Analysis of Student Satisfaction Questionnaire with 2D Autocad Learning Media in Learning Road and Bridge Construction

Elfisana Pujiastuti[1*]; Rufi'i[2]

[1,2]Educational Technology, Graduate School, Universitas PGRI Adi Buana Surabaya, Indonesia
[1]Corresponding Email: elfisanapuji@gmail.com, Phone Number: 0812 xxxx xxxx*

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Abstract: The aim is to determine students' satisfaction level in class XI using Autocad 2D learning media in road and bridge construction lessons. This study also shows that 2D AutoCAD-based learning can help students understand the material better and become more adept at drawing. Non-test evaluation data from student satisfaction questionnaires in class XI DPIB were analyzed. Students were asked to determine their perceptions, preferences, and level of satisfaction with the application. To make educational media based on the Autocad 2D application to concentrate on road and bridge construction lessons more efficient and practical. The Likert Scale Model is used for research and development. The Likert scale is a scale that can be used to measure the attitudes, opinions and perceptions of students or groups of students about the benefits and how effective the use of this media is. From the results, the conclusion that can be drawn is that the AutoCAD 2D application in learning Road and Bridge Construction drawings is considered positive and very good in helping students' learning, as evidenced by the results of the percentage of student responses with the results obtained being 85% to 90%, which means students feel delighted. Moreover, it makes learning two 2-dimensional Autocad-based drawings easier in Road and Bridge Construction lessons.

Abstrak: Tujuannya adalah untuk mengetahui Tingkat kepuasan peserta didik di kelas XI dengan menggunakan media pembelajaran Autocad 2D pada pelajaran Konstruksi jalan dan jembatan. Studi ini juga menunjukkan pembelajaran berbasis AutoCAD 2D dapat membantu siswa lebih memahami materi dan lebih mahir menggambar. Data evaluasi non-test dari angket kepuasan siswa di kelas XI DPIB dianalisis. Siswa diminta untuk menentukan persepsi, preferensi, dan tingkat kepuasan mereka dengan aplikasi. Dengan tujuan agar media pendidikan berbasis aplikasi Autocad 2D untuk konsenstrasi pelajaran konstruksi jalan dan jembatan ini apakah lebih efisien dan praktis. Model Skala Likert digunakan untuk penelitian dan pengembangan. Skala likert ialah skala yang dapat di pergunakan untuk mengukur sikap, pendapat, dan persepsi siswa atau sekelompok siswa tentang manfaat dan seberapa efektif penggunaan media ini. Dari hasil kesimpulan yang dapat diambil adalah aplikasi AutoCAD 2D dalam pembelajaran gambar Konstruksi Jalan dan Jembatan dinilai positif, sangat baik dalam membantu pembelajaran para siswa, terbukti dari hasil prosentasi respon siswa dengan hasil yang didapat adalah 85% sampai 90% yang artinya siswa merasa sangat puas dan dimudahkan dalam pembelajaran gambar berbasis Autocad 2 Dimensi pada pelajaran Konstruksi Jalan dan Jembatan.

A. Introduction

The purpose of this study was to determine the level of class satisfaction. According to (Dino & Sofianto, 2021), One of the problems that often occurs in building-based vocational schools is learning resources to support an essential learning process regarding drawing materials. With this learning media, students can learn the material more innovatively and effectively. This research aims to find valuable knowledge that will be the basis for efforts to equip students with practical skills in the world of work.   According to (Al Hafiz & Wijaya, 2023), The results showed that DPIB students can use AutoCAD module learning media in Technical Drawing courses. Later, this media can provide more enjoyable knowledge and skills through the curriculum's essential competencies. In the learning process at vocational schools, students must acquire knowledge and skills relevant to the world of work. The competency achievement of vocational students is still low because of the demands of the desired skills in the industrial world.

