



Development of Autocad 2D Learning Media with the ADDIE Model

Elfisana Pujiastuti^{1*}; Ruffi'i²; Suhari³

^{1,2,3}Educational Technology, Universitas PGRI Adi Buana Surabaya, Indonesia

^{1*}Corresponding Email: elfisanapuji@gmail.com, Phone Number: 0812 xxxx xxxx

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Abstract: This study aims to develop AutoCAD 2D-based learning media for the Road and Bridge Construction subject for class XI DPIB students. The study uses the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation) to draw and design bridges with learning media for SMK PPGRI 1 Gresik students. This research combines qualitative data analysis in the form of improvement suggestions and quantitative data obtained from questionnaires assessing the feasibility of the learning media by test subjects. After several validation and feasibility testing phases, the AutoCAD 2D learning media is deemed suitable for vocational school education. The developed learning media includes worksheets or jobsheets and a guide to using AutoCAD 2D software. Based on expert validation, the feasibility results show a 94.29% (very feasible) score for material validation. The design expert validation scored 90% (very feasible), the small group test resulted in 67% (feasible), and the significant group test achieved 96.8% (very feasible or excellent). Applying AutoCAD 2D in Road and Bridge Construction learning improves students' technical skills, making them more prepared for careers in design and construction. This innovation also ensures the learning's relevance to industry standards.

Abstrak: Tujuan dari penelitian ini adalah untuk mengembangkan media pembelajaran berbasis AutoCAD 2D dalam mata pelajaran Konstruksi Jalan dan Jembatan untuk siswa kelas XI DPIB. Dengan menggunakan model pengembangan model pengembangan ADDIE (*Analysis, Design, Development, Implementation, Evaluation*) untuk menggambar dan mendesain jembatan dengan media pembelajaran pada siswa kelas XI SMK PPGRI 1 GRESIK. Penelitian ini menggabungkan teknik analisis data kualitatif berupa saran perbaikan dan data kuantitatif yang diperoleh dari angket penilaian kelayakan media pembelajaran oleh subyek uji. Media pembelajaran Autocad 2D ini layak digunakan pada pembelajaran SMK dengan melalui beberapa tahapan uji kevalidan dan kelayakan. Media pembelajaran yang dikembangkan berupa lembar kerja atau *jobsheet* dan panduan dari bahan ajar penggunaan perangkat Autocad 2D. Hasil dari kelayakan produk berdasarkan hasil dari validasi ahli materi menunjukkan nilai 94,29% kategori sangat layak. Penilaian dari validasi ahli desain menunjukkan nilai akhir 90% kategori sangat layak uji kelompok kecil yang menunjukkan nilai 67% kategori layak, dan uji kelompok besar diperoleh 96,8% kategori sangat layak atau sangat bagus. Penerapan AutoCAD 2D dalam pembelajaran Konstruksi Jalan dan Jembatan meningkatkan keterampilan teknis siswa, menjadikannya lebih siap berkarir di bidang desain dan konstruksi. Inovasi ini juga memastikan relevansi pembelajaran dengan standar industri.

A. Introduction

Numerous facets of life have seen substantial changes due to the quick growth of information technology, including the field of learning. In this digital era, using technology-based educational resources is an urgent need to improve the quality of learning. One of the challenges faced by teachers is how to design learning media that are effective, interesting, and relevant to students' needs, especially in vocational fields such as Building Modeling and Information Design (DPIB). As a learning medium, AutoCAD instructional materials have been utilized extensively by Program Building Engineering Education. As it is, AutoCAD can help students learn more about and comprehend the topic of building construction modeling. Students' comprehension of the operations program AutoCAD can be improved by including module learning devices as extra instructional resources (Wiyono et al., 2024).

Using software such as AutoCAD 2D could help with the learning process because this software allows students to learn engineering drawing with high precision according to industry standards. This study aims to create educational media based on AutoCAD 2D using The ADDIE development paradigm. Analysis, Design, Development, Implementation, and Evaluation (ADDIE) is the development model used in this media and is designed to help class XI DPIB students learn and apply road and bridge construction design concepts effectively. With this media, the educational process will be more structured and engaging and will be able to improve student competence based on the requirements of the workplace. Based on (Dino, 2021), Learning resources to support students are one issue that frequently arises in building-based vocational schools, the critical process of learning to draw material. Based on (Al Hafiz & Wijaya, 2023), the study's results showed how DPIB students could utilize the instructional resources for the AutoCAD module in the Engineering Sketching course. In the learning process in vocational schools, students must acquire knowledge and skills pertinent to the workplace.

