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Project-Based Psychomotor Assessment Instruments to Increase Student Competencies in the 21st Century

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ABSTRACT
This research and development aim to produce a project-based psychomotor assessment instrument that was valid and appropriate according to the demands of student competence in the 21st century. The project was given in the form of creating social media accounts and online marketing using social media Facebook, Twitter, and Pinterest. The psychomotor assessment instrument based project was developed using the Borg & Gall Research and Development method. In producing the product the researcher conducted material validation, assessment validation, and limited trials. Material validation was carried out by 2 people (1 lecturer and 1 teacher), assessment validation by 1 lecturer, and limited trials of 12 students. Data analysis was done with percentages and paired sample test analyses. The results of assessment validation by lecturers were 97.30%, the average percentage of worksheet validations by lecturers was 94.44%, validation of material experts by lecturers was 94%, and validation of material experts by teachers was 86%. The results of the project-based psychomotor assessment instruments by the teacher were 89.33%, the students' reading comprehension test result was 94.58%. The results of validation and limited trials indicate the criteria "very feasible". The results of the paired sample test analysis showed the Sig. (2-tailed) of 0,000 & lt; 0.05, which means that there are significant differences between student competencies before and after using project-based psychomotor assessment instruments. The results of research and development are a product of six project-based psychomotor assessment instruments a valid and appropriate canva application that can improve student competence in the 21st century.

Keywords: *psychomotor assessment, project based, competence*

1. INTRODUCTION

The 21st century develops learning frameworks that require students to have skills, knowledge, and abilities in the fields of technology, media and information, learning and innovation skills, and life and career skills (Pheeraphan, 2013; van Laar et al., 2018, 2019, 2020). According to Egan et al., (2017); Meyer & Norman (2020); Teo (2019); Trilling et al., (2015); and koivkoviĿ (2016) states that some skills must be mastered by students in dealing with the 21st-century era, including critical thinking, communication, collaboration, and creativity.

Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 23 of 2016 concerning Education Assessment Standards, one aspect of student learning outcomes assessment in Vocational High Schools (SMK) is the skill / psychomotor aspect. Psychomotor assessment is an activity carried out to measure students' ability to apply knowledge

when performing certain tasks (Ferreira et al., 2018; Rovai et al., 2009; Salim et al., 2012). The teacher assesses students' competency skills through performance appraisal, which is an assessment that requires students to demonstrate a certain competency using practice tests, portfolio assessments, and projects. The instrument used can be a checklist or grading scale that is equipped with a rubric.

The assessment emphasized on vocational students according to the 2013 curriculum is a project-based psychomotor assessment. Projects are learning tasks that consist of written, oral and verbal design, implementation, and reporting activities carried out by the teacher at the end of each Basic Competency (Garg et al., 2019; Paturca et al., 2019). As research by Epinur et al., (2016), Arifin (2013), Basuki & Hariyanto (2016) and Salim et al., (2012) shows that there were two types of project-based psychomotor assessments, namely project appraisal that emphasizes process and assessment product-focused projects (Aksel & Gürman-Kahraman, 2014; Mansell et al., 2002).

In the psychomotor domain, there are seven types of behavior, namely perception, readiness, guided movements, accustomed movements, complex movements, adjustments, and creativity. Where the seven behavioral indicators in the assessment can be through tasks, observations, actions. Project appraisal can be used to determine the level of understanding, ability to apply, investigate, and inform students clearly on certain subjects (Aksel & Gürman-Kahraman, 2014; Shariff et al., 2013).

Uno & Koni (2018) explained that in evaluating project assignments, there were at least three important things that needed to be considered, including (1) Management capabilities, namely selecting topics, finding information, and managing the time of data collection and report writing; (2) Relevance, namely the appropriateness of subjects with the stages of development of students' cognition; (3) The authenticity of the work, taking into account the teacher's contribution in the form of instructions and support for the student project.

Psychomotor assessment in this research will be implemented in the subject of Online Business, especially on the basic competencies of implementing social media account creation and online marketing using social media. So that in these Online Business subjects in addition to assessing the cognitive aspects, the teacher can also assess the aspects of students' psychomotor skills, because in these basic competencies students not only learn in theory but can also explore material with practice. In Online Business learning activities carried out by students include accessing applications or relevant links. If you don't have an account, students first create a marketing account in groups. Then students are allowed to discuss with their respective groups to create product feed designs using Canva. Product feeds that have been created are posted on social media accounts on Facebook, Twitter, and Pinterest.