According to (Adji & Jaedun, 2019), Teaching and learning activities in SMK are dominated by practice or learning in computer laboratories. Through these practical activities, students are expected to gain real experience directly with objects, such as making working drawings using the Autocad 2D application. Teaching materials are targets that significantly influence students' knowledge and understanding of the subject matter. School facilities and infrastructure must support teaching and learning activities and facilitate students' learning. According to Article 1 of Law Number 20 of 2013, "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 have faith and devotion to God Almighty, have noble character, personality, intelligence, morals, and have the skills needed by themselves, society, nation, and state. Textbooks, learning implementation media, student abilities, student motivation and encouragement in learning activities, and the teacher's ability to manage learning strategies are some factors that affect student learning outcomes. Computer support devices and learning modules are some of the components that affect students' knowledge and understanding in capturing subject matter.

According to (Siahaan, 2017), students must learn Autocad as a productive subject to achieve these goals. SMK Expertise Competency: Building engineering is related to drawings and requires size accuracy, so drawings can represent an object to be worked on. The 2D Autocad application is one of the learning options that can help students in drawing because, in this Autocad application, there are various kinds of commands and image settings that make it easier for students to complete road and bridge drawing assignments. This AutoCad 2D program media application is a more visual depiction. According to (Reza et al., 2024), The success of SMK in producing competent graduates is highly dependent on the role of teachers and existing facilities. The learning process is the key to producing graduates who are competent and able to meet the needs of the world of work and adapt to change. Industry needs and scientific development trends must design the curriculum. This is to ensure that the material taught is relevant and up-to-date. In addition to technical

knowledge, developing soft skills such as communication, leadership, and the ability to work in teams is also significant.

These soft skills are often the differentiating factor in the world of work. According to (Setiawan., 2013), CAD (Computer Aided Design) learning requirements for drawing buildings using computer programs at various levels of education (universities, building vocational schools) and vocational education with the basics of AutoCAD have values that are less than the Minimum Completeness Criteria (KKM), which is 7.0. About 40% of students scored less than the KKM, meaning that only 60% of students graduated with a mastery of AutoCAD drawing materials that can be used as a whole if needed by various organizations, including contractors, planning consultants, students, teachers, and other work groups that have used this program. The AutoCad application helps students in drawing planning and design ranging from structure, architecture, even plumbing (MEP), electrical and mechanical work. The use of AutoCad software originates from low student learning achievement, which tends to be caused by a lack of student involvement in learning activities and a lack of understanding of the subject's essential competencies. Learning Road and Bridge Construction using the AutoCAD 2D application will facilitate and make students more active in understanding and completing drawing assignments.

According to (Priambudi, 2022), By the 2013 curriculum structure, the Building Modeling and Information Design Competency subject will be included as a Software Application subject, given in grade XI and covering both knowledge and skills. This subject focuses more on practical activities or skills, such as vocational competencies. Another effort given to students is to encourage them to use AutoCAD to express their creativity. Providing tasks that allow them to design interesting objects or solve design problems, especially in road, pedestrian, and bridge design. Job sheets are distributed to students accompanied by drawing materials with a predetermined task collection target. This is adjusted to the ability of students who also need time to show the results with consultation or correction by the teacher before being collected. That is where the fundamental learning objectives are. In addition to students becoming more skilled in using the device, they also gain the correct knowledge and skills of drawing.

Learning can also be done quickly using Android (mobile phone), not only in the school computer laboratory room meeting twice a week. To improve students' skills, it is recommended to learn frequently by utilizing technological advances by opening social media or tutorials that exist today. According to (Septiantoro & Widaningsih, 2022), Based on the researcher's analysis, it can be seen that the researcher made several innovations in the learning process by developing AutoCAD Video Tutorials using TikTok social media. The analysis conducted in this study is a student satisfaction questionnaire regarding the use of AutoCAD 2D learning media in learning road and bridge construction. The aim is to evaluate the effectiveness of the media and understand students' perceptions of their learning experience. The quality of the application was assessed based on aspects such as ease of use, clarity of instructions, and completeness of AutoCAD 2D features. Asking questions about Learning Effectiveness measures how well the media helps students

understand road and bridge construction concepts, including students' ability to apply that knowledge. Moreover, in the end, the results of the question in the form of a questionnaire were obtained, namely student satisfaction with the use of 2-dimensional AutoCAD learning media and their learning experience while using it. Provide space and opinions to students to provide additional input or suggestions for improvement.

