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DEVELOPMENT OF COLLABORATIVE PEER-BASED AUTHENTIC ASSESSMENT IN PHYSICS LEARNING

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Abstract

This study presents findings on developing collaborative peer-based authentic assessment in physics learning. This type of research is qualitative descriptive. The source of research data with secondary data is derived from data from SMK Muhammadiyah 1 Klaten. The data analysis involves collecting, organizing, interpreting, and drawing conclusions from qualitative research data. The research results show that the PCAA model is an assessment of the learning process that can improve higher-order thinking skills (HOTS) and can be applied to improve the quality of education. Collaborative skills, peer assessment, and authentic assessment can improve the quality of education. The Peer Collaborative-Authentic Assessment (PCAA) model assesses Higher Order Thinking Skills (HOTS) learning. HOTS learning can improve education quality, so that the PCAA model can improve the quality of education.

Keywords

Authentic Assessment, Collaborative, Learning Education, SMK Muhammadiyah 1 Klaten

INTRODUCTION

The change of time is very fast, which is marked by technological advances in all areas of life (Wijaya et al., 2016; Zaroni, 2015). The use of technology has become a necessity, especially for the younger generation, for example, the use of gadgets (A Nursyifa, 2018). Gadgets have many benefits, especially if used in the right way, but it must be remembered that there are positive and negative impacts of using gadgets (Junierissa Marpaung, 2018). One of the negative impacts of using gadgets is the decrease in social skills. For example, children don't play with friends in the surrounding environment and don't care about the circumstances around them (Junierissa Marpaung, 2018). The sophistication of features on gadgets such as online games, Instagram, Facebook, and other applications makes them more interested in gadgets than the surrounding environment (Subarkah, 2019). Addiction to gadgets has a big influence on their lives and can even change their mindset, personality, and behavior (A Nursyifa, 2018). This causes a person to have introverted, antisocial behavior and find it difficult to join the real world (A Nursyifa, 2018). In (Syahyudin, 2020), the highest negative impact of gadgets is the laziness of students in social activities, 81.81%. The lack of social activity will have an impact later when they are in the world of work, where they are required to be able to interact with others competently and respectfully (Redhana, 2015; Zubaidah, 2016). One of the provisions to deal with these problems is collaboration skills.

According to the World Economic Forum (WEF), there are 16 important skills needed in the 21st century. These skills are divided into three categories, namely basic literacy, competence, and character quality. Competencies related to children's ability to solve complex challenges are (1) Critical thinking/problem-solving, (2) Creativity, (3) Communication, and (4) Collaboration. Among the four competencies, collaboration can improve learning outcomes through a number of mechanisms, including opportunities to verbally express and elaborate one's own ideas and resolve potential differences with colleagues to facilitate critical thinking (Andrews & Rapp, 2015). The advantages of collaboration for problem-solving have been attributed to the fact that collaboration provides a more effective division of labor, the incorporation of solutions from group members with different perspectives, knowledge, and experience, and the quality of solutions enhanced by the ideas of other group members (Graesser et al., 2017).

Someone's choice at SMK Muhammadiyah 1 Klaten of a partner to collaborate with does not significantly affect collaboration outcomes. Collaboration performance itself helps to produce better results. Collaboration skills are the ability to participate in every activity to foster relationships with

other people, respect each other's relationships, and teamwork to achieve the same (Le et al., 2018). Non-technical skills, or known as employability skills, are a number of skills that can be used in everyday life at work and can be transferred to various fields of work and professions, such as teamwork, communication skills, problem-solving skills, adaptability, and self-management skills. One way to practice collaboration or collaboration skills is through education. Education is not only carried out to develop knowledge based on the core subject of learning but also must be oriented so that students have collaborative abilities (Andayani et al., 2019). Thus students possess more ability than they can train by providing challenging problems that exist in real life (Zubaidah, 2016).