The results of previous research that support are Epinur et al., (2016); and Wahyuni & Ruhimat (2018) which states that the project appraisal model can be used to measure psychomotor competencies both individually and in groups. Besides, project appraisal instruments are also used to measure students' problem-solving skills (Scoular & Care, 2020; Teglasi, 1998; von Davier et al., 2017).

Based on the results of interviews with Online Business Subject teachers at State Vocational High School 2 in Kediri, three aspects of assessment have been carried out namely cognitive, affective, and psychomotor aspects. However, the specific psychomotor skills that have been made are still done manually and there are no comprehensive criteria specifically, so the level of the subjectivity of the assessment was relatively high. The psychomotor assessment has not fulfilled the principles of valid, reliable, integrated, objective, transparent, accountable, and educational principles. Teacher complaints are still difficult in making grading rubrics that are tailored to projects given to students, moreover, the projects must be adjusted to meet the characteristics of 21st-century students who emphasize mastery of

knowledge and technology. This complaint is experienced by most vocational teachers both in the study area and outside the study. Considering the measurement of learning outcomes in vocational high school is more oriented towards practical competencies compared to knowledge competencies because the output vocational high school is preparing graduates ready for work equipped with competencies according to their study program. Therefore researchers feel necessary and important to conduct this research because: (1) can be used as an alternative in giving students psychomotor grades, especially in making project-based psychomotor assessment rubrics; (2) can provide value to students objectively, fairly, transparently, systematically, and educate, and is expected to be able to train students in giving value to themselves and their peers, (3) is expected to be able to facilitate teachers in compiling assessment indicators especially the psychomotor aspects of students, and (4) can improve student competency because project work is carried out applicatively using the canva editor application.

The novelty of this research is that the psychomotor assessment instrument based project was created with the help of the Canva editor application; project outputs undertaken by students in the form of feeds or product posts that have been designed using the Canva application; the assessment rubric is rigidly adjusted to the project given and measured correctly.

2. METHODS

This research is a research and development with Borg & Gall (2003) model in which there are ten stages, namely: (1) a preliminary study, (2) planning, (3) development of a product draft, (4) content validation, (5) limited trials, (6) design revisions, (7) product revisions, (8) large class trials, (9) final product revisions, (10) production.

In this research and development, validation activities are carried out by 3 validators. One validator assessment from the lecturer and two material validators from the lecturer and teacher. Validation conducted by researchers has the aim to determine the level of eligibility of the instrument made. Validation results are used as a reference in making improvements or revising instruments.

Limited trial activities are carried out by providing project-based psychomotor assessment instruments to 12 students and 1 teacher of Online Business subjects in Business XI Online and Marketing at SMK Negeri 2 Kediri. Large class pilot activities are carried out by providing project-based psychomotor assessment instruments to 60 students to analyze student competencies through project assignments.

The type of data obtained from the entire research and development stage is in the form of quantitative and qualitative data obtained through the results of questionnaires. This questionnaire was used for validation and limited trials that were prepared using the Linkert scale 5,4,3,2,1.

Guidelines expert validation questionnaire instrument shown in Table 1 below:

Table 1. Guideline of Quitionaries Expert Validation Assessment

Variable	Aspect	Indicator	No. Item Question	Number of Questions
Psychomotor Assessment Instrument	Content Feasibility Assessment Instrument	Appropriate appraisal instruments with CC and BC	1	11
		The appropriateness of the aspects measured with the learning objectives	2	

Table Cont...

		There are instructions for using the instrument	3	
		Clarity of the assessment indicators on the assessment instruments	4	
		Clarity of the assessment indicators in the rubric of the assessment criteria	5	
		The instruments are presented systematically	6	
		There is a match between size and font type	7	
		The use of tables and figures is nice and neat	8	
		Complete assessment rubric	9	
		Assessment of rubrics are easy to understand and use	10	
		Ease of use of instruments	11	
Psychomotor Assessment Instrument	Language	Use the right words and sentences	12	4
		Clarity of words and sentences to understand	13	
		Conformity with Indonesian rules	14	
		Consistent use of symbols or icons	15	

Source Sunarti & Rahmawati (2014) Modification Researcher

Guidelines questionnaires validation worksheet is shown in the following table:

Table 2. Guideline of the Worksheet Instrument Validation Questionnaire

Variable	Aspect	Indicator	No. Item Question	Number of Questions
Psychomotor Assessment Instrument	The contents presented	The suitability of the project with CC and BC	1	9
		The suitability of the project questions with the learning objectives	2	

Table Cont...

