Implementation of Learning Modules to Improve Student Competence

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ABSTRACT

This study aims to (1) Produce a learning module for manufacturing engineering drawings and (2) Improve student competence using the learning module. This study used a classroom action research method with the following stages: Planning, Implementation, Observation, and Reflection. The subjects of this study were 35 students of the XI Mechanical Engineering class at SMK Negeri 2 Wonosari Gunungkidul Yogyakarta. Data collection techniques included attitude observation sheets, knowledge tests, skills tests, field notes, and documentation. The data analysis technique used was quantitative descriptive analysis. The results of this study are (1) The results of the module validation by two material experts and media experts obtained an average value of 7.1 and a feasibility percentage of 90% from material experts, an average value of 7.2 with a feasibility percentage of 93.75% From the validation results and referring to the scale of the instrument assessment interval was declared "very feasible" to use, (2) The module improved student competence after being tested for three cycles, with the following results: (a) student attitudes increased by 22% in cycle I, 29% in cycle II, and 31% in cycle III. (b) Student knowledge increased by 23% in Cycle I, 32% in Cycle II, and 28% in Cycle III. (c) Student competence increased by 23% in Cycle I, 49% in Cycle II, and 19% in Cycle III.

Keywords: action research, learning modules, manufacturing engineering drawings, student competencies, vocational high school.

INTRODUCTION

Education in Indonesia requires national standards that require adjustments to the dynamics and developments of science, technology, and community life to improve the quality of education. Graduate competency standards at Vocational Secondary Education Units focus on skills to enhance students' competency so they can live independently and follow further education according to their vocation. (PP No. 57 of 2021 concerning National Education Standards). The educational process at school is an activity that involves various factors, including students/learners, curriculum, teachers/facilitators, learning facilities/media, and the teaching and learning process as the target of all educational activities. Learning is a teacher's concrete effort to convey teaching materials so students can absorb them. Learning consists of various components: objectives, materials, methods, tools, and assessments. SMK N 2 Wonosari has a Mechanical Engineering expertise program. There are several subjects in the Mechanical Engineering expertise competency, one of which is Manufacturing Drawing Techniques. This subject is included in phase F in the latest curriculum of the Ministry of Education and Culture, the Center for Excellence (PK) SMK curriculum. SMK PK is one of the priority programs of the Directorate General of Vocational Education (Ditjen Pendidikan Vokasi) of the Ministry of Education and Culture in 2021. This program was born to develop SMK with specific expertise programs to improve quality and performance. Of course, this achievement must be strengthened by partnerships with the business world and industry (DUDI) and the presence of the local government and vocational colleges. SMK PK is a continuation of the previous program, namely the SMK Center of Excellence (CoE) and SMK Revitalization (Ministry of Education and Culture). The Manufacturing Engineering Drawing subject is a productive subject that equips students with work competencies according to the Indonesian National Work Competency Standards (SKKNI) or competency standards agreed upon by institutions representing the business world or industry. This subject teaches students to understand the rules of drawings and artistry signs, applying essential and precision measuring tools in drawing design, drawing coordinate systems, simple drawing design, detailed drawing design, and complex assembly drawing design using relevant CAD technology applications (software). The results of the implementation of the initial pre-test ability test on the

subject of manufacturing engineering drawing at SMK Negeri 2 Wonosari showed that the competency in this subject had not met the minimum competency; this is evidenced by the data on the achievement of student attitude, knowledge, and skills scores which are still lacking.

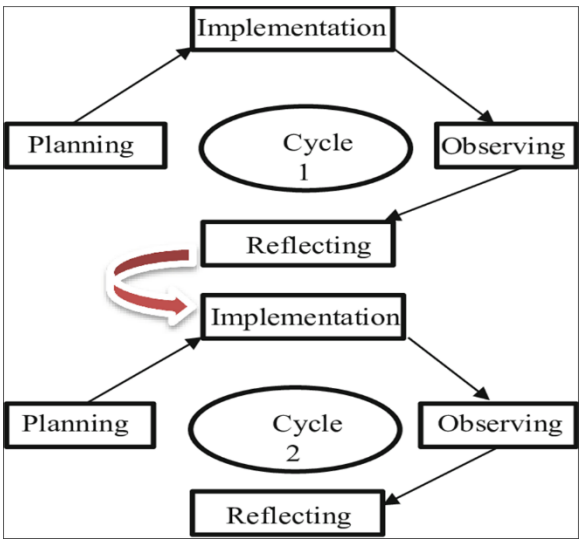
Table 1. Student competency test results