According to Adji & Jaedun (2017), Activities for instruction and learning in vocational Practice or instruction in computer labs predominate in schools. Students are expected to obtain firsthand experience with objects through these hands-on activities, such as making working drawings using the AutoCAD 2D application. The goal of instructional materials is to significantly impact the student's knowledge and comprehension of the subject. Infrastructure and amenities in schools must support instructional activities and help students learn. "Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to become human beings who can learn," states Article 1 of Law Number 20 of 2013, believe and possess the abilities required by themselves, society, the nation, and the state they also fear God Almighty; they are morally upright; they are intelligent, according to Hartoyo (2009), texts, learning aids, student aptitudes, student support and motivation during educational activities, and teachers.

Students are expected to obtain firsthand experience with objects through these hands-on activities, such as how AutoCAD 2D was used to construct the working drawings.

The objectives of instructional materials significantly impact students' knowledge and comprehension of the subject matter. Infrastructure and amenities in schools must support instructional activities and help students learn. Learning modules and computer assistance devices affect students' comprehension and knowledge when obtaining lesson material.

According to [Siahaan \(2017\)](#), AutoCAD must be studied as a productive topic to accomplish these objectives. Knowledge Competencies in SMK, especially in the building engineering department or DPIB (Building Modeling and Information Design), are related to working drawings and require size accuracy, adjusted to work instructions, both scale and dimensions in plotting working drawings according to the work steps on the job sheet and Autocad 2D teaching materials. This application makes drawing more manageable for students because this AutoCAD program has several instructions and drawing options that help students comprehend job requirements. In addition, the program is engaging and dynamic for students. According to [Al Hafiz & Wijaya \(2023\)](#), The function of teachers and the facilities now in place are crucial to SMK's ability to produce competent graduates. The learning process is essential for creating and following capable graduates who can fulfill the requirements of the demands of the world of work. The learning curriculum must be made to accommodate both the advancement of science and the needs of the students. This is to ensure that the material being taught is up-to-date and relevant. In addition to technical proficiency, developing soft skills such as communication, leadership, and teamwork are also very important.

In the workplace, soft talents are frequently what set people apart. According to [Setiawan \(2013\)](#), The minimum AutoCAD learning requirements for building drawings using computer programs at various educational levels (universities, building vocational schools) are lower than those for vocational education with a basic comprehension of AutoCAD 7.0 is the Completion Criteria (KKM). Only 60% of students finish with a knowledge of AutoCAD drawing, with about 40% receiving a score below KKM. Material that can be used as a whole if needed by various organizations, including contractors, planning consultants, students, teachers, and others. The AutoCAD application helps students draw plans and designs ranging from structures, architecture, plumbing (MEP), and electrical and mechanical work. According to [Priambudi \(2022\)](#), The Building Modelling and Information Design Competency subjects will be added as Software Application courses in line with the 2013 curriculum structure. Subjects. By providing feedback in the form of tasks that allow them to plan roads based on existing conditions in the field and apply them to the road or bridge planning plan that is attractive and by the construction needed for the land conditions and types of land to be planned. This is related to discussions and interactive surveys between students and students and teachers to resolve design issues, particularly those involving roads, bridges, and pedestrians, by distributing worksheets in the form of jobsheets to students.

Based on [Septiantoro & Widaningsih \(2022\)](#), by resolving design issues, particularly those involving roads, bridges, and pedestrians. From the analysis, the researcher found excellent results from the student satisfaction questionnaire distributed to the DPIB class

(large group). The efficiency of AutoCAD 2D uses learning media in studying the construction of roads and bridges. These products or media are simple, practical, and effective for finishing and working on floor plans, pedestrian roads, and roads. Bridge sections. For this reason, teaching materials and Jobsheets can make it easier for students to work on drawing assignments equipped with work steps as a basis for drawing roads and bridges using AutoCAD software. Based on Hilmy et al (2023), The issues of inadequate equipment and passive interaction during the practicum process can be resolved with this approach. The application's simplicity of use, the instructions' clarity, and the AutoCAD 2D features' completeness can all be used to evaluate its quality.

Ultimately, the findings from the survey were obtained from a large group of 33 students. Namely, the high level demonstrates students' satisfaction with 2-dimensional AutoCAD learning resources and the encounters they encounter when utilizing them. The 2D Autocad Application Media compares learning from manual drawings to the use of Autocad, which is easier, more practical, and efficient in completing and working on floor plans, pedestrians, and road and bridge sections and providing a more conducive and comfortable learning atmosphere for students with the hope that it can run smoothly, efficiently and successfully throughout the educational process. The content is basic skills and an overview of construction, including how to use AutoCAD software to draw roads and bridges. The results of using this media are that students are proficient in AutoCAD software, and later, these students will dive directly into the world of work with the skills they have mastered in the future. This activity can involve interactive discussions between students or teachers to increase learning motivation, abilities, and comprehension. Learning that is precise, organized, and visual is anticipated. By the 2013 curriculum structure, the Building Modelling and Information Design Competency subjects will be included as Software Application courses, in contrast to the outdated, traditional teaching approach. This is helpful and consistent with what has been used in the workplace. According to Pribadi et al (2023), SMK is a secondary school vocational education program designed to prepare pupils for the workforce. One tool that can assist you in creating a work plan is AutoCAD, which is in the form of drawings. As stated by Fitriyanto & Idjar (2021), the necessary media is not only cheap but also not "complicated" to locate for educators and apply, attract students' attention, and allow pupils to take an active role in their education. AutoCAD is one of the learning tools (media) that can be easily accessed to learn in addition to the teaching materials provided, either through YouTube tutorials or by downloading them on the internet. According to Carina & Sulistianingsih (2021), AutoCAD is an instrumental program, especially in engineering, especially architecture. According to Dinata & Suwito (2019), much work has been done to improve learning quality and science and technology development worldwide. Among them is creating teaching materials and jobsheets to make it simpler for pupils to use the AutoCAD program.