Peer assessment at SMK Muhammadiyah 1 Klaten is a form of formative assessment used as a learning tool. In the context of education, the steps of the peer assessment process are summarized in a systematic order as follows: establishing relationships, distributing work to be assessed, distributing rubrics and performance criteria, providing peer assessment, training using sample work, discussion, and revision of work. Peer assessment comes in a variety of formats in terms of its implementation and evaluation process. Students are instructed to do learning assignments and submit completed assignments where the Teacher at SMK Muhammadiyah 1 Klaten will be responsible for making assessments and the assessment process. Once returned, there is a possibility that students will not read written feedback. According after the work is completed from the hands of students, they are no longer involved in the work. Students at SMK Muhammadiyah 1 Klaten may be extrinsically motivated to complete or forced to do study assignments because of time limits or fear of punishment. Furthermore, they become less reflective in doing work and lack the information to make quality work. In peer assessment, students indirectly benefit from being reflective when assessing or assessing peer work. Students can receive immediate feedback on their work. In a study conducted by Adediwura (2015) on the use of peer assessment, it was found that the intervention had a positive impact on the retention rate of student learning.

Effective inspections and evaluations play a key role in improving the quality of education and school success (Kurum & Cinkir, 2019). Teachers have used most of the traditional assessment methods in classroom assessment practice. Teachers identified the main factors influencing the classroom assessment process as characteristics of students, but it was found that they did not reflect this situation in their practice (Acar-Erdol & Yildizli, 2018). Because the traditional assessment process has resulted in certain teaching-related problems, including the following: (1) the measuring instrument used for assessment measures student achievement is isolated from the real world and

in a limited time, causing students to experience problems in solving real-world problems (2) inadequate to show what students can do (3) does not allow students to access resources and research (4) assessment results are not used effectively for the purpose of providing feedback to students, but are used primarily for assessment purposes (Gömleksiz, M., & Erkan, 2016). Learning and assessment are inseparable. Peer learning describes sharing, discussing, and reflecting on each other's information, knowledge, and experiences (Stenberg & Carlson, 2015). Previous interview studies on peer learning have described how student pairs test ideas and solve problems together (Stenberg & Carlson, 2015). Testing the idea can be done through an assessment.

Authentic assessment is a form of assessment in which students are required to perform tasks in the real world that demonstrate the application of meaningful knowledge and skills. The implementation of an authentic assessment with a behavioral approach meets the effectiveness criteria (Karim et al., 2018). Authentic assessment is generally viewed as a constructive alignment of the curriculum and associated assessment where assigned activities enable students to develop skills that are seen as central to the real world (James & Casidy, 2018). The authentic assessment focuses on higher-order thinking skills and the completion of multiple tasks, while conventional assessment, namely inauthentic assessment, is more concerned with memorizing facts and figures and successfully completing standardized, closed-book, multiple-choice exams (James & Casidy, 2018). Authentic assessment encourages students to think creatively and innovatively. Previous research has shown that the skills required to participate in innovation activities are not yet part of actual teaching (Edwards-Schachter et al., 2015).

Learning assessment through Authentic Peer Collaborative can assess the success of learning activities that can be measured from the start. Authentic peer assessment in learning has at least two main functions, namely diagnostic evaluation and formative evaluation. Sequential diagnostic evaluation to analyze some of the weaknesses, shortcomings, and learning difficulties of students in the dimensions of the learning process. While the formative evaluation function aims to measure student learning outcomes (Surahman et al., 2018). Based on the results of the author's observations and analysis, several problems were found that involved obstacles in realizing student collaboration. In addition, in the traditional assessment, various problems have been found that have an impact on learning outcomes and learning effectiveness. Learning assessment activities are one of the important activities. Good judgment can produce good and valid results. Assessment statements are the prerogative of educators, but not entirely true when applied in the context of adult learning

(Surahman, 2017). Adult learning has the advantage that students can be involved in providing assessments. Peer assessment can be used to involve students in the learning process (Surahman et al., 2018). The aim of this study is to present the descriptive of the use of collaborative peer-based authentic assessment in physics learning.