The product or media is expected to be used easily, practically, and efficiently in completing and working on drawing plans, views, and pieces of roads and bridges. Creating a more conducive and comfortable student learning atmosphere in the hope that it can run effectively and efficiently during the teaching and learning process. The material provided, in addition to core competencies and introduction to construction, is also in the form of steps to draw roads and bridges using AutoCAD software. The purpose of this construction drawing is to provide a foundation for students to be proficient in drawing plans, views, and pieces of roads and bridges with the help of AutoCAD software. According to (Hilmy et al., 2023), This strategy can overcome the problems of limited equipment and passive interaction during the practicum process. In addition, the strategies and methods can be widely applied to general learning and other application-based practicums. This material must be mastered by all students studying drawing in the DPIB department.

This provides opportunities for students to master the material better, increase student interest in learning activities, and increase learning motivation, impacting students' ability to understand the material and steps to work on two-dimensional AutoCAD drawings. Activities that involve explanation and direct practice using Autocad tools are expected to improve student's skills and understanding. Visual, structured, and detailed learning is expected to influence students and motivate them to use the 2D Autocad application more than the conventional way of learning. The teacher is the center point, and the students work on drawing tasks manually. If there is an error in the drawing, students must repeat from the beginning of the drawing again. In this case, the analysis conducted by researchers is a student satisfaction questionnaire regarding the use of AutoCAD 2D learning media in learning road and bridge construction. The questionnaire aims to evaluate the effectiveness of the media and understand students' perceptions of their learning experience. The quality of the application is assessed based on aspects such as ease of use, clarity of instructions, and completeness of AutoCAD 2D features. I asked several questions about Learning Effectiveness, which measures how well the media helps students understand the concepts of road and bridge construction, including students' ability to apply that knowledge.

Moreover, in the end, the results of the questionnaire were obtained, namely student satisfaction with the use of 2-dimensional AutoCAD learning media and experience while using it. Provide space and opinions to students to provide additional input or suggestions for improvement. The product or media is expected to be used easily, practically, and efficiently in completing and working on drawing plans, views, and pieces of roads and bridges. Creating a more conducive and comfortable student learning atmosphere in the hope that it can run smoothly, effectively, and efficiently during the learning process. The

material provided, in addition to core competencies and introduction to construction, is also in the form of steps to draw roads and bridges using AutoCAD software. This road and bridge construction drawing aims to provide a foundation for students to be able and proficient in drawing plans, views and pieces of roads and bridges using AutoCAD software. According to (Hilmy et al., 2023), This strategy can overcome the problems of limited equipment and passive interaction during the practicum process. In addition, the strategies and methods can be widely applied to general learning and other application-based practicums. This material must be mastered by all students studying drawing in the DPIB department.

Activities that involve explanation and hands-on practice using Autocad tools are expected to improve students' skills and understanding. Visual, structured, and detailed learning is expected to influence students and motivate them to use the 2D Autocad application more than the conventional way of learning. The teacher is the center point, and the students draw manually using drawing equipment. Moreover, if students experience drawing errors, they must repeat from the beginning of the drawing or start from the beginning of basic drawing again before it is correct, then proceed with using a drawing pen. From the problems that arise, it is the consideration of researchers to raise the issue of learning media so that road and bridge construction material can be understood and directly practiced by students. It is hoped that the pre-learning process can run quickly and smoothly with the curiosity of students to continue learning until they are proficient in using Autocad software, honing their drawing skills, and understanding the material of the structural parts of roads and bridges by going through several stages of revision or improvement of drawings. This is very useful and by what has been applied in the world of work.

SMK is a vocational education program at the secondary education level that aims to prepare students to enter the world of work. The administrative science major is one of the majors offered by SMK. This major focuses on planning, controlling, and organizing companies. AutoCAD is a program that can help you plan plans through drawings. Schools must prepare SMK students to enter the workforce. Learning can be defined as a process of activities that change cognitive and motor skills through interaction. (Iswadi et al., 2015), With the advancement of technology, humans intentionally or unintentionally interact with technology. Due to the influence of technological advancements, electronic media has gained considerable attention from students. This has a significant impact on education.