B. Method

From the data produced, observations were made during student practice hours in large groups or classes of 35 students in class XI DPIB for observation of the object of research, namely the use of the Autocad 2D application, where the research subjects were students in class XI DPIB. The questionnaire results showed satisfaction with using the Autocad 2D Application media in learning Short-span Road and Bridge Construction 7x3 m2. It is more concise with more straightforward, effective, and efficient working drawings in time.

In sequence, the research process includes conducting observations, creating a job sheet, preparing questionnaires, testing for validity and reliability, distributing questionnaires, analyzing the data, and interpreting the results to finalize the research.

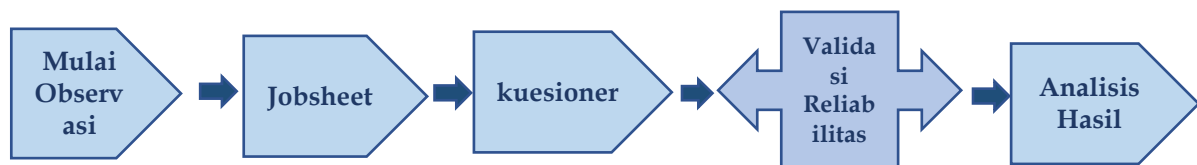


Figure 1. Research Flow (Dhimas & Azman, 2019)

The Likert scale was used as a reference in calculating the results of the student questionnaire. The formula used to get the proportion of the overall score corresponding to the highest possible score is to divide the sum of all scores by the highest possible score, then multiply the result by one hundred.

Based on these findings, it can be said that the application of When learning road and bridge construction drawings, AutoCAD 2D, is taken into consideration positively excellent at assisting student learning, as seen by the proportion of student responses with scores ranging from 81% to 96.7%, indicating that students believe delighted and made it easier to learn two-dimensional drawings based on AutoCAD in learning the construction of bridges and highways. Much work has been done to improve the quality of learning along with the development of science and technology worldwide. One of them is by creating a learning module (Dinata & Suwito, 2019). Evaluation of the level of satisfaction based on a Likert scale questionnaire. The Likert scale or scoring A research scale called assessment is used to gauge people's beliefs and attitudes. The scoring scale can be seen in the following table.

Table 1. Likert Scale Table Format

Score	Information
5	Very good
4	Good
3	Quite appropriate
2	Not quite appropriate
1	Not appropriate

Adaptation of: Sugiono (2019)

Examination, namely recognizing students' requirements for learning about building roads and bridges materials and figuring out the goals and anticipated outcomes of using AutoCAD 2D. Analysis of Competencies, specifically what skills students need to learn and how AutoCAD 2D may help them develop them. Design through material planning. For instance, AutoCAD 2D can be used to create the framework of the instructional materials provided, including the creation of modules and user instructions. Creating interactive learning resources with AutoCAD 2D, like project assignments, hands-on activities, and simulations, is another aspect of learning design. Evaluation Instrument Progress, namely designing a survey to gauge how well instructional materials work and how satisfied students are. Material development, such as creating educational resources using AutoCAD 2D, for instance, procedures for creating bridge drawings.

The preliminary testing comprises exercises to conduct preliminary testing of educational resources and media by enlisting a limited number of students or specialists to obtain preliminary comments. Next, continued with revision or improvement of the drawing, namely the improvement and refinement of designs for building roads and bridges based on input from the analysis of the preliminary test, namely identifying students' learning needs related to road and bridge construction materials and determining the objectives and expected results of using AutoCAD 2D. Competency Analysis, namely determining what competencies students must master and how AutoCAD 2D can help achieve these competencies. Design by planning the materials. For example, by designing the structure of the learning material that will be supplied in AutoCAD 2D, along with the development of user manuals and modules. Creating interactive learning resources with AutoCAD 2D, like project assignments, hands-on activities, and simulations, is another aspect of learning design. Evaluation Instrument Development, namely designing a questionnaire to assess student happiness and the efficacy of educational media. Material development, such as creating educational resources using AutoCAD 2D and procedures for creating bridge drawings.