METHOD

This type of research is qualitative descriptive (Sugiyono, 2019, 2020). Qualitative descriptive analysis is intended to obtain a description or description of the employability skills of students' collaboration and learning outcomes of solar panel design practice. The source of research data is secondary data, which is derived from data from SMK Muhammadiyah 1 Klaten. The data analysis technique is the process of collecting, organizing, interpreting, and drawing conclusions from qualitative research data (Tanzeh, 2018).

FINDINGS AND DISCUSSION

Findings

Instrument Development Step and Indicator

One of the skills that must be possessed by 21st-century students is collaboration skills. To determine the collaboration ability of students, teacher assessment, self-assessment, and peer assessment are carried out. The assessment chosen in this study is peer assessment through authentic assessment to provide feedback. In carrying out this assessment, students are asked to demonstrate the application of the knowledge and skills acquired in the real world. Some people say authentic assessment (performance assessment, because it focuses on performance rather than knowledge alone), alternative assessment (alternative assessment, because it is different from traditional assessment), or direct assessment (direct assessment, because authentic assessment provides direct evidence of the application of knowledge). Authentic assessment includes a series of tasks that students must do through a rubric in the form of performance.

The collaboration indicators used in this research are collaboration indicators according to Greenstein (2012), namely: (1) Working productively with a group of friends; (2) Participate and contribute actively; (3) Balanced in listening and speaking, being the main and being a follower in the group; (4) Demonstrate flexibility and compromise; (5) Collaborate with different types of people; (6) Respect the ideas of others; (7) Demonstrate skills in taking one view or perspective; (8)

Appreciate the contribution of each group member; (9) Matching tasks and jobs based on individual strengths and abilities of group members; (0) Work with others to make decisions that include the views of multiple individuals; (11) Participate respectfully in discussions, debates and disagreements; (12) Committed to putting group goals first; (13) Taking into account the interests and needs of the larger group; (14) Working together to solve problems and generate new ideas and products; (15) Take joint responsibility to complete the work.

The development of Peer Collaborative-Authentic Assessment in this study includes a model for assessing: (1) the employability skills of student collaboration and (2) the learning outcomes of solar panel design practice. In practice, these two assessment models are used together. This is done because the development of student collaboration and employability skills is carried out in an integrated manner with practical learning of solar panel design. The development of the Peer Collaborative-Authentic Assessment model is carried out in four stages, namely: (1) standard determination; (2) authentic task completion; (3) making criteria; and (4) making a rubric. In the following section, the results of the development of an assessment model for learning the practice of making solar panels are described:

Standard Setting

The basis used in the preparation of the standard in question is a statement about what students should know or can do. In this case, the standard refers to the competency standards of solar panel design practice subjects which are formulated as follows: "Students are able to design solar panel designs and apply them." This competency standard is formulated into several basic competencies. Competency standards and basic competencies become references and goals to be achieved in the whole learning process. In this section, examples of basic competencies that will be assessed are: "Students are able to conceptually and logically make solar panel designs and apply them."

Authentic Assignment

Authentic tasks are tasks that are actually assigned to students to then measure their competency achievement. The provision of authentic tasks is adjusted to the predetermined competency standards and basic competencies and is relevant to real life. Before students are asked to do authentic tasks according to basic competency indicators, various things related to the basic concepts of solar panels and solar panel design are explained first. This knowledge becomes the basis for students in designing solar panels, both conceptual and logical. Each student is given the

freedom to raise the theme of solar panel design based on real problems in the field. Based on the solar panel theme that has been chosen by each student, then they are asked to: (1) Determine ideas, (2) Plan tools and materials in solar panel design, (3) Plan steps for making solar panel designs, (4) Pictures of the solar panel electrical installation circuit, (5) Provide a description of the solar panel electrical installation circuit drawing.