According to (Fitriyanto, 2021), the media needed is cheap and not "complicated" for teachers to find and implement, can attract students' attention, and allows students to participate in the learning process actively. Autocad is a learning tool (media) that can be accessed easily by downloading it online. This is the reality in the field that graduates of SMK with majors in Building Modeling and Information Design who work in the industry use Autocad more in their work every day. According to (Fajarwati & Purnawirawan, 2022), Autocad is a beneficial program, especially in engineering, especially architecture. Starting with students who do not understand the functions and uses of Autocad the teacher must provide primary material first with an initial introduction to work commands. This is a

challenge for educators to be able to provide some basic exercises to students before giving direct drawing assignments so that students can later easily interact with Autocad in the teaching and learning process. Second, not all learners or students have personal computers, so they are less optimal in learning independently about the functions and uses of Autocad and are more dependent on learning in the DPIB vocational computer laboratory. Third, students need more interest in learning in class.

According to (Dinata & Suwito, 2019), Many efforts are made to improve the quality of learning along with the development of science and technology worldwide. One of them is by creating a learning module. The program requires guidance and direct simulation media to enable students to operate the AutoCAD program and create various 2D drawing sketches, such as plans, cuts, and views. Through printed drawings, students can find errors and correct the drawings based on predetermined standards.

B. Method

This research uses a qualitative descriptive research approach. Descriptive qualitative is a method of presenting qualitative data described descriptively using a holistic analysis of a phenomenon, social situation, or classroom action by describing the results of observations in a specific scientific context. The research data collection technique is a percentage of student satisfaction questionnaire results using the 2-dimensional Autocad software application in road and bridge construction learning. Moreover, the questionnaire results were obtained from several students' responses, namely a small group of 10 students to represent class XI DPIB. From the data generated, observations were made during student practice hours to observe the object of research, namely using the 2D Autocad application. The research subject was class XI DPIB students. The questionnaire results for students consisted of 18 questions that aimed to explore students' opinions and experiences in interacting with the 2D Autocad application.

The equation for calculating the percentage of the total score to the maximum score is dividing the total score by the maximum possible score and multiplying the result by 100. This equation can be written as follows:

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

Figure 1. The Formula Used in Calculating Percentages
Adaptation of: (Iswadi et al., 2015)

From the results, it can be concluded that the AutoCAD 2D application in learning Road and Bridge Construction drawings is considered very good in helping students learn, as evidenced by the percentage of student responses with the results obtained between 81% and 96.7%, which means that students feel delighted and facilitated in learning two-

dimensional Autocad-based drawings in Road and Bridge Construction lessons. Many efforts are made to improve the quality of learning along with the development of science and technology worldwide. One is by making learning modules (Dinata & Suwito, 2019). Assessment of satisfaction level based on Likert scale questionnaire, as in the example table:

Table 1. Format Table Likert Scale

Score	Information
5	Very Good
4	Good
3	Moderately Appropriate
2	Less Appropriate
1	Not Appropriate

Adaptation of (Sugiono, 2019)

Research on the development of AutoCAD 2D learning media for road and bridge construction subjects for class XI DPIB (Modeling Design and Building Information) students at SMK PGRI 1 Gresik uses a development method consisting of five stages: Analysis, Design, Development, Implementation, and Evaluation. This research belongs to non-test evaluation research, which evaluates the effectiveness of learning media through questionnaires rather than written tests. The following is a description of each stage in this research method:

Figure 2. Work Flow Adaptation of (Listyorini, 2019)

Analysis: Identifying student learning needs related to road and bridge construction material 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. Literature Study: Conduct a literature review to understand best practices using AutoCAD 2D applications in engineering education.