A limited number of students or experts are involved in the early testing activities to gather preliminary input on the learning materials and media. Following that, the drawing was revised or improved; namely, the road and bridge construction drawings were improved and refined based on the input received from the initial testing.

The implementation involves using AutoCAD 2D learning materials in the DPIB computer lab to complete drawing tasks using the created jobsheet. Following the procedure, it is essential to keep an eye on the learning process, namely by making observations as it is taking place to make sure the media is being used efficiently and in line with the established goals. The result is data gathering when a small number of students representing class XI DPIB complete a questionnaire to assess their educational experience. Microsoft Excel is used to analyze the data and provide the evaluation. Information gathered from the questionnaire was used to evaluate the efficacy of the AutoCAD 2D learning materials and to determine if using AutoCAD 2D has aided pupils in achieving the necessary competencies and comprehending the idea of building roads and bridges. It is

anticipated that feedback and improvement will be able to determine the outcomes and pinpoint drawings that need improvement. These results can be used to improve the learning materials and make changes to the drawings according to the working drawings' requirements. A non-test evaluation method was employed in this study to obtain a more complete view of the learning program's efficacy without depending on written examinations. Researchers can gather information about students' perceptions, satisfaction, and learning efficiency from their point of view by employing a questionnaire. This data is crucial for maximizing the application of AutoCAD 2D in education.

C. Result and Discussion

Result

According to research findings on large groups of students, they were satisfied with the Autocad 2D learning materials they used to study building roads and bridges. The proportion of student responses was calculated to determine the findings of the quantitative analysis of the data collected from the questionnaire to the Autocad 2D application media. Then, the percentage will be seen using the interpretation table that has been provided. Likewise, the frequency of each student's responses will be calculated to determine which questions are better, reasonable, and less good. The highest frequency of answers is considered as the tendency of the answer.

Table 2. Percentage and Criteria

Persentase	Criteria
81% - 100%	Very good
61% - 80%	Good
41% - 60%	Quite appropriate
21% - 40%	Not quite appropriate
0% - 20%	Not appropriate

Adaptation of: [Iswadi et al \(2015\)](#)

1. Material Expert Validation

Mr. Ainur Rosyidi, S.T., M.T., Consultant Director of PT, validated the material. Panorama, who acted as a practitioner or professional with in-depth expertise and direct experience in the field of building and road-bridge projects. His expertise is relevant to creating educational materials for AutoCAD 2D short-span Bridge and road construction. As a material expert, he deeply understands both the field's practical aspects and theory, especially in building drawing and construction. With a history in architecture education and practical experience in using AutoCAD, he has been involved in various real construction projects. This validation process was carried out on Tuesday, September 10, 2024. The questionnaire given to this material expert consisted of 14 questions, where the reviewer was also asked to provide comments and suggestions. This aims to obtain

information, criticism, and input that will help improve the quality of the learning media being evolved. The developed. The results of the content/material expert reviewer.

Table 3. Material Expert Validation Results

No	Indicator	Result	
		Value	Category
1.	Suitability of material with Core Competencies and Basic Competencies	5	Very Good
2.	Suitability of material with learning objectives	5	Very Good
3.	Suitability of color, image display, and job sheet Development of Autocad 2D Learning Media With Addie Model	5	Very Good
4.	Suitability of material presented in learning media	5	Very Good
5.	Interestingness/suitability of images with material	5	Very Good
6.	Use of words according to Enhanced Spelling (EYD)	5	Good
7.	Ease of understanding of the material by grade XI DPIB students using learning media	4	Very Good
8.	Accuracy of systematic material presented in learning media	5	Good
9.	Level of depth and breadth of material with material characteristics for grade XI DPIB.	4	Very Good
10.	Suitability of practicum activities, observations, and discussions with material in learning media	5	Good
11.	Level of truth of content in summary	4	Very Good
12.	Suitability of types, forms of evaluation, and variations of questions in learning media	5	Good
13.	Suitability of videos and images in learning with material	5	Very Good
14.	The use of learning media can motivate students	4	Good
Total		66	
Maximum Score Total		70	

From the research results obtained above, the number of research scores can be expressed as a percentage to ascertain the degree of feasibility of the content of the material that has been created. The percentage outcomes of the material experts' validation are as follows:

$$\text{Percentage} = \frac{\sum \text{Total Score}}{\text{Maximum Score}} \times 100\%$$

The Percentage Results of Material Expert Validation

$$\text{Percentage} = \frac{66}{70} \times 100\% , \text{Percentage} = 94,29\%$$

This product can be used by educators to be tested on students without the need for revision. The media experts' media test results on AutoCAD 2D-based drawing learning showed the following assessments: 94% was obtained in the media aspect, with the qualification Very Good/Very Eligible. Based on the percentage results, the product content eligibility reached 94.29%, according to Table 4.3. This result ranges from 61% to 80%, included in the Very Good or Very Valid category. The suggestion from the Material expert is to provide additional literature on adding work orders to Autocad.