Determination of Criteria

The criteria made are statements that describe the level of achievement and real evidence of student learning achievements with certain qualities in accordance with the objectives. Criteria or also known as indicators are descriptions of basic competencies so that it is clear what abilities, skills, or performance are the targets of the assessment. Examples of basic competency formulations: "Students are able to design solar panels conceptually and logically" are translated into five indicators, as follows: (1) Determining ideas, (2) Planning tools and materials in solar panel design, (3) Planning steps for making solar panel designs, (4) drawings of solar panel electrical installation circuits, (5) providing descriptions of solar panel electrical installation circuit drawings.

Rubric Making

The rubric can be understood as a scoring scale used to assess the performance of students for each criterion on certain tasks. The rubric created is an analytical rubric, the assessment of which is given for each criterion. Two main things are made in each rubric, namely the criteria and the level of performance achievement of each criterion. The criteria refer to the basic competency indicators. The level of performance achievement is shown in numbers, measured using a scale of 1-5. A score of 1 indicates no performance, which is indicated by a very low or very incompetent learning achievement level, while a score of 5 indicates a very convincing and meaningful performance which is characterized by a very good or very competent learning achievement level. Table 2 shows the rubric for assessing the ability of solar panel designs conceptually and logically. Assessment of the design results (performance) is carried out among students, so this assessment model is called Peer Collaborative-Authentic Assessment. Meanwhile, the model for assessing students' employability skills is focused on collaboration skills. The assessment indicators refer to the points as formulated in Table 3. The assessment of employability skills is carried out simultaneously with the assessment of learning outcomes for each basic competency. This is done with the intention of being able to measure the achievements of developing employability skills that are integrated with certain competencies.

Table 1. Assessment Rubric of Competence to Design Solar Panel Designs at SMK Muhammadiyah 1 Klaten

Code	:	Student's name	:
Subject	:	NIS	:
Major	:	Class/Semester	:

No.	Assessment Component	Quality (%)	Score	Grade (Bxs)
1.	Determining the idea	15		
2.	Planning tools and material	10		
3.	Planning manufacturing steps	25		
4.	Electrical Installation circuit drawing	40		
5.	Giving a description of electrical installation circuit drawings	10		

Testing the Design Prototype of the Solar Panel Installation System

Product/tool testing or testing a concept that is owned by a product/tool is an activity in one of the development stages of the tool to be made. Before the product/tool is produced, it is used by the community, then the product/tool must be tested first so that it meets the expected requirements or criteria for the need for the tool/product. To test the prototype of a household electrical installation system, there are several things that must be in the testing stage so that the solar panel design prototype can pass the tests carried out by technicians. Things need to be considered in testing the prototype solar panel design. The design that will be used in making the prototype of the solar panel design must be easy to understand according to the need for household electrical network installation. So that in making a prototype, solar panel design refers to the plans that have been made.

The results of the experimental testing of the solar panel design prototype were produced according to the needs and demands of consumers/users. Testing the prototype of the solar panel design that is made according to the plan, if in the stages carried out in making the prototype solar panel design follow the reference in the plan, it is possible that there is a slight error in the final result of the solar panel design prototype. The criteria that need to be considered in testing the prototyping of the solar panel design system according to the plan are as follows: (1) ensuring the prototype of the solar panel design installation system is made in accordance with the ideas and needs of the problems contained in the planning, (2) ensuring the material -materials, and tools used in making the prototype of the solar panel design as planned, (3) ensuring the tools used in making

the prototype of the solar panel design as planned, (4) ensuring the steps for making the prototype of the panel design solar panels in accordance with the plan both in making parts, as well as assembling a water purifier, (5) ensuring that the prototype solar panel design is in accordance with the circuit drawings contained in the plan. If an error occurs in the solar panel design prototype, it is necessary to identify the problem starting from the beginning of planning, and it is necessary to revise the planning and manufacture until the solar panel design prototype is in accordance with the plan.