Design by planning the materials and, for example, designing the structure of learning materials that will be delivered using AutoCAD 2D, including creating modules and usage guides. Learning Design also includes designing interactive learning methods using AutoCAD 2D, such as project assignments, practical exercises, and simulations. Development of Evaluation Instruments, i.e., designing questionnaires to evaluate the effectiveness of learning media and student satisfaction. Material development, for example, developing learning materials based on AutoCAD 2D, for example: Steps in working on bridge drawings. Initial testing includes activities to conduct initial testing of learning

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materials and media by involving a small number of students or experts to get initial feedback. Then, proceed with revision or improvement of drawings, namely improving and perfecting road and bridge construction drawings based on feedback obtained from initial testing.

The implementation is to carry out drawing assignment work by applying AutoCAD 2D learning media in the DPIB computer laboratory to the job sheet that has been made. After the process runs, it is necessary to monitor the learning process by conducting observations during the learning process to ensure that the media is used effectively and by the predetermined objectives. The final result is data collection where data is collected using a questionnaire from a small group of students as representatives of class XI DPIB to evaluate their learning experience. The evaluation was produced by analyzing data using Microsoft Excel data obtained from questionnaires to assess the effectiveness of AutoCAD 2D learning media. To assess whether AutoCAD 2D has helped students understand the concept of road and bridge construction and achieve the expected competencies.

Feedback and improvement are expected to know the results and identify drawings that need to be improved. Based on these findings, revisions can be made to the drawings by the working drawing criteria and, simultaneously, to improve the learning media. In this research, non-test evaluation methods are used to get a more comprehensive picture of the learning program's effectiveness without relying on written tests. Using questionnaires, researchers can collect data regarding students' perceptions, their satisfaction, and the effectiveness of learning from the student's perspective, all of which are essential information to optimize the use of AutoCAD 2D in the learning process.

C. Result and Discussion

Result

The results of research conducted on students in small groups show that students have a high level of satisfaction in using Autocad 2D learning media in learning road and bridge construction. The results of the quantitative analysis of the data obtained from the questionnaire were carried out by calculating the percentage of students' responses to the 2D Autocad application media. Then this percentage will be seen using the interpretation table provided. Similarly, the frequency of responses for each student will also be calculated to determine which questions are better, reasonable, and less good. The highest response frequency is considered as the tendency of the answer. After obtaining the results of the percentage calculation, which question is better or unfavorable will be decided by calculating the frequency of each participant's responses for each available.

Table 2. Percentage and Criteria

Percentage	Criteria
81% - 100%	Very Good
61% - 80%	Good

Percentage	Criteria
41% - 60%	Moderately Appropriate
21% - 40%	Less Appropriate
0% - 20%	Not Appropriate

Adaptation of : (Iswadi et al., 2015)

To get results or conclusions from the analysis of the student satisfaction questionnaire with the Autocad 2D learning media, it is necessary to collect data and analysis from 10 students in small groups representing class XI DPIB. These results were collected and using Microsoft Excel, results were obtained, which showed the level of student satisfaction in using Autocad 2D software. This shows increased skills and understanding in the class XI Road and Bridge Construction subject using the Autocad 2D application. The following results are obtained from the object studied, namely the effectiveness of using the Autocad 2D application in learning to draw road and bridge construction, and the subject is a small group of XI DPIB students with the following results;

The results obtained were seven students with a percentage level between ≥ 90% and a percentage (81% - 100%), and three students with a percentage level ≥ 81% with a percentage (81% - 100%) stated that they were very good or delighted. To determine the results of the assessment using PAP (Benchmark Assessment), the teacher can find out which students have a high, medium, or low level of mastery, and then the teacher will be able to make efforts that are deemed necessary so that the teaching objectives can be achieved optimally.

