International Journal of Research in Science & Engineering
ISSN: 2394-8299
Vol: 03, No. 06, Oct-Nov 2023
http://journal.hmjournals.com/index.php/IJRISE
DOI: https://doi.org/10.55529/ijrise.36.8.20

Impact of AutoCAD among Engineering and Architecture Students in Butuan City, Agusan Del Norte

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Received: 26 May 2023 **Accepted:** 14 August 2023 **Published:** 01 October 2023

Abstract: ***Computer-aided design and drafting (CADD) technology, particularly AutoCAD, has transformed design and technical documentation by automating procedures that formerly required manual drafting. This study explores the impact of AutoCAD on engineering and architecture students at the Saint Joseph Institute of Technology in Butuan City, Agusan del Norte. The main objectives are to gather students' perspectives on the challenges and benefits of using AutoCAD, identify the number of students experiencing difficulties, and assess how AutoCAD helps prepare students for their future professions. Using a survey research design with a Google Form, data was collected from 30 participants, comprising 15 engineering and 15 architecture students. The questionnaire consisted of closed-ended questions addressing the impact of AutoCAD on learning outcomes, perceptions, and overall satisfaction with the program. The findings reveal that the majority (96%) of participants reported a positive impact from utilizing AutoCAD, highlighting its effectiveness in enhancing technical skills, improving design understanding, and streamlining drafting and modeling processes. Moreover, AutoCAD facilitated accurate and detailed drawings, promoting better visualization and communication of ideas. Respondents expressed that AutoCAD integration into the curriculum provided valuable hands-on training and prepared them for the industry's demands. While most students found AutoCAD beneficial, a smaller proportion (70%) encountered difficulties with the software, particularly those who were less computer literate or lacked skilled faculty support. Nonetheless, the study emphasizes the importance of AutoCAD's role in developing design creativity among students in engineering and architecture programs. In conclusion, this research demonstrates the significant impact of AutoCAD on the engineering and architecture students of Saint Joseph Institute of Technology, Butuan City. The software enhances technical proficiency and fosters design***

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creativity, contributing to a comprehensive and practical learning experience. The study's findings shed light on the importance of efficient faculty support and proper training to fully harness the potential of AutoCAD in education. As AutoCAD remains an indispensable tool in the modern design industry, its successful integration into the curriculum is essential for preparing students for their future professions.

Keywords: AutoCAD, Engineering, Architecture, Impact.

1. INTRODUCTION

Background of the Study

Computer-aided design and drafting (CADD) is a technology for design and technical documentation that replaces manual drafting with an automated process. If you're a designer, drafter, architect, or engineer, you've probably used 2D or 3D CAD programs such as AutoCAD or AutoCAD LT software (CAD Software [2D and 3D Computer-Aided Design] Autodesk, 2019). It was founded by John Walker in 1982 (Autodesk, 2021). AutoCAD also works on a database of geometric systems, including points, lines, arcs, etc. The user interacts with the application via commands; editing or drawing is done via the built-in command line. AutoCAD is issued free of charge to students, educators, and institutions (Introduction to AutoCAD, Characteristics, and Applications of AutoCAD, 2019).

AutoCAD is the world's most commonly used CAD software, with the highest overall job market demand (Aina, 2022). Therefore, it is widely introduced to students in institutions of higher learning so they can get exposure to the software and fulfill market demand simultaneously (Awang, 2000). Developing design creativity in the schools of architecture and engineering is generally regarded as the most crucial goal of architectural and engineering educators. In the course of the students' developmental processes, the means and media for attaining this goal typically bring special difficulties and chances. The study investigates how some characteristics of students' creativity are impacted by computer-aided design (CAD) software. According to the survey of Covenant University in Ota, Nigeria, which was conducted and analyzed using descriptive statistics, architecture and engineering students do not believe that CAD programs could encourage laziness in their design work. Additionally, it was discovered that using CAD improved students' capacity for creating conceptual patterns, original forms, and unique concepts; 77.8% of respondents concur that CAD fosters creativity (Dare-Abel et al., 2016). However, there are still some students who have issues using AutoCAD, usually the ones who are more computer illiterate, according to Prathamesh Barge. About 20–50% of students are taught in first-year architecture and engineering classes; therefore, half of the students are having a problem with their unskilled faculty. They are not aware of all the tools available to do the job. And they arrive with only a smattering of knowledge and end up in the most inefficient ways possible (Barge, 2018). In general, they would struggle to learn almost any software.