2. Design Expert Validation

Media validation was carried out by Dr. Achmad Noor Fatirul, S.T., M.Pd., a lecturer in the Educational Technology Study Program at the Postgraduate School of Universitas PGRI Adi Buana Surabaya, who acted as a design expert. The questionnaire given to the material expert consisted of 12 questions, which the reviewer was also asked to provide comments and suggestions. This aims to obtain information, criticism, and input that will help improve the quality of the learning media being developed. This validation process was carried out on Tuesday, September 3, 2024. The results of the content/material expert review can be seen at:

Table 4. Design Expert Validation Results

No	Indicator	Result	
		Value	Category
1.	The Interest in Developing 2D Autocad Learning Media with the Addie Model in Road and Bridge Construction for class XI DPIB.	5	Very Good
2.	The interest in the layout design in 2-Dimensional Autocad as an opener for Autocad-based learning media.	5	Very Good
3.	The clarity and suitability of the images on the interface and the Autocad commands used in the 2D Autocad Learning media.	4	Very Good
4.	The suitability of fonts, hatches (building material structure materials), and colors in the layer (image type description) in the learning media is easy to understand.	4	Very Good
5.	The interest in the 2D image results in the learning media	5	Good
6.	The interest and suitability of the print results of the supporting PDF images	4	Good
7.	The interest in the accompanying music and the learning material when presenting the image.	4	Very Good
8.	The accuracy of the layout of the navigation buttons (continue, back, main menu) in the Autocad learning media.	5	Good
9.	The ease of the Autocad 2D learning media operating system.	5	Very Good
10.	The interest in the layout used in the Autocad 2D learning media.	5	Very Good
11.	The ease of understanding the learning material in the Autocad 2D-based learning media. The effectiveness of learning media was developed in short-span road and bridge construction drawing activities using AutoCAD.	4	Very Good

No	Indicator	Result	
		Value	Category
12.	The Interest in Developing 2D Autocad Learning Media with the Addie Model in Road and Bridge Construction for class XI DPIB.	4	Good
Total		54	
Maximum Score Total		60	

$$\text{Percentage} = \frac{\sum \text{Total Score}}{\text{Maximum Score}} \times 100\%$$

The Percentage Design expert validation results

$$\text{Percentage} = \frac{54}{60} \times 100\% , \text{Percentage} = 90 \%$$

3. Large Group Trial Results

In this final stage, the researcher conducted a final test with the revised Autocad 2D learning media from a small group. The researcher conducted a trial on a large group, namely one class (35 students of XI DPIB), of 35 students majoring in Building Information Design and Modelling in the 2022 batch in the Drawing Practice Room of the DPIB Lab, on Monday, September 12, 2024. Then, the bridge drawing jobsheet was given along with the work steps to make it easier for them to work on the short-span bridge drawing. Furthermore, they were given an assessment questionnaire to measure the ease and practicality and ask for input on the drawing assignment. From the distribution of the questionnaire, the researcher got the following results:

Table 5. Percentage Format of Learning Outcomes of 35 Class XI DPIB Students Regarding the Use of the Autocad Application

No.	Student Respondent	Score	Maximum Score	Criteria
1	Student 1	93	90%	Very good
2	Student 2	92	90%	Very good
3	Student 3	89	90%	Very good
4	Student 4	87	90%	Very good
5	Student 5	91	90%	Very good
6	Student 6	92	90%	Very good
7	Student 7	94	90%	Very good
8	Student 8	91	90%	Very good
9	Student 9	91	90%	Very good
10	Student 10	79	90%	Good
11	Student 11	79	90%	Good
12	Student 12	82	90%	Very good
13	Student 13	85	90%	Very good
14	Student 14	94	90%	Very good
15	Student 15	72	90%	Very good
16	Student 16	84	90%	Very good

No.	Student Respondent	Score	Maximum Score	Criteria
17	Student 17	90	90%	Very good
18	Student 18	87	90%	Very good
19	Student 19	89	90%	Very good
20	Student 20	90	90%	Very good
21	Student 21	91	90%	Very good
22	Student 22	68	90%	Very good
23	Student 23	87	90%	Very good
24	Student 24	90	90%	Very good
25	Student 25	74	90%	Very good
26	Student 26	94	90%	Very good
27	Student 27	87	90%	Very good
28	Student 28	87	90%	Very good
29	Student 29	93	90%	Very good
30	Student 30	91	90%	Very good
31	Student 31	92	90%	Very good
32	Student 32	71	90%	Very good
33	Student 33	92	90%	Very good
34	Student 34	90	90%	Very good
35	Student 35	92	90%	Very good
Jumlah		3050%	3.150%	

From the research results obtained above, the number of research scores can be a percentage to determine the level of practicality of the media that has been created. The outcomes of the Large Group Trial are shown as follows, in percentages:

$$\Sigma \text{ Prosentase} = \frac{\Sigma @\text{Responden result}}{\Sigma \text{maximum}} \times 100\%$$

The formula for Calculating the Percentage of a Large Group

$$\text{Then the result of the Percentage of 35 students} = \frac{3.050}{3,150\%} \times 100\% = 96.8\%$$

Considering the percentage outcomes above, the feasibility of the product content in a large group of 35 students of class XI DPIB is 96.8%, according to Table 4. The results are between the 81% - 100% range with the category Very Good or Valid.