No	Evidence	Attitude value	Knowledge value	Skill value
1.	Average value	**64**	**62**	**43**
2.	Max value	**78**	**80**	**75**
3.	Min value	**58**	**45**	**25**
4.	Total amount	**3**	**4**	**1**
5.	Passing percentage	**9%**	**11%**	**3%**

Based on the pre-test data above shows that the average value of manufacturing drawing competency is still below 70, and the percentage of passing is only 9% in attitude, 11% in knowledge, and 3% in drawing skills. Innovation and breakthroughs are needed so that this manufacturing drawing competency can be further improved, one of which is the use of existing learning media. Still, the school has not provided learning media relevant to manufacturing engineering drawings. Therefore, the author will create learning media as a manufacturing engineering drawing module to improve student competence in manufacturing engineering drawings. By considering the conditions of facilities and infrastructure that have limited computer specifications, the software that will be used to create this module uses software that is still relevant and by the minimum specifications of the computer available in the CAD lab.

METHODOLOGY

The type of research to be conducted is classroom action research, often referred to as PTK. According to Kunandar (2011:44-45), classroom action research is action research conducted by teachers who are also researchers in their class or together with others (collaboration) by designing, implementing, and reflecting on actions collaboratively and participatively aimed at improving or increasing the quality of the learning process in their class through specific actions in a cycle. The main objective of PTK is to solve real problems in the classroom and improve the actual activities of teachers in their professional development activities. According to Mu'alimin (2014:5), PTK is also research that has its own rules and procedures; some keywords regarding classroom action research are as follows: Action research is a form of inquiry (investigation) conducted through self-reflection; Classroom action research is undertaken by participants involved in the situation that occurs, namely teachers, students, or principals; Conducted in an educational setting to improve the basis of thinking and the appropriateness of academic practices. The stages of this research include the preparation of plans (Planning), Action (implementation), Observation (Observing), and Reflection (Reflecting).



Picture 1. Classroom action research flow

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Time and Place of Research

This Classroom Action Research will be conducted at SMK Negeri 2 Wonosari in the odd semester of the 2024/2025 academic year, precisely on the class XI Mechanical Engineering block schedule, in class XI of the Mechanical Engineering expertise program.

Subjects and Characteristics

This study's subjects were 35 students of class XI of Mechanical Engineering at SMK N 2 Wonosari Gunungkidul, with abilities ranging from high to medium.

Procedure

After planning, action and observation activities will be carried out simultaneously, namely when the action and observations are also carried out. As a researcher and observer, the teacher will observe changes in student behavior. The results of the observations are then reflected in the plan for the following action stage. The action cycle is carried out continuously until the problem is resolved and the improvement in learning outcomes is maximized or no longer needs to be improved. Kunandar (2011:70-76) explains that classroom action research is carried out through a dynamic and complementary process consisting of four essential "moments," namely: Preparation of plans, Action, Observation, and Reflection.

Data Collection Techniques and Instruments

The data in this study are quantitative in the form of response scores related to student attitude assessments, then for knowledge assessments using test questions and assessment rubrics. The instruments used are observation statements and test questions that have been validated through validation tests by experts, namely in the form of student attitude assessment observation sheets by being given a checklist (√) according to the results of observer observations in class by referring to the student attitude observation assessment rubric that has been made, then a written test is used to measure aspects of knowledge using pre-tests and post-tests to measure improvements in learning outcomes, instruments. Documentation data carried out in this study include learning objective flows, teaching modules, learning objectives, and photos of the implementation of student attitude observations, knowledge tests, skills tests, attendance lists, and pictures during the learning process.

Data Analysis Techniques

For data analysis on media expert and material expert validation, researchers used a Likert scale, which is used to measure attitudes, opinions, and perceptions of a person or group of people about social phenomena. The social phenomenon in this study is in the form of learning media variables based on learning modules. The variables to be measured are described as variable indicators. Then, the indicator is used as a starting point to compile instrument items in the form of statements or questions. The instrument items' assessment (rating scale) is made with intervals of 1-4 with criteria as in Table 2 below.

