Comparative Study on AutoCAD and Revit: Student Proficiency and Perception across Academic Levels

Muriatul Khusmah Musa[1], *Mohamad Zain Hashim[2]

[1]**Akademi Pengajian Bahasa, Universiti Teknologi MARA Cawangan Pulau Pinang, Pematang Pauh Campus, 13500 Pulau, Pinang, Malaysia**

[2]**Civil Engineering Studies, College of Engineering, Universiti Teknologi MARA Cawangan Pulau Pinang,Pematang Pauh Campus, 13500 Pulau, Pinang, Malaysia**

***Corresponding Author**

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Abstract: This study examines students' proficiency in AutoCAD and their perceptions of Revit within engineering programs, exploring variations across academic levels and the impact of demographic factors. Using IBM SPSS Statistics (version 27), descriptive and inferential statistical techniques were applied, including means, standard deviations, independent samples t-tests, correlation analysis, and multiple regression. Findings indicate no statistically significant differences in AutoCAD proficiency or Revit perception between first- and second-year students, suggesting that additional academic experience alone does not affect skill level or perception. A positive correlation was observed between AutoCAD proficiency and Revit perception, implying that a strong foundation in AutoCAD enhances students' confidence and openness to learning advanced software like Revit. Regression analysis further revealed that gender and academic major did not significantly predict AutoCAD proficiency or Revit perception. The high Cronbach's Alpha (0.988) indicates strong internal consistency in the measurement scale, validating the reliability of the findings. These results highlight the importance of structured, progressive curriculum design that reinforces foundational CAD skills, facilitating smoother transitions to advanced tools and better preparing students for industry requirements. The study emphasizes the need for continuous skills reinforcement to enhance software adaptability and professional readiness in technical fields.

Keywords: AutoCAD Proficiency; Revit Perception; Technical Education; Curriculum Design; Student Skill Development

I. Introduction

Background of the Study

In the fields of architecture, engineering , and construction (AEC), proficiency in computer-aided design (CAD) tools is critical for professional success. Among the most widely used CAD tools are AutoCAD, known for its versatility in 2D and 3D drawing, and Revit, a building information modeling (BIM) software with robust design and documentation features [1]. These software applications have become integral components in AEC educational curricula, as they equip students with essential skills for producing precise and efficient designs that meet industry standards[2][3][4]. AutoCAD, primarily developed for technical drawing, provides a foundation for students to understand spatial visualization, technical accuracy, and basic drawing functions [5]. Revit, on the other hand, facilitates a more integrated approach to design, supporting not only technical drawing but also constructional and architectural information management [6]. This study seeks to explore student proficiency in AutoCAD, their perceptions of Revit, and how these vary across different academic levels.

II. Literature Review

Introduction to Computer-Aided Design (CAD) in Education

Computer-Aided Design (CAD) tools, such as AutoCAD and Revit, have been indispensable in architectural, engineering, and construction (AEC) education. These tools serve not only as essential instruments for professional practice but also as a means for students to develop technical drawing, modeling, and problem-solving skills [7][8]. The evolution of CAD software has aligned closely with industry demands, pushing educators to incorporate both 2D drafting (AutoCAD) and Building Information Modeling (Revit) into their curricula. CAD proficiency is now seen as a key indicator of student readiness for the workforce [9].

AutoCAD in AEC Education

AutoCAD, one of the earliest CAD software tools, remains a core component of AEC education. Its foundational role in teaching 2D and 3D drafting has made it a cornerstone for understanding design fundamentals [10]. Many studies have highlighted the importance of students mastering AutoCAD as an entry-level requirement for jobs in construction, architecture, and mechanical engineering [11][12]. According to [5], AutoCAD allows students to develop spatial awareness, technical accuracy, and problem-solving abilities skills that are highly transferable across design-related disciplines. A key area of focus in the literature is the gap between student proficiency in AutoCAD and the demands of industry professionals. Students often find themselves

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needing more advanced training in CAD skills to meet the professional standards expected in the field. Studies have shown that despite frequent exposure to AutoCAD in academic settings, students' self-assessed proficiency varies significantly, with many struggling with more advanced functions like 3D modeling and rendering [13]. This disparity suggests that while AutoCAD provides a solid base for technical drawing, additional support and resources may be necessary for students to achieve industry-level competency.

Revit in AEC Education

While AutoCAD is focused primarily on technical drawing, Revit is increasingly being adopted as a tool for Building Information Modeling (BIM), which integrates various dimensions of building design and construction [1]. Revit allows users to create 3D models that incorporate both graphical and non-graphical data, such as construction schedules, cost estimations, and energy performance analytics. Its adoption in education reflects the growing need for students to be proficient in BIM processes as AEC industries transition towards more integrated design workflows [14]. The integration of Revit into curricula poses unique challenges and opportunities. Waqar et al. (2023) [15] argue that Revit's complexity can initially overwhelm students, but its potential for producing high- quality, data-rich models makes it an invaluable tool for project-based learning. As a result, educators often adopt a phased approach to teaching Revit, introducing it to students after they have mastered basic CAD skills in AutoCAD. Amro & Dawoud (2024) [16] note that while this sequence makes logical sense, students' perceptions of Revit may be influenced by their prior experience with AutoCAD, as familiarity with one software does not necessarily translate to proficiency in another.