Most students stated that the AutoCAD 2D program satisfies their educational requirements, which is crucial. Among the many benefits of Autocad 2D as a drawing tool are its user-friendliness and clear instructions. Some of these are important in evaluating learners' effectiveness in using educational materials. In addition, the appearance of the resulting images or visuals attracts students to study Autocad further to achieve their learning goals – an example of the construction of a short-span bridge drawing by students in class XI. According to the results of the drawings of class XI students, significant changes can be seen starting from manual drawings of road and bridge work.



Figure 2. One Example of a Student's Manual Drawing Assignment for Roads

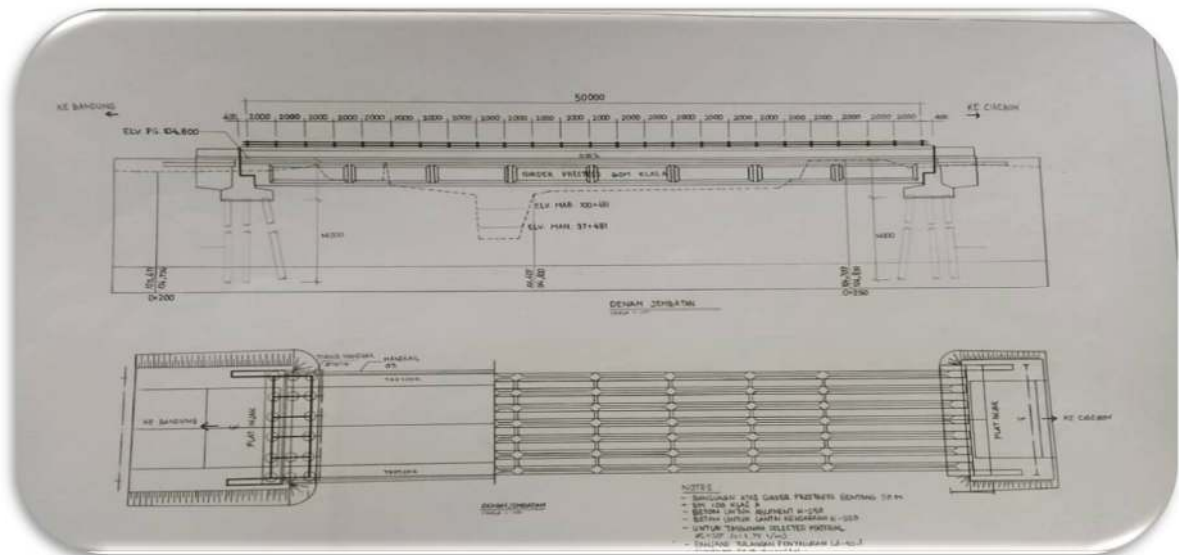
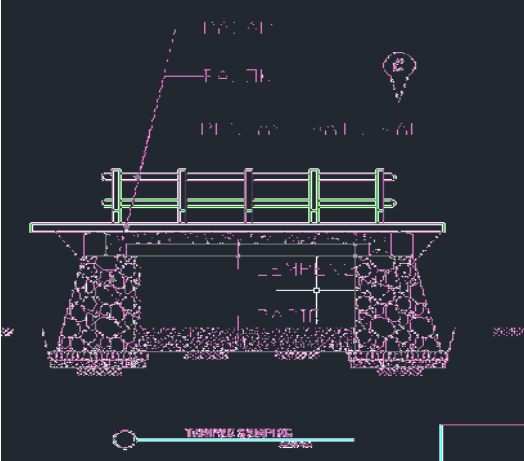
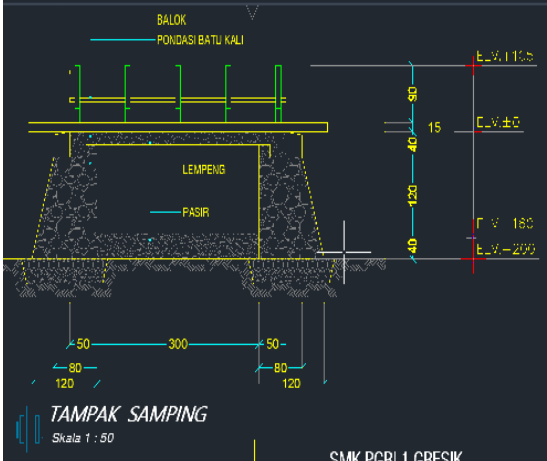
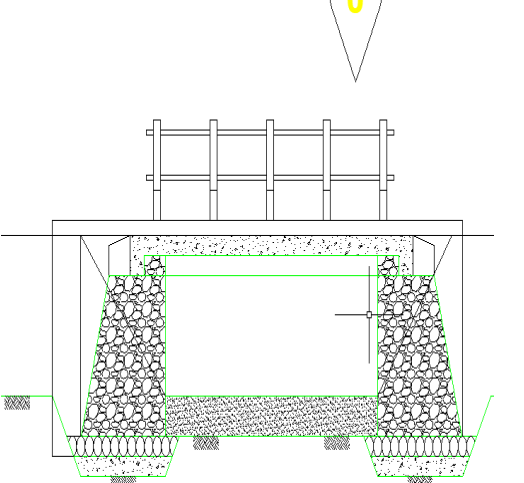
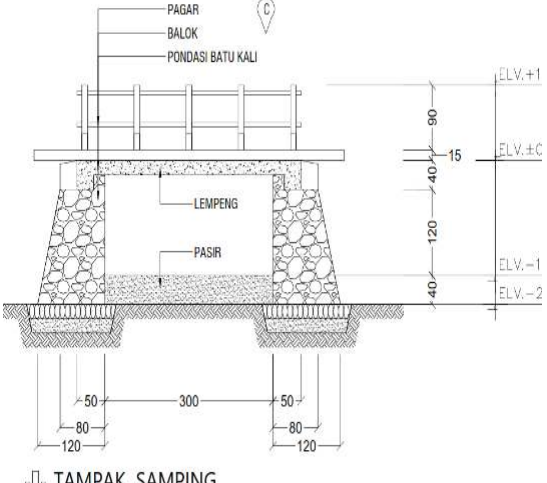