The next test is to test whether the electrical network is functioning properly through its components from the results of the solar panel design prototype. Of course, this test is carried out if the solar panel installation design system is finished in its actual form and is ready to be operated for the electrical installation. The following are things that must be considered in testing the solar panel design prototype if it is done in real, which of course, the criteria are in accordance with the needs during planning. Its location and in accordance with the solar panel drawing design, (2) ensuring all functions of electrical components function properly starting from how to activate and deactivate the components, (3) ensuring that in every electrical installation, there is a flow of electric current by using a tester in the form of a voltmeter or type, (4) ensure when all electrical components are activated (on status) the power limiter and electric meter are in normal condition according to electric power, (5) ensure when all electrical components are activated (on status), there is no short circuit (short circuit) and a strong smell (6) ensure that all electrical installations do not experience electric leakage. The success of the electrical installation testing carried out is, of course, in accordance with the electrical needs contained in the ideas in the planning.

Validity and Reliability of Collaboration Employability Skills Rubric

There are a number of basic principles of assessment of learning outcomes that need to be guided, including (1) the principle of validity, (2) the principle of reliability, (3) focused on competence, (4) the principle of comprehensiveness, (5) the principle of objectivity, and (6) the principle of educating. Related to the principles of validity and reliability, the validity of the assessment instrument is proven by validation based on expert opinion. At the same time, the reliability of the assessment instrument is proven by Cronbach's Alpha. The results of the reliability estimation are presented in Table 2. Based on these results, the reliability of the instrument Employability Skills Collaboration is categorized as low.

Validator 1 is a mathematics teacher, namely Nur Rohman, S.Pd. M.Pd. Validator of Collaboration Employability Skills Rubric includes material aspects, language aspects, and construction aspects. The results are shown in the following table:

Table 2. Validation of Student Ability in Employability Skills Collaboration at SMK Muhammadiyah 1 Klaten by Nur Rohman

No.	Indicator of Employability Skills Collaboration	Reliability	Validation Categories
1.	Materials Aspects	3,70	Highly Valid
2.	Language Aspects	3,67	Highly Valid
3.	Construction Aspects	3,81	Highly Valid
Overall Average		3,73	Highly Valid

Based on the validation results above, the material aspect obtained an average value of 3.70 with highly valid categories, the language aspect of 3.67 with highly valid categories, and the construction aspect of 3.81 categories is highly valid categories. The results of pedagogic expert validation for Ability in Employability Skills Collaboration at SMK Muhammadiyah 1 Klaten from 3 aspects obtained an overall average value of 3.73 is a highly valid category. These results show that the quality of Ability in Employability Skills Collaboration at SMK Muhammadiyah 1 Klaten that has been developed in terms of Experts is by material aspects, language aspects, and construction aspects.

Validator 2 is a physics teacher, namely Inggit Hascaryani, S.Pd., M.Pd. Validator of Collaboration Employability Skills Rubric includes material aspects, language aspects, and construction aspects. The results are shown in the following table:

Table 3. Validation of Student Ability in Employability Skills Collaboration at SMK Muhammadiyah 1 Klaten by Inggit Hascaryani

No	Indicator of Employability Skills Collaboration	Reliability	Validation Categories
1.	Materials Aspects	3,69	Highly Valid
2.	Language Aspects	3,68	Highly Valid
3.	Construction Aspects	3,71	Highly Valid
Overall Average		3,69	Highly Valid

Based on the validation results above, the material aspect obtained an average value of 3.69 with highly valid categories, the language aspect of 3.68 with highly valid categories, and the construction aspect of 3.71 categories is highly valid categories. The results of pedagogic expert validation for Ability in Employability Skills Collaboration at SMK Muhammadiyah 1 Klaten from

3 aspects obtained an overall average value of 3.69 is a highly valid category. These results show that the quality of Ability in Employability Skills Collaboration at SMK Muhammadiyah 1 Klaten that has been developed in terms of Experts is by material aspects, language aspects, and construction aspects.