Table 2. Instrument rating scale

No.	Response	Value
1.	Very bad	1
2.	bad	2
3.	Good	3
4.	Very good	4

The indicator is then used as a starting point to compile instrument items, which can be questions or statements. So that the classification of the final score assessment results and the percentage of media experts and material experts developed can be seen in the following table:

Table 3. Classification of assessment

No.	Score	Evidence
1	>3,25 - 4,00	Very good
2	>2,50 - 3,25	Good
3	>1.75 - 2,50	Bad
4	1,00 - 1,75	Very bad

Table 4. Classification of percentage scale

Percentage	Rating scale	Evidence
76 - 100 %	4	Very worthy
56 - 75 %	3	Worthy
40 - 55 %	2	Enough
0 - 39 %	1	Less worthy

RESULTS AND DISCUSSION

Learning Module

After going through many revisions, this learning module has been successfully packaged in an innovative and varied way; this module is entitled "Autodesk Inventor Professional Manufacturing Engineering Drawing Learning Module 2020", a total of 70 pages with three learning activities that can be studied independently or collaboratively/in groups, the material in this module focuses on the basic understanding of manufacturing engineering drawings using Autodesk Inventor software specifically for class XI semester 3 machining engineering students.

This module can be accessed via cellphone/smartphone or using the print media provided. The learning module contains all materials related to the learning achievements of manufacturing engineering drawings, explained in detail, starting from the initial explanation to practice questions in each learning activity. The CAD software used in this manufacturing engineering drawing learning module is Autodesk Inventor..