Table 3. Percentage Format of the Results of 10 Class XI DPIB Students
Regarding the Use of the Autocad Application

Respondents Students	Percentage	Maximum Score	Criteria
Student 1	96,7%	90%	Very Good
Student 2	84,4%	90%	Good
Student 3	86,7%	90%	Good
Student 4	83,3%	90%	Good
Student 5	96,7%	90%	Very Good
Student 6	94,4%	90%	Very Good
Student 7	93,3%	90%	Very Good
Student 8	96,7%	90%	Very Good
Student 9	94,4%	90%	Very Good
Student 10	94,4%	90%	Very Good

Most students indicated that the Autocad 2D application met their learning needs, which is very important. Autocad 2D as a drawing medium has many advantages, including ease of use and easy-to-understand instructions. These are essential to assess how effectively students can use the learning media. Also, displaying the resulting images or visuals attracts

students to learn more about Autocad to achieve their learning goals—examples of short-span bridge construction drawings by class XI students.
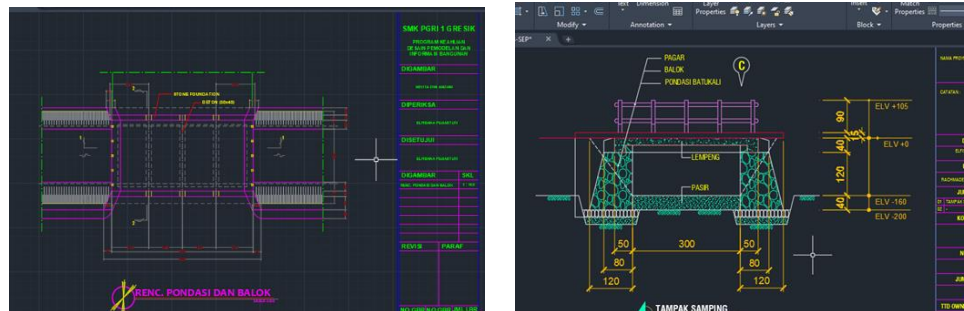

Figure 3. Examples of Results from Images 2a and 2b, Students Using Cad 2D
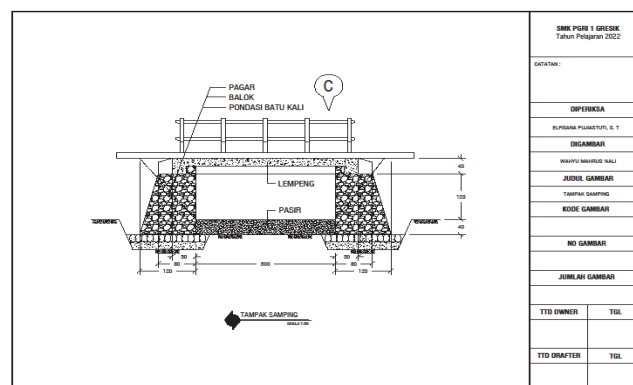

Figure 4. Has been Completed and Printed in PDF by the Students

The trial results showed that the small group of ten students showed delighted and excellent results and that they could improve their drawing ability.

Discussion

With applications such as AutoCAD that make it easier to learn drawing, teachers can highlight students' abilities in using these tools correctly and efficiently. According to (Yani, 2022), technical drawing using the AutoCAD program is one of the sciences, technologies, and arts that is in line with the demands of the times and demands in the industrial world. Based on the particular objectives of Vocational Secondary Education (SMK) according to Law Number 20 of 2003, it is necessary to carry out AutoCAD training for vocational school students.

According to (Lestari, 2024), Vocational school students need several skills that will later be used when they complete their studies. One of the skills expected is the ability to draw construction using the AutoCAD program. The final ability expected from students is to make construction drawings in the form of 2D models. They can emphasize the importance of speed and accuracy in creating technical drawings and students' ability to

understand software interactions. Using 2-dimensional (2D) learning media based on AutoCAD in the drawing process for class XI students has several advantages compared to manual drawing methods using traditional drawing tools. According to (Istigna et al., 2022), One computer program that can be used as a learning medium is AutoCAD. The AutoCAD program is an acronym that comes from the words Automatic Computer Aided Design. In a straightforward sense, it can be interpreted that AutoCAD is a package program that can function as a tool in design. According to (Patkur & Wibowo, 2013), the objective of writing this research is to find out students' responses to learning using the AutoCAD module to make it easier for students in the learning process, knowing the role of the teacher by using the program modules AutoCAD computer in learning, and find out the learning outcomes achieved by students with using AutoCAD learning module tools which exists. From this presentation, it can be concluded that in the teaching and learning process, a learning media is needed to provide good visualization of drawing subjects using AutoCAD, especially material that discusses basic and advanced drawing with AutoCAD.