There are 14 indicators in Employability Skills Collaboration at SMK Muhammadiyah 1 Klaten. In each indicator, there are positive and negative statements. The internal consistency and reliability that have been tested of Employability Skills Collaboration at SMK Muhammadiyah 1 Klaten ls can be presented in the table below:

Table 4. Internal Consistency and Reliability of Employability Skills Collaboration at SMK Muhammadiyah 1 Klaten

No	Indicator of *Employability Skills* Collaboration	Internal Consistency Index
1.	Work productively with a group of friends (Positive)	0,32
	Work productively with a group of friends (Negative)	0,48
2.	Actively participate and contribute (Positively)	0,32
	Actively participate and contribute (Negative)	0,38
3.	Balanced in listening and speaking, being the first and being a follower in the group (Positive)	0,45
	Balanced in listening and speaking, being the first and being a follower in the group (Negative)	0,59
4.	Demonstrate flexibility and compromise working with colleagues with different types of people (Positive)	0,46
	Demonstrate flexibility and compromise working with colleagues with different types of people (Negative)	0,54
5.	Respecting other people's ideas (Positive)	0,44
	Respecting other people's ideas (Negative)	0,37
6.	Demonstrate one view or perspective-taking skills (Positive)	0,44
	Demonstrate one view or perspective-taking skills (Negative)	0,51
7.	Appreciate the contribution of each group member (Positive)	0,38
	Appreciate the contribution of each group member (Negative)	0,56
8.	Match tasks and jobs based on individual strengths and abilities of group members (Positive)	0,67
	Match tasks and jobs based on individual strengths and abilities of group members (Negative)	0,32
9.	Work with others to make decisions that include multiple individual views (Positive)	0,43
	Work with others to make decisions that include multiple individual views (Negative)	0,51
10.	Respectfully participate in discussions, debates, and disagreements (Positive)	0,39
	Respectfully participate in discussions, debates, and disagreements (Negative)	0,44 0,36
11.	Committed to putting group goals first (Positive)	0,48
	Committed to putting group goals first (Negative)	0,55

12.	Consider the interests and needs of the larger group (Positive)	0,53
	Consider the interests and needs of the larger group (Negative)	
13.	Work together to solve problems and generate new ideas and products (Positive)	0,61
	Work together to solve problems and generate new ideas and products (Negative)	0,72
14.	Shared responsibility to get the job done (Positive)	0,70
	Shared responsibility to get the job done (Negative)	0,52
Reliability		0,67

Based on Table 4, you can see the internal consistency index values of all indicators. All indicators have exceeded the established threshold of 0,3, and the items in the indicators are usable (Sugiyono, 2020). Furthermore, the reliability coefficient of the data is 0.67. This indicates that the reliability of Employability Skills Collaboration at SMK Muhammadiyah 1 Klaten has reached an acceptable level, making the instrument acceptable for use (Sekaran, 2000).

The principle of focusing on competence and comprehensiveness is reflected in the basic competencies and their elaboration in the form of indicators. Meanwhile, in terms of objectivity, 92% of students stated that they judged their peers honestly, and 88% stated that the assessment was carried out objectively. Thus, the value obtained by students shows the actual level of ability to solve a problem. The assessment carried out through peer assessment is a form of educational assessment because students evaluate learning achievements independently. The results of this evaluation are used as the basis for making improvements to improve performance. The ability to make judgments between friends is a reflection of the ability to manage oneself.

Description of Collaboration Ability

In the following, the results of the Peer Collaborative-Authentic Assessment model trial are presented. The assessment model sets that were tested include (1) a collaboration ability rubric and (2) the learning achievement rubric for making solar panel designs conceptually and logically. The test subjects were students majoring in electrical power installation engineering at SMK Muhammadiyah 1 Klaten who practiced making solar panel designs. The number of students is 87 students divided into three parallel classes.