Picture 2. Learning module design

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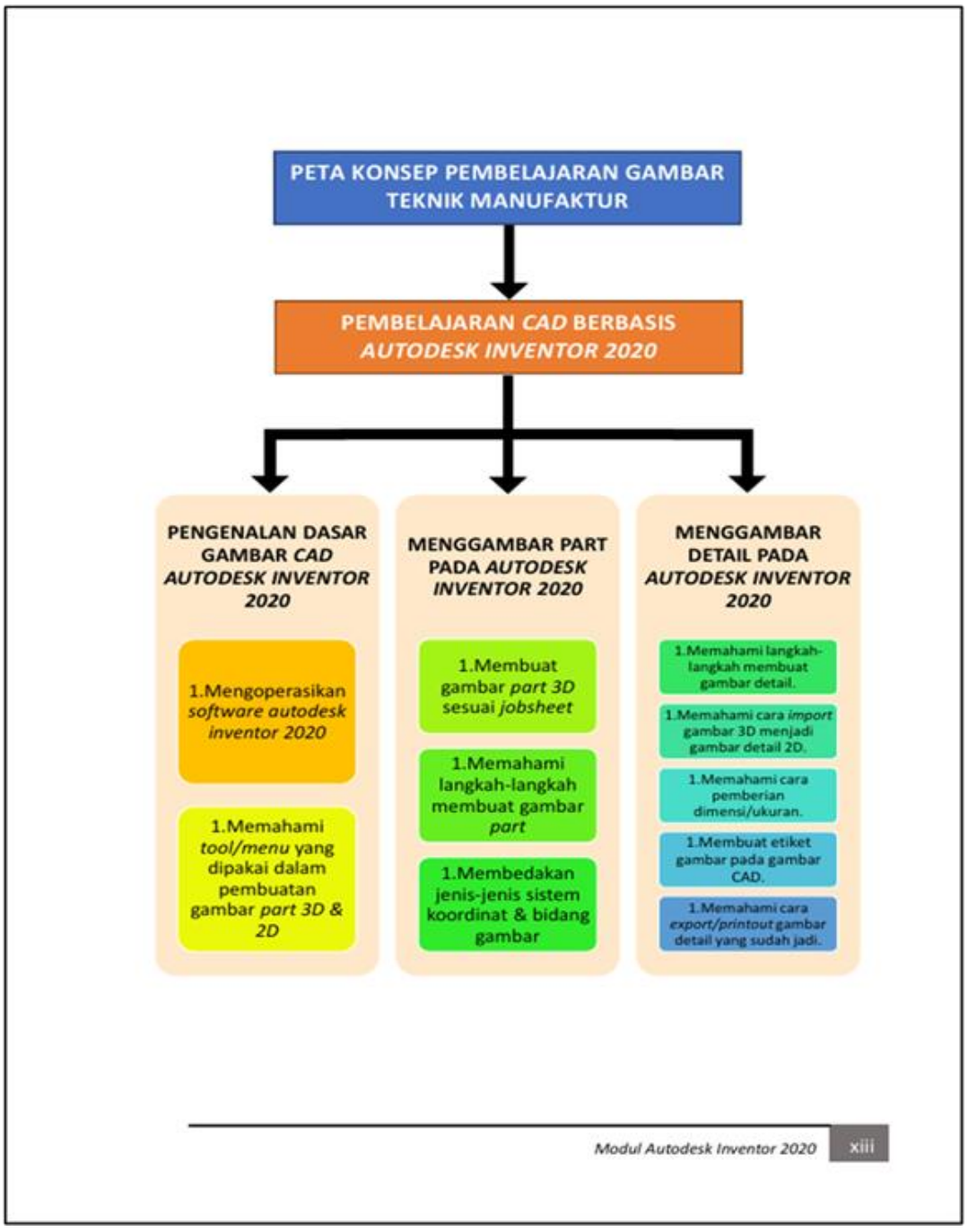
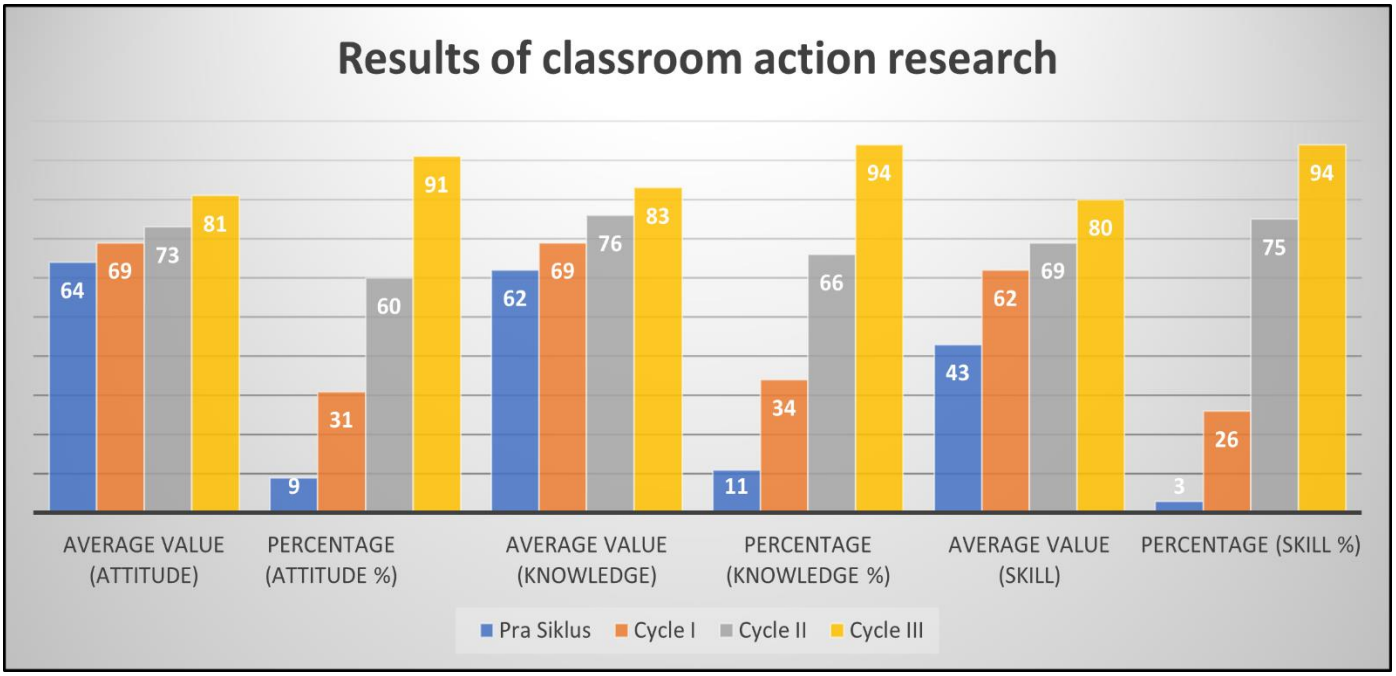
The results of the validation of expert judgment show a 90% assessment from material experts and 93.75% for media experts. With the results obtained, the learning module created by the researcher indicates that it is "worthy" of being used and applied for classroom learning.