AutoCAD 2D is software designed to assist in creating digital engineering drawings, which are very relevant in the drawing field, especially in the modeling and building information design department. According to (Siahaan, 2017), students must learn Autocad as a productive subject to achieve these goals. SMK Expertise Competency: Building engineering is related to drawings and requires size accuracy, so drawings can represent an object to be worked on. Autocad 2D allows students to produce drawings with very high accuracy and precision. Features like snap, grid, and coordinates ensure that every line and shape is drawn precisely. This is different from manual drawings, which are more susceptible to human error, for example, lines that are not straight or inaccurate measurements. Students find the instructions for using AutoCAD 2D easy to follow, which helps them improve their skills and understanding of the material provided. Attractive 2D AutoCAD visualization makes the learning process more interactive and fun and motivates students to deepen the material. According to (Adji & Jaedun, 2019), Teaching and learning activities in SMK are dominated by practice or learning in computer laboratories. Through these practical activities, students are expected to gain real experience directly with objects, such as making working drawings using the Autocad 2D application.

Additionally, the app allows students to create visual displays that support their understanding of complex construction concepts. According to Iswadi et al (2015), this research generally aims to develop computer-based learning media using the AutoCAD program in Road and Bridge Construction subjects. This type of research is development research, which aims to produce valid and practical computer-based learning media.

To improve class XI students' understanding of design, modeling, and construction skills in road and bridge construction subjects, 2D AutoCAD-based learning media will be created. To encourage the class better and maximize their abilities in using AutoCAD 2D-based applications. AutoCAD 2D allows students to produce very highly accurate and precise drawings. Features like snap, grid, and coordinates ensure that every line and shape is drawn precisely. This is different from manual drawings, which are more susceptible to

human error, for example, lines that are not straight or inaccurate measurements. Drawing with AutoCAD 2D is usually faster than manual methods. Students can easily change, edit, and repair images without starting from scratch. In addition, the copy-paste feature and templates speed up the process of creating similar or repetitive images. According to (Setiawan, 2013), Conditions for learning CAD (computer-aided design) to draw buildings using computer application programs at various levels of education (universities, building vocational schools, and related vocational education) require special attention. CAD is essential knowledge in technical drawing competency. This material must be mastered by all students studying building engineering. According to (Al Hafiz & Wijaya, 2023), The success of SMK in producing competent graduates is highly dependent on the role of teachers and existing facilities. The learning process is the key to producing graduates who are competent and able to meet the needs of the world of work and adapt to change. According to (Buhari et al., 2023), AutoCAD's advantage lies in its ability to create precise and detailed drawings and allows users to make changes and revisions easily. Apart from that, AutoCAD also supports various design features and tools that help users create a realistic and professional appearance.

Drawings created with AutoCAD 2D can be easily saved in digital format, which makes storage, management, and re-access easy. In contrast to manual images, which require physical space for storage and are easily damaged or lost, digital files are safer and can be stored on various electronic storage media. According to (Aldo, 2020), vocational school students must have good knowledge, skills, and attitude competencies to become graduates who suit the needs of the business and industrial world. According to (Bagyo & Ngadiyono, 2020), research results show that the CAD competencies in the 2013 Vocational School Curriculum are relevant to the competencies required by industry. According to (Amanda & Hambali, 2021), The benefits of communication media for the world of education are significant to clarify the presentation of the message, overcome space limitations, overcome the passive characteristics of students, and increase students' attention to technology advances.

According to (Ardhiansyah & Sumarjo, 2022), Products or media are tools used to convey ideas or the essence of material from transparent sources. That way, using existing media will create a comfortable learning environment, and the learning process can be carried out effectively and efficiently. Teachers also benefit from using AutoCAD 2D because they can better assess students' mastery levels and effectively direct the teaching process to achieve goals. Thus, AutoCAD 2D proves to be a handy and effective learning tool that enhances students' technical abilities and facilitates their overall academic achievement.