This study aims to assess the impact of AutoCAD on Engineering and Architecture students in Butuan City, Agusan del Norte. The primary objective is to determine the level of

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difficulty experienced by students when utilizing AutoCAD as their foundational tool for designing and producing accurate 2D and 3D drawings, models, electrical diagrams, construction drawings, and other relevant applications.

Statement of the Problem

The study is directed towards the impact of AutoCAD on engineering and architecture students in Butuan City, Agusan del Norte. The research sought to answer the crucial questions as follows:

1. What is the respondent's demographic profile in terms of:
   a. Sex
   b. Course (Engineering or Architecture)
   c. Year Level
2. What difficulties do the students experience while using AutoCAD?
3. Is there an impact on Engineering and Architecture students using AutoCAD?

Objectives of the Study

The purpose of this study is to determine the "Impact of AutoCAD Among Engineering and Architecture Students in Butuan City, Agusan del Norte." The following are the specific goals of this study:

1. To gather data by asking engineering and architecture students in Butuan City, Agusan del Norte, to give their thoughts on the challenges and impact of utilizing AutoCAD.
2. Determine the number of students who have difficulties with AutoCAD.
3. To determine how AutoCAD helps engineering and architecture students prepare for their future professions.

Statement of the Study

The purpose of the study is to determine the “Impact of AutoCAD among Engineering and Architecture Students in Butuan City, Agusan del Norte”.

Ho1: There is no significant difference with regards to using AutoCAD for engineering and architecture students.

Ho2: There is a significant difference with regards to using AutoCAD for engineering and architecture students.

Conceptual Framework/ Theoretical Framework

The concept of this study is the Impact of AutoCAD among Engineering and Architecture students in Butuan City, Agusan del Norte.

Input

Engineering and Architecture Student’s profile:
• Sex
• Course (Engineering Or Architecture)
• Year Level

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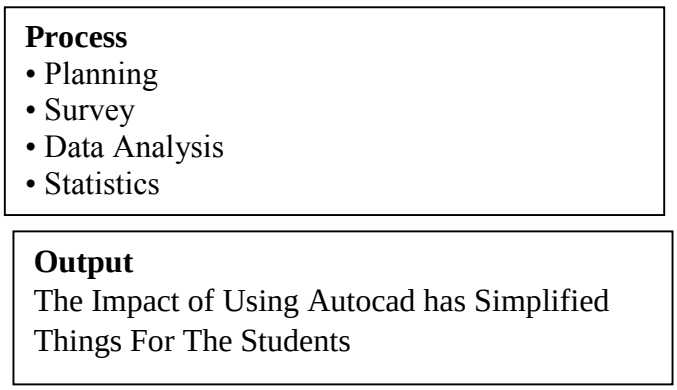


Figure 1. Research Paradigm shows the Impact of AutoCAD among Engineering and Architecture students in Butuan City, Agusan del Norte.

Scope and Delimitations

This study seeks to identify the impact of AutoCAD on engineering and architecture students. Recent studies and research will be used as a reference in finding out what affects their performance in terms of AutoCAD. The study will focus on the effects that every engineering and architecture student encounters when learning AutoCAD.

This research study will investigate 30 Engineering and Architecture students in Butuan City, Agusan Del Norte.

Significance of the Study

The study was conducted to measure the difficulties of AutoCAD for engineering and architecture students. This study will benefit the following:

- **Animators:** This study can serve as a guide for animators to be more efficient in their work.
- **Other researchers** Future researchers can benefit from this knowledge of study, and it can be exploited as a resource for studies on related subjects in the future.
- **Students** The goal of this study is to prepare incoming college students from Bayugan City, Agusan del Sur, for using AutoCAD and its challenges.
- **Teachers** The information gathered in this study can help teachers prepare simpler methods for teaching AutoCAD.
- **Visual Effects Artist** Most VFX artists use AutoCAD to make 3D models of buildings to lessen the budget. Our study can be beneficial for VFX artists to use AutoCAD efficiently.
- **Definition of Terms** For a better understanding of this study, the terms are defined in the context of this research.
- **AutoCAD** it is a program used for 2-D and 3-D design and drafting. As for the research, AutoCAD would mean the same.
- **Computer-aided design (CADD)** is a technology for design and technical documentation that replaces manual drafting with an automated process.
- **Digital design** create, develop, and improve digital systems and tools, taking a lead role in overseeing the entire process from concept to implementation.