Picture 3. Flow chart design

Implementation of Action

Attitude assessment in cycle I experienced an increase with a passing percentage of 31%, and students obtained an average score of 69; in cycle I, this was still very lacking because the number of percentages and average scores achieved were still low. Then, in cycle II, there was still an increase, with a passing rate of students of 60% and obtaining an average score of 73. In cycle II, there was also a significant increase. However, the data results and scores obtained to achieve the learning objective criteria were the number passing percentages of students of 85% and the average score of 75. Then, the data collection continued to cycle III. In cycle III, there was also a good increase, with a passing percentage of 91%, and the average score obtained by students was 81.



Picture 4. Results of classroom action research

The data shows an increase and that the set value and percentage have reached the achievement criteria, with an average value of 75 with 85% passing. The manufacturing engineering drawing learning module can improve students' attitudes. In the graph, the percentage of passing the knowledge test in cycle I has increased, with a percentage of passing the knowledge test of 34% and students getting an average score of 69; in cycle I, this is still very lacking because the percentage of passing the knowledge test and the average score achieved is still low.

Then, in cycle II, there was still an increase, with the percentage of students passing the knowledge test and getting an average score of 76. In cycle II, there was also a significant increase; although the average score had shown achievement, the percentage of passing the knowledge test had not reached the minimum criteria of 85%. Therefore, data collection continued in cycle III. In cycle III, there was also a good increase, with the percentage of passing the student knowledge test at 94% and the average score of students getting 82. The data shows an increase and has reached the set value and percentage; the achievement criteria are an average value of 75 with 85% passing. This indicates that this manufacturing engineering drawing learning module can improve student knowledge.

The results of the skills test assessment in cycle I increased with a percentage of passing the skills test of 26%, and students obtained an average score of 62; in cycle I, this is still very lacking because the percentage of passing the knowledge test and the average score achieved is still low. Then, in cycle II, there was still an increase, with the percentage of passing the skills test at 75% and obtaining an average score of 69. In cycle II, there was also a significant increase; the average score and percentage of passing the skills test had not reached the minimum criteria of 85% of 35 students passing with an average score of 75; therefore, data collection was continued to cycle III. In cycle III, there was also a good increase, with a percentage of passing the skills test at 94%, and an average score of students obtained 80. The data shows an increase and has reached the value and percentage set; the achievement criteria are an average score of 75 with 85% passing. This indicates that this manufacturing engineering drawing learning module can improve students' skills.

CONCLUSION

Producing a feasible and innovative manufacturing engineering drawing module, the validation results from material experts and media experts that the module is declared "very feasible" to be used for classroom learning with an average value of 7.1 with a percentage of 90% from material experts, then the validation results from media experts get an average value of 7.2 with a rate of 93.75%. From the validation results from the two

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experts and referring to the Linkert scale interval percentage table, it can be concluded that the manufacturing engineering drawing learning module using Autodesk Inventor 2020 software is feasible.

The results of the application of this manufacturing engineering drawing learning module include: 1) Students' attitudes during learning increased by 22% in cycle I, then increased by 29% in cycle II, and increased again by 31% in cycle III; 2) Students' knowledge during learning increased by 23% in cycle I, then increased by 32% in cycle II and increased again by 28% in cycle III. 3) Students' drawing skills during learning increased by 23% in Cycle I, 49% in Cycle II, and 19% in Cycle III.

From the data results above, it can be concluded that implementing this manufacturing engineering drawing learning module can "improve" students' competence.

SUGGESTION

Teachers, facilitators, or other researchers can develop a more enjoyable and feasible manufacturing engineering drawing learning module by adding materials related to the latest version of Autodesk Inventor software and relevant jobsheet examples. Teachers/facilitators can develop and improve student competencies by collaborating on learning using the project-based learning model so that students who practice are more challenged to work on the questions and exercises given.

REFERENCE

1. Kemendikbud. (2021). Praktisi Dunia Usaha dan Dunia Industri. Jakarta
2. Kemendikbud. (2022). Capaian Pembelajaran Mata Pelajaran Teknik Pemesinan Fase F Untuk SMK/MAK. Jakarta
3. Kemendikbud. (2024). Kajian Akademik Kurikulum Merdeka. Jakarta
4. Kunandar. (2011). Langkah Mudah Penelitian Tindakan Kelas Sebagai Pengembangan Profesi Guru. Jakarta : PT. Raja Grafindo Persada
5. Mu’alimin. (2014). Penelitian Tindakan Kelas Teori dan Praktik. Jawa Timur. Universitas Muhammadiyah Sidoarjo
6. Presiden Republik Indonesia. (2021). Peraturan Pemerintah RI Nomor 57, Tahun 2021, tentang Standar Nasional Pendidikan.