Figure 3. One Example of a Student's Manual Drawing Assignment for Bridges

After students are given the task of drawing manually, they are then introduced to working drawings using the more innovative and engaging Autocad 2D application media. as in the outcomes of the students' drawings in the table that follows:

Table 5. Some Examples of Student Work Drawings Using the Autocad Application Before and After Being Corrected by the Teacher

No.	Before Revision	After Revision
1.		
	<p>The floor plan of a 7x3 m short-span bridge using Autocad before revision shows incomplete image description notation, and the line thickness is inappropriate.</p>	<p>The floor plan of a 7x3 m short-span bridge was revised using AutoCAD and is complete with notations for image descriptions and material.</p>
2.		
	<p>The PDF image results show the results of the 7x3 m short-span bridge plan images, which are not monochrome.</p>	<p>Pdf image results, short span bridge plan drawing 7x3 m</p>

No.	Before Revision	After Revision
3.		
<p>Unrevised side view of the 7x3m short-span bridge.</p>	<p>Revised Side View Image of 7x3m Short Span Bridge</p>	
4.		
<p>The PDF image results of the 7x3m Short Span Bridge have not been revised.</p>	<p>Revised PDF Image Results of the 7x3m Short Span Bridge</p>	

The trial results showed that a large group of 35 grade XI DPIB students showed satisfactory and excellent results and improved their drawing skills. The trial results showed that a large group consisting of 35 grade XI DPIB students showed very satisfactory and very good results and were able to improve their drawing skills.

Discussion

Practical activities in vocational education have been mainly carried out with the help of job sheets and demonstrations by the practicum teacher. This causes students to have difficulty understanding the instructions on the manual practicum job sheet. Although a demonstration is carried out first by the teacher before the practicum is carried out, it takes quite a lot of time, materials, and energy to carry out the demonstration (Akbar et al., 2016). Using programs like AutoCAD that facilitate learning to draw, teachers can demonstrate

their students' proficiency with the tool accurately and effectively. Vocational high Students at school require a variety of abilities later when students finish their coursework at school. Among the expected abilities is the ability to draw construction using the AutoCAD program. Where the ultimate skill that pupils should possess later is being able to create construction blueprints in two-dimensional models (Lestari, 2024).

According to Yani (2022), one of the arts, sciences, and technology that responds to the needs of the industrial world and the times is technical drawing using the AutoCAD program. Considering the specific Vocational goals, High According to Law Number 20 of 2003, education (SMK), AutoCAD training needs to be held for vocational school students. Based on Lestari (2024), SMK students require several abilities they will need once they finish their coursework. The ability to use the AutoCAD application to draw constructions is a required talent. Based on Istigna et al (2022), AutoCAD is one computer application that can be utilized as a teaching tool. The abbreviation for the program is AutoCAD, which stands for Automatic Computer Aided Design. In its most basic form, AutoCAD can be understood as a package application that can be used as a design tool.