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- **2D. (two-dimensional)** drafting has the same input and output interface and displays length and height information on a flat surface without depth.
- **3D. (three-dimensional)** is achieved using a different interface and also describes objects in terms of height, width, and depth.
- **Electrical schematic** a graphical representation of a plan or a model that is presented in a simple, accessible way
- **Electrical diagram** a type of technical drawing that shows information about power, lighting, and communication for an engineering or architectural project.
- **Sketch Technology** a detailed, precise diagram or plan that conveys information about how an object functions or is constructed.
- **Software** a set of instructions, data, or programs used to operate computers and execute specific tasks.

Research Related Literature

This chapter discusses the literature and studies that the researcher evaluated while determining the significance of the present study**.**

Autodesk was founded in December 1982 by John Walker. He and the other 15 co-founders intended to develop five different desktop automation applications, hoping that one of the applications would take off. Their flagship product turned out to be AutoCAD. They launched AutoCAD at the COMDEX trade show in Las Vegas as the first CAD program in the world to run on a PC. By March 1986, only four years after it was introduced, AutoCAD had become the most widely used design application worldwide, a position it still holds today. The software supports APIs for customization and automation, which enabled the creation of vertical products such as AutoCAD Architecture, AutoCAD Electrical, and AutoCAD Civil 3D. In the last five years, Autodesk has also created mobile and cloud-based apps, including AutoCAD 360, Fusion 360, and A360 Viewer. These programs couple design and documentation tools with the ability to share and collaborate via the Internet (Luke, 2014).

The Republic Act of 2067 is very helpful to our research since it focuses more on supporting or assisting students who are studying or performing programming, which is helpful for us because AutoCAD is a product of programming. Cruz et al. (2018) assert that science and technology have been developing at an exponential rate. As a result, the law must change in order to reflect the sound reasoning produced by evidence-based procedures. Regrettably, the advancements in science and technology have been made in such abrupt leaps that the law has obviously had trouble keeping up with them. While the generation of knowledge in science takes a lot of time, dedication, and hard work, as well as the diverse interests and global-scale scientific feats and movements of the previous and current generations, the same have significantly altered the way we perceive the world. With this, the emergence of new avenues and platforms has become available for human interaction, which, unfortunately, is almost always not regulated by current legal standards.

According to James D. Bethune in Engineering Graphics with AutoCAD 2020, award-winning CAD instructor and author James Bethune teaches technical drawing using

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AutoCAD 2020 as its drawing instrument. Taking a step-by-step approach, this textbook encourages students to work at their own pace and uses sample problems and illustrations to guide them through the powerful features of this drawing program. More than 680 exercise problems provide instructors with a variety of assignment material and students with an opportunity to develop their creativity and problem-solving capabilities. Effective pedagogy throughout the text helps students learn and retain concepts. The step-by-step format throughout the text allows students to work directly from the text to the screen and provides an excellent reference during and after the course. The latest coverage is provided for dynamic blocks, user interface improvements, and productivity enhancements. Exercises, sample problems, and projects appear in each chapter, providing examples of software capabilities and giving students an opportunity to apply their own knowledge to realistic design situations. ANSI standards are discussed when appropriate, introducing students to the appropriate techniques and national standards. Illustrations and sample problems are provided in every chapter, supporting the step-by-step approach by illustrating how to use AutoCAD 2020 and its features to solve various design problems. Engineering Graphics with AutoCAD 2020 will be a valuable resource for every student wanting to learn to create engineering drawings (Bethune, 2019).

In the article, the tasks of the computer modeling of moldboard's working surface are considered. The proposed solution was developed through geometric and computer modeling of moldboard's working surface elements. As surface elements, the frontal contour, a directory curve, and the generative lines were chosen with their pre-set conditions, which were given by specialists. The geometric models of working surface elements, which were developed based on research results, were implemented in the AutoCAD system. The research was carried out using constructive geometric modeling methods and systems based on surface modeling methods of Descriptive Geometry and traditional methodologies for designing moldboards. The proposed models, algorithms, and methodology can reduce the design period, simplify the setting of geometric parameters, and facilitate the work of designers. The solution is required in educational, research, and production processes in Agriculture Engineering and can be used in developing other technical objects with geometrically complex surfaces (T. Juraev, 2020).