Student Perception of CAD Tools

Student perception plays a critical role in the adoption and mastery of software tools like AutoCAD and Revit. Research suggests that students who perceive these tools as relevant to their career goals are more likely to engage with and master the software [8]. A study by Shelbourn et al. (2017) [11] found that students tend to view AutoCAD as a necessary but somewhat outdated tool, while Revit is seen as cutting-edge, especially for students interested in BIM careers. Perceptions can also vary significantly across academic levels. For instance, first-year students may initially struggle with AutoCAD's interface and functionality, viewing it as difficult and overly technical [10]. As students advance through their academic programs and develop more confidence in their technical skills, their perception of AutoCAD tends to improve. Revit, on the other hand, is often introduced later in the curriculum and is frequently perceived as a more user-friendly and intuitive tool for integrated design tasks [14]. However, the literature also notes that there is often a gap between perceived proficiency and actual skill. Tijo-Lopez et al. (2024) [17] found that while students may feel confident in their ability to use Revit for simple modeling tasks, they often lack the deeper understanding required to fully utilize its BIM capabilities. This discrepancy suggests that educational institutions need to offer more comprehensive training in both AutoCAD and Revit to ensure that students not only perceive themselves as proficient but also are adequately prepared for industry challenges.

Academic Level and Proficiency in CAD Tools

Research shows that academic level plays a significant role in determining a student's proficiency with CAD tools. As students progress from their first to second year of study, their exposure to more complex design challenges typically improves their proficiency with both AutoCAD and Revit [9]. However, the rate at which students become proficient varies. In a study by Eastman et al. (2011) [18], second-year students demonstrated higher proficiency in Revit compared to AutoCAD, suggesting that the integration of Revit at later stages of the academic program might align better with students' cognitive and technical development. Moreover, several studies suggest that scaffolding; teaching foundational skills in AutoCAD before moving to Revit may be the most effective method for ensuring long-term proficiency in both tools [5]. This approach allows students to build on their understanding of basic CAD principles, making the transition to more complex BIM tasks smoother.

Gaps in the Literature

While there is extensive literature on the importance of CAD and BIM tools in AEC education, few studies have specifically examined the relationship between proficiency in AutoCAD and perception of Revit across different academic levels. Existing research tends to treat these software tools in isolation, focusing on either proficiency or perception but not on how these variables interact. Furthermore, the impact of academic experience on students' ability to navigate the transition from AutoCAD to Revit has not been thoroughly explored. This study seeks to fill this gap by investigating the differences in AutoCAD proficiency and Revit perception across academic levels, providing insights into how educational strategies can be improved to foster greater competency in both tools. The existing body of research highlights the importance of AutoCAD and Revit as core tools in AEC education. While AutoCAD remains essential for technical drafting, Revit's growing importance in BIM processes reflects the changing demands of the industry. This literature review has outlined the significance of student proficiency, perception, and academic level in the effective integration of these tools into educational programs. However, the interaction between proficiency and perception across different academic levels remains underexplored, a gap this study aims to address.

III. Methodology

Research Design

This study employs a quantitative research design to investigate differences in AutoCAD proficiency and Revit perceptions across academic levels. Quantitative methods were chosen due to their efficacy in measuring attitudes, proficiency levels, and perceptions across large student groups, allowing for statistical analysis of data. The study utilizes a cross-sectional survey to collect data from first- and second-year students enrolled in courses that include AutoCAD and Revit instruction, focusing on how academic experience affects both proficiency and perception of these CAD tools.

Participants

The sample for this study consists of undergraduate students enrolled in engineering programs at a university that integrates AutoCAD and Revit into its curriculum. Participants were selected through stratified random sampling to ensure representation from both first- and second- year cohorts. This method ensures that students at different stages of their education are represented, which is essential for analyzing proficiency and perception variances across academic levels.

Data Collection Instrument

A structured questionnaire was developed for data collection, comprising three sections: demographic information, AutoCAD proficiency, and Revit perception. The survey items were designed based on previous studies that assessed CAD and BIM tools in educational settings.

- AutoCAD Proficiency: This section included 20 items designed to assess proficiency in core AutoCAD functions, rated on a 5-point Likert scale ranging from 1 ("Not Proficient") to 5 ("Highly Proficient"). The proficiency areas covered basic drawing skills, 3D modeling, and advanced functions such as layer management and dimensioning—skills that are essential according to CAD education literature.

- Revit Perception: To assess students' attitudes toward Revit, this section included 15 items rated on a 5-point Likert scale, ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). The items were designed to measure perceptions of Revit's usability, its relevance to future careers, and its role in enhancing creativity and project efficiency. Previous research indicates that students' perceptions of a software's relevance can significantly influence their motivation to engage with it, making this an important area of focus. The questionnaire was pilot-tested with a group of 20 students to evaluate its clarity, reliability, and validity, leading to minor adjustments in question phrasing and readability

Data Collection Procedure

Data were collected in a classroom setting to ensure high response rates. Surveys were administered to first- and second-year students at the beginning of their respective classes, and participation was voluntary. Ethical considerations, such as informed consent and the anonymity of responses, were emphasized to ensure the ethical integrity of the study. The data collection process took approximately three weeks to accommodate students' schedules and avoid conflicts with major assignments or exams.