Based on Patkur & Wibowo (2013), the purpose of this study is to ascertain how students react to learning with the AutoCAD module, which aids students in their educational journey to determine the part of teachers by using the AutoCAD computer program module in education and ascertain the learning objectives attained by pupils employing the existing Tools for Learning modules for AutoCAD. From the explanation, a learning medium is required for the teaching and learning process to provide good visualization in drawing using AutoCAD, especially material that discusses basic and advanced drawing with AutoCAD. AutoCAD 2D is software designed to assist in creating sketches for digital engineering. They are highly pertinent to the drawing field, particularly in the building information department of modeling and design. Based on Siahaan (2017), AutoCAD must be studied as a productive topic to accomplish these objectives. Proficiency in Vocational High School Competency because drawings can represent an object to be worked on and building engineering is tied to drawings and demands size accuracy. Students can create drawings with high accuracy and precision with Autocad 2D. Every line and form is drawn precisely thanks to features like snap, grid, and coordinates. as opposed to hand drawings, which are more likely to have errors like crooked lines or imprecise measurements. The AutoCAD 2D instructions are simple for students to follow, which helps them become more proficient and comprehend the content. According to Adji & Jaedun (2017), Practice or instruction in computer labs dominates teaching and learning activities in trade schools. It is anticipated that students will obtain firsthand experience with objects through these hands-on activities, such as how to create working drawings using the AutoCAD 2D application. Based on Iswadi et al (2015), this research generally seeks to use the AutoCAD software to create computer-based educational materials for constructing roads and bridges. This development study aims to create reliable and valuable computer-based learning resources. 2D learning materials based on AutoCAD will be developed to

enhance grade XI students' comprehension of design, modeling, and construction techniques in road and bridge construction.

From the explanation above, a learning medium is required for the teaching and learning process that can offer a clear visual of the subject of drawing using AutoCAD, particularly the sections that cover both basic and expert AutoCAD drawing. Software called AutoCAD 2D was created to help with the production of digital engineering drawings, which are highly important in the drawing industry, particularly in the modeling and building information design departments. Based on [Siahaan \(2017\)](#), students must learn AutoCAD as a productive subject to accomplish these objectives. Vocational High School Expertise Competence Drawings can represent an object to be worked on because building engineering is related to them and demands size accuracy. Students can create drawings using AutoCAD 2D with a very high degree of accuracy and precision. Every line and form is drawn thanks to features like snap, grid, and coordinates, unlike manual drawings, which are more prone to human error, such as non-straight lines or inaccurate measurements. Students find the instructions for using AutoCAD 2D easy to follow, thus helping them improve their skills and understanding of the material provided. According to [Adji & Jaedun \(2017\)](#), Practice or instruction in computer labs dominates teaching and learning activities in trade schools. It is anticipated that students would obtain firsthand experience with objects through these hands-on activities for [Iswadi et al \(2015\)](#) how to create working drawings using the Practice or instruction in computer labs dominates teaching and learning activities in trade schools. Students are expected to obtain firsthand experience with objects through these hands-on activities – Autocad 2D application. Based on [Iswadi et al \(2015\)](#), this research aims to develop computer-based learning media using the AutoCAD program on road and bridge construction. This development study aims to create reliable and valuable computer-based learning resources. A 2D learning resource based on AutoCAD will be developed to help class XI students better comprehend design, modeling, and building techniques in the road and bridge construction course.

D. Conclusion

The result of this development research is the creation of AutoCAD 2D learning media with the ADDIE model that is adjusted to the Technical Design, Modeling, and Building Information course for class XI SMK. This AutoCAD 2D learning media is considered suitable for use in SMK after going through several stages of validation and feasibility tests. The Questionnaires are distributed via survey media as part of the data collection technique. The purpose of the Likert scale is to persuade respondents to provide answers at different levels for every statement or question in the survey ([Dhimas & Azman, 2019](#)). The results of product feasibility based on expert validation showed a score of 94.29%, having a convenient category. With a very feasible category, the design expert validation received a score of 90%. In the extensive group test, the media scored 96.8%, putting them in the feasible or excellent range. It has been demonstrated that using AutoCAD 2D to teach

road and bridge construction enhances students' technical proficiency, preparing them for a future in design and construction.

This innovation also ensures that the educational process conforms to industry standards. Considering the outcomes of the large group's field test validation, the media obtained a score of 96.8%, which indicates that the AutoCAD 2D Learning materials are very effective. These results indicate that the media makes it easier for teachers to deliver short-span bridge drawing (7x3 m) subject matter more effectively and for students to learn and practice road and bridge drawing techniques. Thus, the learning process for grade XI students in Engineering Design, Modeling, and the SMK software for Building Information Study PGRI 1 Gresik becomes more straightforward and practical.

Long-term studies to evaluate the effects of learning materials for AutoCAD 2D on students' career readiness and professional competence will also offer valuable data for continuous improvement and further refinement of educational tools in the field of technical education.

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