Computer-based learning will greatly help educators in the current era of Information and Communication Technology, especially vocational teachers who teach in productive fields (engineering subjects). The problem faced is the inability of teachers to use computers as learning media. Teachers only use computers to present PowerPoint media, even in practical subjects. The teacher has not been able to utilize software engineering that will assist in the practical learning process, such as AutoCAD software in learning Drawing Engineering and PLC software in learning control systems. Therefore, it is necessary to conduct integrated and comprehensive training for teachers in utilizing computers as learning media, especially in the use of software engineering. Besides that, there was an increase in motivation and enthusiasm from the teacher to show performance, both in the use of software for classroom learning and in daily life as a professional who always tried to improve his competence (Fivia Eliza et al., 2019).

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The design of building systems has become more difficult as engineering construction projects grow in size, complexity, and functionality. This study develops an AutoCAD network architecture design teaching system to assist students in better acquiring information about course resources, successfully demonstrating the teaching process, and understanding the curriculum and learning effectively.

2. METHODOLOGY

This chapter explains various methodologies that will be used in gathering data and analyzing it, each of which is relevant to the researcher. The methodologies will include areas such as the location of the study, research design, variables, research participants, research instruments, data gathering procedures, and data analysis.

A. Research Methodology

This study will use a data collection method that will be collected using a self-administered questionnaire that will be distributed to the selected participants. The questionnaire will be composed of closed-ended questions that will address the impact of AutoCAD on the students' learning outcomes, their perceptions of AutoCAD, and their overall satisfaction with the AutoCAD program.

B. Research Design

This study aims to investigate the impact of AutoCAD on engineering and architecture students at the Saint Joseph Institute of Technology in Butuan City, Agusan del Norte. The research will use a survey research design with a Google Forms document to gather data from the students.

The survey will consist of closed-ended questions. The survey questions will be developed based on a thorough literature review on the impact of AutoCAD on engineering and architecture education.
The survey will be delivered to a convenience sample of engineering and architecture students at the institute. Participation in the survey will be entirely optional, and no incentives will be provided. The survey data will be evaluated using descriptive and inferential statistics, including correlation and regression analysis.

The findings of the study are expected to provide insights into the impact of AutoCAD on engineering and architecture education as well as inform the curriculum development and teaching strategies of the institute.

C. Variables of the Study

The main objective of this study is to get the opinions of the students of Saint Joseph Institute of Technology in Butuan City and to validate the determinants of their intention to use AutoCAD software, utilizing the constructs from prior studies in a more integrated model. This study seeks to identify the impact of AutoCAD on engineering and architecture students. Recent studies and research will be used as a reference in finding out what affects their

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performance in terms of AutoCAD. The primary purpose of the study is to measure the difficulties of the students using AutoCAD.

D. Sample and Size

The sample consists of engineering and architecture students chosen from the population to participate in the study. A set of students who are available for the study make up the sample. The researcher opted to select the engineering and architecture students. The sample consists of 15 engineering and 15 architecture students.

E. Research Instruments

The primary tool that is used in this research is collecting data through self-administered and administered survey questionnaires. It consists of questions to be given via Google Forms, such that the data would be taken from the Google Forms. This can be used to determine how much impact AutoCAD has on architecture and engineering students. The survey is used to gather data from the opinions of architecture and engineering students.

F. Data Gathering Procedure

The research will use the questionnaire to gather data as well as determine the knowledge and impacts of AutoCAD on architecture and engineering students. The questionnaire will be submitted via Google Forms, as we encourage the participants to submit any clarifications, concerns, or unclear questions due to the difficulties.

After the participants complete the questionnaires, we will conduct consultation with Sir Orvin Lobitos to verify and assess the research instrument.

To test the reliability of the research questionnaire's results, we ask a separate question with the same idea. The results must have similarities to determine whether the question and answers are still valid.

G. Data Analysis

In this research, data analysis will involve both descriptive and inferential statistics. Descriptive statistics will summarize students' perceptions and learning outcomes related to AutoCAD, while inferential statistics will make predictions about the broader student population. Correlation and regression analyses will explore relationships and significant predictors. Content analysis will be used for open-ended responses. The findings will provide valuable insights to enhance AutoCAD education at the institute, and consultation with an expert will validate the research instrument's credibility. A reliability test will ensure the validity of the questions and answers.

H. Research Locale

The research locale for this study is Saint Joseph Institute of Technology, located in Butuan City, Agusan del Norte. The study aims to investigate the impact of AutoCAD on engineering and architecture students at this institution. The researchers will use a Google Form survey to gather data from the students.