Descriptive statistics show the total score of 15 item indicators of collaboration ability statements. The lowest score is 58, and the highest score is 92. Furthermore, the classification of collaboration skills into five categories based on the criteria according to Widoyoko (2014) is shown in Table 1. Based on the descriptive statistics of the student's collaboration ability, from 87 students, there are eight students, or 9.2%, enough category; 68 students, or 78.2%, good category; 11 students,

or 12.6%, very good category. As for the collaboration ability of students in the category of less and very less, there is none. In general, the collaboration ability of students has a good category because 87 students, there are 79 students or 90.8%, have good and very good collaboration skills.

Table 5. Classification of Collaboration Ability at SMK Muhammadiyah 1 Klaten

Category	Score Range	Respondents Total Number	Percentage (%)
Not much	$0 < x \leq 20$	0	0%
Not enough	$20 < x \leq 40$	0	0%
enough	$40 < x \leq 60$	8	9,2 %
Good	$60 < x \leq 80$	68	78,2 %
Very good	$80 < x \leq 100$	11	12,6%
Total		87	100%

Description of Learning Outcomes

The learning achievement in question is the achievement of the ability to make conceptual and logical solar panel designs. The total score was converted on a scale of 100. The lowest score was 80, the highest was 92, the mean score was 85, and the standard deviation was 3.06. Classification of learning outcomes is arranged in five categories, as shown in Table 5. Based on these descriptive statistics, in general, students' ability to design solar panels conceptually and logically is quite good. However, compared to one group, there were 1.2% very low, 39.1% low, 33.3% moderate, 14.9% high, and 11.5% very high. In general, when compared to one group of 87 students, there are still 35 students, or 40.3%, in the low category even though the score is above 80. Meanwhile, when compared to one group of 87 students, there are 23 students or 26.4% in the high and very high categories.

Table 6. Classification of Ability to Design Solar Panel Designs Conceptually and Logically at SMK Muhammadiyah 1 Klaten

Category	Score Range	Respondents Total number	Percentage from total
Very low	$x \leq 80,41$	1	1,2%
Low	$80,41 < x \leq 83,47$	39	39,1%
Average	$83,47 < x \leq 86,53$	29	33,3%
High	$86,53 < x \leq 89,59$	13	14,9%
Very high	$89,59 \leq x$	10	11,5%
Total		87	100 %

Discussion

The development of student collaboration employability skills that are integrated with practical learning of solar panel design implies the importance of an assessment model that is able to measure these skills aspects. Direct assessment of performance in making solar panels becomes an alternative model for measuring student competence. Meanwhile, the assessment carried out through peer assessments of the performance or products that have been produced is a form of peer assessment evaluation in an effort to make improvements to achieve the expected competencies. This is in line with the opinion (Adediwura, 2015), which states that the use of peer assessment, it was found that the intervention had a positive impact. Authentic assessment can provide more valid data about student competencies. According to (Surahman et al., 2018), it functions to increase students' active participation in learning and train higher-order thinking skills to produce quality learning, and this model is HOTS learning. According to (Tyas & Naibaho, 2021), HOTS learning can improve the quality of education.

Based on the test results of 87 students, there were 79 students, or 90.8% showing collaboration skills in the good and very good categories. Students' ability in this collaboration can be seen in a real or authentic way in practical learning and assessment. In this practical learning, each group consisting of 3-4 students cooperated in completing the task in harmony. The results of the assessment carried out obtained the achievement score of each indicator that has been developed to get a good and very good score. The pattern of assessment of student collaboration abilities developed is not rigidly centralized by educators but, in the process, involves students. Feedback from students is one aspect of the final assessment. However, the results of self-assessment and peer assessment can be used as feedback notes for students in learning (Surahman, 2017). Good collaboration skills provide an advantage in problem-solving because collaboration provides a more effective division of labor, incorporation of solutions from group members with different perspectives, knowledge, and experience, and the quality of solutions enhanced by the ideas of other group members (Graesser et al., 2017). The quality of solutions that come from the ideas of other group members will improve the quality of Education.