		The ability of project questions in measuring student psychomotor	3	
		There are work instructions on the questions	4	
		Questions are arranged systematically	5	
		Questions must be easily understood and known by students	6	
		The overall appearance of the questions should attract the user's attention	7	
		Ease of implementing the questions	8	
		Figures, tables, and others are presented clearly and easily understood	9	
Psychomotor Assessment Instrument	Language	Conformity of the sentence with the Indonesian language rules	11	3
		Use the right words and sentences	10	
		Writing sentences in the questions and work steps there is no double meaning	12	

Source: Sunarti & Rahmawati (2014), Researchers Modifications

Guidelines questionnaire instrument validation material, psychomotor skills, and student understanding of psychomotor assessment instruments, especially worksheets, respectively are located in tables 3 and 4.

Table 3. Guideline of Questionnaire Validation Expert Material

Variable	Aspect	Indicator	No. Item Question	Number of Questions
Psychomotor Assessment Instrument	Material Worthiness	Material compatibility with CC and BC	1	7
		Completeness of the material presented	2	
		The suitability of the material with the development of science	3	

Table Cont...

		The accuracy of concepts and definitions	4	
Psychomotor Assessment Instrument	Language	The accuracy of examples, pictures, diagrams, and illustrations	5	**6**
		Updated library references	6	
		Consistent use of symbols and icons	7	
		Use the right words and sentences	8	
		Clarity of words and ease of sentences to understand	9	
		Conformity with Indonesian rules	10	

Source: Sunarti & Rahmawati (2014), Researchers Modifications

Table 4. Guidelines Evaluation Rubric of Student Competencies Making Product Feed Designs with Canva Applications

Variable	Aspect	Indicator	No. Item Question	Number of Questions
Psychomotor Assessment Instrument	Component Design	Accuracy of color selection	3	6
		The suitability of the product theme with the design created	6	
		Appropriate selection of template designs for product types	4	
		Creativity in integrating icons and available features	5	
		The selected product image has an appeal	7	
		Proficiency in using the Canva application	10	
	Language	Completeness of product information	8	4
		Font selection accuracy	2	
		The uniqueness of brand selection	9	

Table Cont...

		Creativity in choosing product headlines	1	

Source: Sunarti & Rahmawati (2014), Researchers Modifications

Based on the explanation of Suharyadi & Purwanto (2015) data analysis techniques used by percentage analysis, using the following formula:

$$V = \frac{Tse}{TSh} \quad X\ 100\% \qquad (1)$$

Explanation:

V = Validity Level
Tse = number of scores obtained
TSh = maximum number of scores

Criteria for the level of feasibility of the percentage of research and development products presented in the following table 5.

Table 5. Feasible Criteria

Feasible Criteria (Percentage)	Criteria
81% - 100%	Very feasible (can be used without revision)
61% - 80%	Feasible (can be used but needs minor revisions)
41% - 60%	Less Feasible (may be used but needs major revision)
21% - 40%	Not Feasible (may not be used)
0% - 20%	Very improper (may not be used)

Source: Sunarti & Rahmawati (2014), Researcher modification

While the analysis of the data used to determine the level of competence of students before and after using this project-based psychomotor assessment instrument is a paired sample t-Test analyzed using the IBM SPSS 22 License Authorization Wizard program. This analysis is a procedure used to compare the average of two variables in one group, meaning that this analysis is useful for testing one sample that receives treatment, then the average of the samples between before and after treatment (Suharyadi & Purwanto).

3. RESULTS AND DISCUSSION

3.1. Assessment Result Project-Based Psychomotor Assessment Instruments that was Feasible

The results of the assessment validation conducted by the lecturer were declared very feasible with an average percentage of 97.30%. The data obtained in addition to quantitative data are qualitative in the form of comments and suggestions that are used as material for product improvement that is: for the social media users should be chosen with more business opportunities; it's better to use other social media because Pinterest social media is relatively unfamiliar to students.

The results of the validation of the worksheets by the assessment expert, that is 1 lecturer who

rated 6 worksheets, can be seen in the following table.