D. Conclusion

This research aims to develop a media-based learning computer using the AutoCAD program in the Road and Bridge Construction subject for class XI students in the Department of Modeling Design and Building Information. The main goal is to produce

valid and practical learning media to improve students' technical abilities and understanding of drawing road and bridge construction.   AutoCAD 2D will increase accuracy and precision in the technical drawing process compared to manual methods. 2D AutoCAD-based learning media will make learning more interactive and exciting and motivate students to deepen the material. AutoCAD 2D will speed up the drawing process, making editing and saving images easier. According to (Iswadi et al., 2015), AutoCAD is a program that can help you plan plans through drawings. Schools must prepare SMK students to enter the workforce. Learning can be defined as a process of activities that change cognitive and motor skills through interaction. Teachers will find it easier to assess students' level of mastery and direct the teaching process more effectively using AutoCAD 2D. The results obtained from using the AutoCAD 2D application are that AutoCAD 2D increases the accuracy and precision of students' engineering drawings, reducing errors that often occur in manual methods. Likewise, the learning process is more interactive and exciting. Instructions that are easy to follow and attractive visualizations make the learning process more interactive and fun, increasing student motivation. AutoCAD 2D speeds up the drawing process with features such as several structure material commands and the ease of setting more detailed drawing scales and sizes and making editing easier without starting from scratch. Images in digital format make storage, management, and re-access easier, reducing the need for physical space and the risk of image damage or loss. Teachers can more easily assess student mastery and direct teaching more effectively, achieving learning goals better. This research shows that using AutoCAD 2D as a learning medium improves students' technical abilities and facilitates their overall academic achievement.

The implication is that the learning process is in accordance with the curriculum to include learning AutoCAD 2D as part of learning and needs to be further improved to ensure students acquire skills relevant to industry demands. Schools need to allocate resources to provide AutoCAD 2D hardware and software and train teachers so they can master this technology. Integrating AutoCAD 2D in the learning process will produce graduates who are more competent and ready to compete in the world of work, meeting the needs of the growing industry. According to (Al Hafiz & Wijaya, 2023), The success of SMK in producing competent graduates is highly dependent on the role of teachers and existing facilities. The learning process is the key to producing graduates who are competent and able to meet the needs of the world of work and adapt to change. The world of business and industry will get a more skilled and ready workforce, reducing training costs and increasing productivity. Therefore, industry support is needed, which can collaborate with schools to ensure the curriculum remains relevant to technological developments and job market needs, creating mutually beneficial synergies. This research shows that using AutoCAD 2D as a learning medium has great potential to improve the quality of education in the Department of Modeling Design and Building Information. In order to prepare students with the skills needed in industry and strengthen the link between education and the world of work.

The use of AutoCAD as a learning tool encourages innovation in learning technology. Development of new features in AutoCAD that are further optimized for educational purposes tailored to students, interactive learning tools, or integration with e-learning platforms. The use of AutoCAD strengthens students' digital skills in the use of technical software. This not only improves their abilities in technical drawing but also prepares them to work in an increasingly computerized work environment. AutoCAD enables deep and authentic project-based learning. Students can create accurate designs and complete project tasks relevant to the real world, such as designing, designing roads and bridges or building structures. This enables active learning and in-depth practical experience. AutoCAD enables collaboration between students on joint projects online. This creates a collaborative learning environment where students can work together, provide feedback, and learn from each other in software use and technical problem-solving. AutoCAD continues to evolve to integrate new technologies such as VR (Virtual Reality) and AR (Augmented Reality) to create a more interactive learning experience. This integration with technology enriches students' learning experience and increases their understanding of technical concepts, and connections between education and industry. Students are trained in software widely used in the engineering and construction industries, increasing their readiness to enter the workforce after graduation. By continuing to encourage the use of AutoCAD in learning and following technological developments, its positive impact on the progress of learning media and improving students' skills will continue to grow.

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