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DOI: https://doi.org/10.55529/ijrise.36.8.20



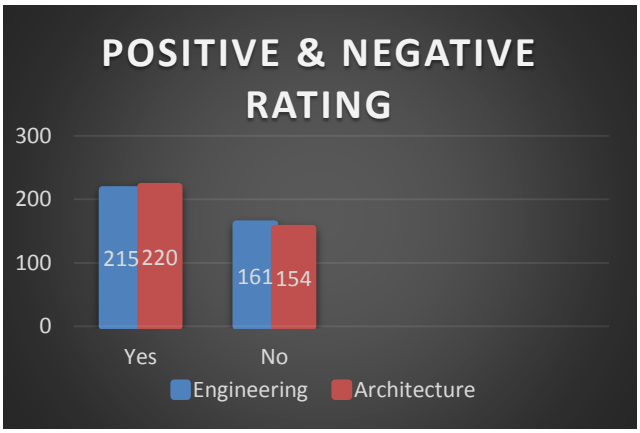
Figure 1. Butuan, Caraga, Mindanao, Philippines, Southeast Asia

3. PRESENTATION, DISCUSSION, AND ANALYSIS OF DATA

In this study, 15 Engineering and 15 Architecture college students were surveyed by providing them with a set of questions. The aim of this study is to determine the Impact of AutoCAD among Engineering and Architecture students in Butuan City, Agusan del Norte.
Prior to data collection, a survey was conducted among Engineering and Architecture students in Butuan City, Agusan del Norte, to examine the impact of AutoCAD. The survey assessed the students' proficiency in independently using the software, their reliance on assistance, and their overall effectiveness in utilizing AutoCAD. The results were then organized and evaluated accordingly.

Table 1.

	ENGINEERING	ARCHITECTURE	TOTAL (450)	TOTAL RESPONDANT (30)	PERCENTAGE (100%)
YES	215	220	435	15	96%
NO	161	154	315	15	70%



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Based on the data collected and presented in Table 1, it is evident that among the total number of participants in the survey, which consisted of fifteen (15) Engineering students and fifteen (15) Architecture students, AutoCAD has been observed to have a positive impact on the majority. Specifically, a significant portion of the participants, constituting 96% (30 individuals), reported experiencing a positive impact from utilizing AutoCAD. Conversely, a smaller proportion of the surveyed participants, accounting for 70% (30 individuals), conveyed a negative impact associated with the usage of AutoCAD.

The survey results indicate a number of notable positive impacts resulting from the utilization of AutoCAD among Engineering and Architecture students. These impacts encompass various aspects of their educational experience and future professional prospects. The following are the key findings derived from the survey:

1. Heightened productivity: AutoCAD software has demonstrated its ability to significantly enhance productivity levels among students. By providing a comprehensive set of design and drafting tools, AutoCAD streamlines the creation of accurate and detailed drawings. This heightened efficiency allows students to accomplish projects in a more effective and time-efficient manner.
2. Enhanced visualization capabilities: AutoCAD's robust 2D and 3D visualization features have proven instrumental in enabling students to better comprehend spatial relationships within their designs. By utilizing AutoCAD's visual representation tools, students can explore and evaluate various design possibilities, resulting in more comprehensive and refined outcomes. Additionally, these enhanced visualization capabilities equip students with the necessary skills to effectively communicate and present their ideas.
3. Improved precision and accuracy: AutoCAD's advanced precision tools and measurement capabilities empower students to create drawings with exceptional accuracy and precision. By leveraging these features, students can minimize errors and discrepancies, thereby ensuring the production of high-quality outputs. The software's precise measurement tools enable students to adhere to industry standards and practices, instilling in them a keen attention to detail.
4. Real-world applicability: The widespread adoption of AutoCAD within the industry endorses its significance as an essential skill for Engineering and Architecture professionals. Proficiency in AutoCAD equips students with
5. Practical knowledge and expertise that can be directly applied to real-world design tasks. By engaging with AutoCAD during their education, students are better prepared for the demands and expectations of their future careers.
6. Facilitation of collaboration and teamwork: AutoCAD serves as a valuable platform for collaborative design projects, encouraging students to work together and share ideas.

Through its shared workspace and file collaboration features, AutoCAD facilitates effective communication, teamwork, and the exchange of insights among students. This fosters an environment conducive to the development of strong collaborative skills, a crucial attribute in the Engineering and Architecture fields.

