analysis for students in detail can be seen in Table 1.

Thus, the characteristics of students in this case are students already familiar with electronic student worksheets, their perception is also positive about the electronic worksheets. In addition, students are also interested in using electronic worksheets and think that they agree that these electronic student worksheets can help students improve their ability to solve problems in citizenship courses.

3.2 Resource Analysis

Analyzing resources related to the source of material content or content that can be written in electronic student worksheets for example from books, journals and other reading materials that are in accordance with learning materials, the availability of technology to access electronic student worksheets such as cell phones, laptops, computers and others as well as student understanding of technology or IT. The results of the needs analysis can be explained in Table 2.

Based on this analysis, it is known that the substance of the content desired by students is contained in electronic worksheets that can be accessed in journals, books or other sources relevant to the learning material, besides that students have laptops/gadgets or cellphones to support the use of electronic student worksheets and students are very understanding in using the device.

3.3 Learning Objectives

The last analysis activity is carried out by analyzing the learning objectives, which include learning outcomes that must be taken by students based on the content of the

Table 2. Resource analysis

No	Variable Analysis	Description	Percentage
1	Content Source	The substance of the content of the electronic student worksheet is available in journals, books, and other sources related to learning materials for citizenship courses	88,5%
2	Technology Availability	Students have laptops/gadgets, cellphones that can support the use of electronic student worksheets	100%
3	Technology Understanding	Students have an understanding of the use of digital technology in learning	93,5%

Table 3. Learning objectives

No	Variable Analysis	Description	Information
1	Understand the basic concepts of integrated learning	Electronic student worksheets can support understanding of civics learning materials	In accordance
2	Analyzing problem-based learning models	Electronic student worksheets can be adapted to the needs of improving students' ability to solve problems	In accordance
3	Developing learning tools	Electronic student worksheets help in developing digital learning tools	In accordance
4	Simulating teaching materials	Electronic student worksheets help to simulate teaching materials to achieve learning objectives	In accordance

courses carried out with a breakdown of graduate competency standards. The results of the detailed analysis of learning objectives can be seen in Table 3.

The analysis of learning objectives shows that the developed electronic student worksheets are expected to support understanding of civics learning materials, can be adapted to the needs of increasing students' ability to solve problems, can assist in the development of digital learning tools, and can simulate teaching materials to achieve learning objectives. In development research, needs analysis activities are a very important part and step. Development research needs to start with a step where the researcher conducts a needs analysis before product development activities are carried out, so that the product to be developed departs from the data from the interpretation of the needs analysis carried out at the beginning [17]. This activity is often interpreted as an initial research activity before researchers determine the type of product to be developed. This means that needs analysis is an activity to collect information in an effort to make a priority decision, to identify needs that are relevant to learning.

Based on the results of the analysis of the needs of student worksheets as an effort to increase students' ability to solve problems, it shows that students are more likely to have an interest in electronic worksheets because they can be accessed anytime and anywhere when they are online. This is because the current learning needs lead to online learning. The student worksheets developed refer to the development of electronic worksheets, students think that electronic-based student worksheets will make it easier to work on because of the ease of access. Teaching materials in this case student worksheets that are developed electronically innovatively can encourage effective and independent learning [18, 19] and help students acquire a skill needed in learning, namely problem solving skills [20]. Good teaching materials in the form of electronic student worksheets can also support a mixed learning process or better known as blended learning where teaching materials will be more easily accessible and learned by students [21]. In this needs analysis, information was also obtained that students hope that teaching materials in the form of electronic books can facilitate the learning process from home. Electronic teaching materials allow students to study each topic individually according to their abilities and competencies [22]. In addition, learning with the help of electronic teaching materials in the form of worksheets can add to the student learning experience [23]. A good student worksheet certainly contains the theory that students will learn, summaries, and is equipped with various learning activities that students can do to improve their ability to solve problems even though they do not meet directly with the lecturer.

The development of learning needs should pay attention to the characteristics of students from various aspects such as the development of their potential, intellectual intelligence, and psychology [24]. The enthusiasm of students in using digital devices such as laptops and gadgets greatly supports the development of electronic student worksheets. With these worksheets students have no trouble using and studying them, because the availability of devices owned by students can display student worksheets with good quality. It can also support online learning, so that lecturers can meet learning needs by developing electronic-based teaching materials the delivery of material in electronic student worksheets will be more meaningful for students when equipped with learning activities that can be done by students to build an independent experience even though they do not meet face-to-face with the lecturer [25]. Submission of material in electronic student worksheets will be more meaningful for students if it is equipped with learning activities that students can do to build an independent experience even though they are not face to face with the lecturer because the use of this student worksheet can encourage students to be actively involved in lecture activities [26].

4   Conclusion

Based on the results of the analysis of student characteristics, it is known that 82.5% of students have knowledge of the use of electronic student worksheets in learning, 85% of students have a positive view of the use of electronic student worksheets in learning, 87.5% of students have the habit of using digital resources in learning. In everyday life, 92.5% of students have an interest in the use of electronic student worksheets in learning and 95% of students need electronic student worksheets so that they can be used as a means to improve their ability to solve problems in citizenship courses.

Then the results of the resource analysis show that 88.5% of the content of electronic student worksheets should be available in journals, books, and other sources related to civics course learning materials, 100% of students have laptops/gadgets, mobile phones that can support the use of electronic student worksheets and 93.5% of students have an understanding of the use of digital technology in learning.

Finally, the analysis of learning objectives shows that electronic student worksheets are appropriate and can support understanding of civics learning materials, electronic student worksheets can be adapted to the needs of improving students' ability to solve problems, electronic student worksheets help in developing digital learning tools, and electronic student work can help simulate teaching materials to achieve learning objectives.

Thus it can be concluded that students have a tendency to need electronic student worksheets to help improve their ability to solve problems in citizenship courses. Electronic student worksheets also make it easier for students to access and complete their assignments. For this reason, researchers chose the live worksheet application as an application that supports the creation of electronic worksheets.

Authors' Contributions.   This study provides input and suggestions for other researchers regarding the importance of developing innovative and interactive electronic student worksheets by utilizing live worksheet applications because Indonesian education conditions are currently accustomed to online learning. In addition, electronic student worksheets help students improve their problem-solving skills which can be easily accessed whenever and wherever they are.

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