Table 6. Results of Project-Based Worksheet Validation

Worksheet	Worksheet Name	Average	Criteria
1	Implementing Facebook social media account creation	95%	Very Feasible
2	Implement Twitter social media account creation	85%	Very Feasible
3	Implement Pinterest social media accounts	96,67%	Very Feasible
4	Create a product feed to be marketed using Facebook social media	98,33%	Very Feasible
5	Make product tweets to be marketed using Twitter social media	93,33%	Very Feasible
6	Make a product pin to be marketed using Pinterest social media	98,33%	Very Feasible

Source: Field Data processed by Researchers, 2020

While the validation results qualitatively from the validator are: (1) the sequence of worksheet indicators between work and time should be reversed, the time before the latest work results; (2) on the part of calculating the value between individual and group values, it should be separated; (3) words that use foreign languages such as: online be friendly, brand image, customer support, etc. a special sheet should be made to explain (such as a glossary); (4) the most popular and well-known social media is Instagram. Social media should be used instead of Instagram, which is relatively less well known to the general public.

The results of the validation of the material by 2 validators that are material experts from lecturers produced 94% (very feasible) and from teachers produced 98.33% (very feasible). While qualitatively the data obtained in the form of suggestions are: (1) table of differences in websites and social media should be reviewed again and more relevant sources need to be found; (2) there is still a list of citations in the body of the text that have not been included in the list of references; (3) the use of sentences should use sentences that are easily understood by students; (4) the importance of adding learning objectives.

This project-based psychomotor assessment instrument is useful for students, teachers, and schools. For students, it is useful so that assessment can be done in a valid, objective, accountable, transparent manner, and can encourage enthusiasm for learning in the learning process. For teachers, it is useful to get information about ways and guidelines for project-based psychomotor assessment. Whereas for schools this assessment can be used as a guide in developing psychomotor assessment based on other subject projects. This is consistent with the results of research conducted by Arlinawati et al., (2017); Arumsari et al., (2016); Epinur et al., (2016); Hamid et al., (2012); Sánchez-Soler et al., (2020); and Widiana (2016) which states that the psychomotor assessment instrument developed by the author can be used to measure the psychomotor realm of students.

Project-based psychomotor assessment instruments developed based on the results of validation and limited trials have met the feasibility criteria. The percentage shows the number "very feasible", as described above.

Furthermore, to determine the magnitude of the teacher's response to the project-based psychomotor assessment instrument, the teacher fills in the assessment questionnaire after the teaching and learning activities were completed. Based on the teacher's response to the project-based psychomotor assessment instrument, the average about 89.33% was declared "very feasible". This is consistent with the results of research conducted by Murniati & Muslim (2018); Pamungkasi & Wijayati (20170; and Saputri et al., (2018), Jalaei et al., (2020);

Quesada-Silva et al., (2019); Sa'adah & Sigit (2018); Safaroh & Dewi (2017)); Shah et al., (2017); and Wahyuni & Ruhimat, 2018) which stated that authentic project-based assessments developed based on the five frameworks for authentic assessment are appropriate to be used.

The advantages of the project-based psychomotor assessment instrument developed when compared with previous assessments consisted of six worksheets, namely Worksheet 1 Implementing Facebook social media account creation, Worksheet 2 Implementing Twitter social media account creation, Worksheet 3 Implementing social media account creation Pinterest, Worksheet 4 Create product feeds to be marketed using social media Facebook, Worksheet 5 Make product tweets to be marketed using social media Twitter, and Worksheet 6 Create product pins to be marketed using Pinterest social media. The six worksheets produced in this research can produce a very valid instrument that was suitable for use in Vocational High School.

The weakness of the developed assessment instrument is that this assessment instrument only focuses on evaluating psychomotor aspects without including cognitive assessment instruments, individual values are not so visible because the assessment is carried out based on project group work. Besides, many aspects are assessed and the assessment process requires a relatively long time, so the assessment process needs to involve an observer to assist in the assessment.

Obstacles or difficulties experienced by researchers in conducting research that is: (1) determining indicators of evaluation of psychomotor aspects on each worksheet, (2) determining the allocation of work on each worksheet following the Learning Implementation Plan (RPP) and syllabus.

The allocation of time to the syllabus, Learning Implementation Plan (RPP), and the characteristics of project-based psychomotor worksheets given to students must be considered by the teacher. Remembering the characteristics of the project assignments are different from the tasks that exist in the cognitive realm. This is reinforced by the opinion of Sunarti & Rahmawati (2014), Yunita et al., (2017), Arini et al., (2017); and Laili & Lufri (2019) which explains that project appraisal was an appraisal activity that must be completed within a certain time based on predetermined criteria, rules, and standards.