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DOI: https://doi.org/10.55529/ijrise.36.8.20

These positive impacts underscore the value and significance of AutoCAD as a transformative tool in the learning journey of Engineering and Architecture students. By leveraging the software's features and functionalities, students can enhance their productivity, improve their design visualization capabilities, refine their precision and accuracy, develop industry-relevant skills, and cultivate effective collaboration and teamwork abilities. Ultimately, embracing AutoCAD empowers students to excel academically and lay a solid foundation for their future professional endeavors in the fields of Engineering and Architecture.

4. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

This chapter discusses the summary, conclusion, and recommendations of the study. The research is titled "Impact of AutoCAD Among Engineering and Architecture Students in Butuan City, Agusan del Norte".

Summary

This research study aimed to determine the Impact of AutoCAD Among Engineering and Architecture Students in Butuan City, Agusan del Norte. The study utilized a survey to gather data for interpretation and to achieve the research objectives. The researchers conducted the survey among Engineering and Architecture students from the Saint Joseph Institute of Technology, located in Butuan City, Agusan del Norte, to collect information for analyzing the respondents' perspectives.

Based on the survey conducted, there were 15 Engineering and 15 Architecture students who participated as respondents and completed the survey questionnaire. Through analyzing the respondents' answers, the researchers were able to interpret the chosen topic.

The analysis conducted by the researchers revealed that some of the Engineering and Architecture students were affected by using AutoCad.

In contrast, in the case of the research on the impact of AutoCAD among Engineering and Architecture students in Butuan City, Agusan del Norte, the majority of results indicate a positive impact on the majority of participants.

Conclusion

The conclusion of the study on the use of AutoCAD among the Engineering and Architecture students of Saint Joseph Institute of Technology, located in Butuan City, Agusan del Norte, is as follows:

After conducting the research and analyzing the data, it can be concluded that the utilization of AutoCAD has a significant impact on the Engineering and Architecture students of Saint Joseph Institute of Technology. The majority of the students reported a positive impact from using AutoCAD, indicating its effectiveness as a tool for their respective disciplines.

The findings suggest that AutoCAD enhances the students' technical skills, improves their understanding of design principles, and streamlines the drafting and modeling processes. It enables them to create accurate and detailed drawings, leading to better visualization and communication of their ideas.

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Moreover, the integration of AutoCAD into the curriculum has contributed to a more comprehensive and practical learning experience for the students. It has provided them with valuable hands-on training and prepared them for the industry's demands.

Recommendations

Based on the results of this study, the researchers propose the following recommendations:

For students

1. Embrace continuous learning and stay updated with the latest features and updates of AutoCAD.
2. Practice regularly to improve your proficiency and explore the various functionalities of AutoCAD.
3. Utilize additional resources like online tutorials and reference materials to deepen your understanding.
4. Collaborate with peers to enhance your skills and share knowledge.
5. Build a portfolio showcasing your AutoCAD projects to demonstrate your skills and creativity.
6. Stay engaged with industry trends to align your expertise with industry requirements.

For Instructors

1. Integrate AutoCAD effectively: Incorporate AutoCAD into the curriculum, providing hands-on training and practical applications to enhance students' skills and understanding of the software.
2. Stay updated with industry trends: Keep abreast of the latest advancements in AutoCAD and its applications in Engineering and Architecture. Incorporate real-world examples and case studies into teaching materials to make the instruction relevant and practicable.

For Parents

1. Support your child's interest: Encourage and provide resources for your child to learn and utilize AutoCAD effectively in their studies.
2. Foster a balanced approach: Emphasize the importance of a well-rounded education while supporting their AutoCAD proficiency.

For Future Researchers

1. Expand the scope and sample size: Investigate the impact of AutoCAD on a larger scale or across multiple institutions to gain a more comprehensive understanding.
2. Assess long-term outcomes: Conduct longitudinal studies to explore the lasting effects of AutoCAD proficiency on students' academic and career success.
3. Analyze specific skill development: Focus on specific AutoCAD skills to understand their individual impact on student learning and professional growth.
4. Evaluate teaching methodologies: Assess different instructional approaches to identify the most effective methods for enhancing student engagement and learning outcomes.
5. Explore interdisciplinary applications: Investigate how AutoCAD integrates with other disciplines to understand its impact on interdisciplinary collaboration and innovation.

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DOI: https://doi.org/10.55529/ijrise.36.8.20

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