Peer assessment requires students to assess the work of friends (other students), based on clear evidence and criteria, for the purpose of improving future performance. Peer assessment helps students to develop collaborative and reflective skills through the results of the metacognitive process (Husamah, 2015). Collaboration that occurs in the implementation of peer assessment

encourages students to have discussions, and this can help students to understand and solve difficult problems (Pengiran Omar et al., 2019). Interventions through peer discussion have a positive impact on student performance in learning, which encourages students in independent learning and metacognitive skills (Ahmad et al., 2018). This can improve the quality of learning, which has implications for improving the quality of education.

Learning outcomes in the form of the ability to make solar panel designs conceptually and logically also show results that are in line with students' collaborative employability skills. This can be seen from the results of tests conducted on 87 students. As many as 86 students or 98.8%, get scores above 80. A total of 13 students or 14.9%, students have the ability in the high category, and as many as ten students or 11.5%, have very high ability. This result shows that learning achievement is in accordance with the expected goals. Good assessment results can be useful for developing learning improvement plans (Surahman et al., 2018). In addition, good judgment serves to draw appropriate conclusions. Authentic assessment is one of the assessment models that encourage the establishment of awareness of the quality of the learning process that is oriented to improving learning outcomes. The assessment of educator prerogatives is not always correct when applied to adult learning because, in this learning, students can be involved (Surahman, 2017) in the assessment. Learning assessment models that involve students dominantly can improve students' creative thinking skills. This happens because the brain activation process is a component of the active thinking process. The more active the brain nerve cells used to think, solve problems, and produce projects, the more willingness to increase higher-order thinking skills that can train critical and creative thinking processes. According to (Tyas & Naibaho, 2021), learning Higher Order Thinking Skills (HOTS) is learning that can develop creativity, learn to think critically and make decisions, and learn to solve problems. The HOTS learning model can improve the quality of education (Tyas & Naibaho, 2021).

Authentic assessment is one of the assessment models that encourage the development of awareness of the quality of the learning process that is oriented towards improving learning outcomes. Improving the quality of the learning process is a focal point in the evaluation of learning (Surahman, 2017). Evaluation of the learning process can be done by involving fellow students with a self-assessment approach and peer assessment. This assessment serves to see the strengths and weaknesses of yourself and your colleagues, then this deficiency becomes the goal of improvement (improvement goal). This assessment model can develop students' abilities in applying their

knowledge and skills to solving real problems and making students more responsible for the process and achievement of learning goals. Authentic assessment focuses on higher-order thinking skills and the completion of several tasks, while traditional assessment, namely inauthentic assessment, is more concerned with memorizing facts and figures and successfully completing the standardized, closed book, multiple choice exams (James & Casidy, 2018). Assessment and learning are closely related and cannot be separated. The focus of authentic assessment is on HOTS skills which have implications for HOTS learning. According to Tyas & Naibaho (2021), HOTS learning improves the quality of education because authentic assessment is closely related to HOTS learning, and authentic assessment can improve the quality of education.

The development of authentic assessment, peer assessment, and Collaborative become a Peer Collaborative-Authentic Assessment (PCAA) model. This model was developed based on the basic principles of assessment as expressed, namely the principle of validity, the principle of reliability, focused on competence, comprehensiveness, the principle of objectivity, and the principle of educating. The purpose of PCAA is to facilitate students to be able to measure and assess all objects that must be assessed (Surahman et al., 2018), according to Surahman et al. (2018). PCAA is a learning assessment model that has the ability to activate higher-order thinking processes. The HOTS learning model can improve the quality of education (Tyas & Naibaho, 2021).

CONCLUSION

The development of student collaboration employability skills that are integrated with practical learning of solar panel design implies the importance of an assessment model that is able to measure these skills aspects. Direct assessment of performance in making solar panels becomes an alternative model for measuring student competence. Meanwhile, the assessment carried out through peer assessments of the performance or products that have been produced is a form of peer assessment evaluation in an effort to make improvements to achieve the expected competencies.

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