3.2. Increasing Student Competency in the 21st century by Implementing Project-Based Instruments

Based on the results of different tests used to determine differences in the level of student competence before and after using project-based psychomotor assessment instruments can be seen in the following table:

Table 7. Summary Results of Statistical Sample Paired Test Students Before and After Using Project-Based Instruments

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before using the instrument	77,9667	30	2,10882	,38502
	After using the instrument	82,9333	30	1,36289	,24883

From the above data, it was known that there were significant differences between student competencies before and after using assessment instruments. The difference between the two variables was relatively small because before using the assessment instruments made by researchers, the teacher uses simple assessment instruments. Simple in this case is in giving psychomotor grades to students, a teacher only makes assignments, without any psychomotor assessment indicators that are detailed and measurable, so that the assessment made by the teacher is relatively

subjective and the scores obtained by students are relatively equal. After using a project-based instrument with 6 LK (creating accounts and fell products) based on social media that was done by students seems to provide a change in increasing student competency.

While the correlation between the competencies of students before and after using the instrument can be seen in the following table 8:

Table 8. Correlation Results or Relationships between Students before and After Using Project-Based Instruments

		N	Correlation	Sig.
Pair 1	Before using instruments & After using instruments	30	,467	,009

From the above data, it is known that the significance value is 0.009 <0.05, meaning that there is a relationship between the two variables. This is because the project is given to students between before and after using a continuous assessment instrument, which at the time before using the assessment instrument in working on the project students only make a product feed in outline (making sketches illustrated manually) while after using assessment instruments students work on projects by utilizing technology in the form of canva applications under sketches that have been made. The delivery of this project is following the demands of digital technology in the 21st century.

Projects contained in the assessment instruments developed by researchers can improve student competency because: (1) there are teacher comments and suggestions listed on the assessment instruments, (2) students have the opportunity to improve the results of projects that have been done so that the competency of student skills, especially in working on projects using the canva application is more improved because they are carried out repeatedly, and (3) there are self and peer evaluation so that they can increase the level of competence of the students concerned.

Increased student competence in the 21st century in this assessment instrument emphasizes the ability of students to manage products and online marketing through 3 social media accounts, namely Facebook, Twitter, and Pinterest, which for the details of the project given have been contained in 6 Worksheets (LK). This is following the demands of the 21st century that require students and teachers as educators to have soft skills, especially in terms of mastery of digital technology.

The project-based instrument in the form of 6 LK application of making social media accounts and online marketing using social media can be implemented to students because it can improve competence, direct students to better master the material both theoretically and in practice following the competencies to be achieved. The 21st-century competency improvement of students is seen in the process and performance of the projects produced in the form of LK1, LK2, LK3, LK4, LK5, LK6 by uploading assignments on Facebook, Twitter, Pinterest which begins with students creating accounts and marketing products with social media. The process and final results remain a concern for the teacher in carrying out the assessment. The results of this study support previous research from (Lawrence-Benedict et al., 2019; Money & Dean, 2019) about project-based assessment.

Whereas the assessment instruments developed by researchers can be implemented by teachers in carrying out assessment activities on Online Business subjects to improve the competence of 21st-century students. The results of this study are relevant to research conducted by Pendleton et al., (2016); Rourke (2020); and Yunita et al., (2017), Brown (2019); Mohamad et al., (2017); and Sylvia et al., (2018), Arini et al., (2017), Firdausa & Istiyono (2019) and Saputra et al., (2018), Akpan et al., (2019); Arlinawati et al., (2017); Dewi & Rahayu (2018); Rusdiyana & Joharudin (2020); and Usman & Yunus (2019) show that the Psychomotor Aspect

Assessment Instrument is feasible and can improve student competency in practicum/practice activities on certain subjects.

4. CONCLUSION

The revised project-based psychomotor assessment instrument can be summarized as follows.

This research and development resulting in a product in the form of a project-based psychomotor assessment instrument that was valid and feasible based on the results of validation, limited trials so that it can be used as a guide to assessing psychomotor aspects by vocational teachers on Online Business subjects.

There is an increase in students' psychomotor competence with the application of project-based instruments consisting of 6 worksheets, namely worksheets with Facebook social media accounts; Twitter; Pinterest; Facebook, Twitter, and Pinterest.

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