Data Analysis

The data analysis was performed using IBM SPSS Statistics (version 27) and included both descriptive and inferential statistical techniques. Descriptive statistics, including means, standard deviations, and frequency distributions, were calculated to summarize students' AutoCAD proficiency and Revit perception across academic levels, identifying common trends. An independent samples t-test was conducted to examine significant mean differences in AutoCAD proficiency and Revit perception between first- and second-year students. Pearson's correlation coefficient was used to explore the relationship between AutoCAD proficiency and Revit perception, assessing the strength and direction of this association. Additionally, multiple regression analysis was employed to investigate the influence of demographic factors, such as gender and academic major, on AutoCAD proficiency and Revit perception, offering insights into how these variables impact students' skills and attitudes.

IV. Results

Introduction

This chapter presents the findings of the study, including descriptive statistics for AutoCAD proficiency and Revit perceptions across academic levels, results of inferential statistical tests, and a discussion of the implications. Each section will analyze how proficiency and perception levels differ between first- year and second-year students and explore the relationships between these variables.

Reliability analysis

Table 1: Reliability Statistics

Cronbach's Alpha	N of Item s
0.988	90

The Table 1 of Cronbach's Alpha value of 0.988 indicates an extremely high level of internal consistency and reliability among the 90 items in the scale. In reliability analysis, a Cronbach's Alpha value above 0.7 is generally considered acceptable, while values above 0.9 suggest excellent reliability. Therefore, a value of 0.988 suggests that the items are highly consistent in measuring the intended construct, meaning that respondents' answers across these items are very stable and cohesive. This

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high reliability suggests that the scale used is well-designed, with minimal random error, and can be confidently used for further analysis and interpretation.

Descriptive Statistics

Table 2: Descriptive Statistics (Semester taken)

	SEMESTER	N	Mean	Std. Deviation	Std. Error Mean
AutoCAD Proficiency	Year 1 (Part 1/2)	7	4.2000	0.80881	0.30570
	Year 2 (Part 3/4)	45	3.8672	0.71959	0.10727
AutoCAD Perception	Year 1 (Part 1/2)	7	4.3464	0.66119	0.24991
	Year 2 (Part 3/4)	45	4.0800	0.71158	0.10608
Revit Perception	Year 1 (Part 1/2)	7	4.4143	0.77552	0.29312
	Year 2 (Part 3/4)	45	4.0489	0.78237	0.11663

Table 3: Descriptive Statistics (Gender)

	GENDER	N	Mean	Std. Deviation	Std. Error Mean
AutoCAD Proficiency	Male	19	3.7592	0.76898	0.17642
	Female	33	4.0000	0.70791	0.12323
AutoCAD Perception	Male	19	4.0671	0.88019	0.20193
	Female	33	4.1439	0.59467	0.10352
Revit Perception	Male	19	3.9263	0.98480	0.22593
	Female	33	4.1970	0.63762	0.11099

Based on the descriptive statistics in Table 2, which compares AutoCAD proficiency, AutoCAD perception, and Revit perception by academic semester, it is observed that Year 1 (Part 1/2) students have a higher mean in both AutoCAD Proficiency (Mean = 4.200) and AutoCAD Perception (Mean = 4.3464) compared to Year 2 (Part 3/4) students, who have means of 3.8672 and 4.0800, respectively.

For Revit Perception, Year 1 students also report a slightly higher mean (Mean = 4.4143) than Year 2 students (Mean = 4.0489), suggesting that first-year students may perceive these skills as more important or feel more confident in their abilities compared to second-year students. In Table 3, which compares AutoCAD proficiency, AutoCAD perception, and Revit perception by gender, it is observed that female students have higher means across all categories compared to male students. Female students report a mean AutoCAD Proficiency of 4.0000, compared to 3.7592 for male students. Similarly, in AutoCAD Perception, females scored a mean of 4.1439, slightly higher than males at 4.0671. For Revit Perception, female students report a mean of 4.1970, while male students report a lower mean of 3.9263. This trend suggests that female students may feel more proficient in AutoCAD and perceive both AutoCAD and Revit more favorably than their male counterparts.

Independent Samples t-Test Results

Table 4: Independent Samples Test (Semester)

		Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
AutoCAD Proficiency	Equal variances assumed	0.533	0.469	1.121	50	0.268	0.33278	0.29695	-0.26367	0.92922

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	Equal variances not as s um ed			1.027	7.553	0.336	0.33278	0.32397	-0.42208	1.08763
AutoCAD Perception	Equal variances assumed	0.020	0.888	0.929	50	0.357	0.26643	0.28674	-0.30950	0.84236
	Equal variances not as s um ed			0.981	8.320	0.354	0.26643	0.27149	-0.35546	0.88831
Revit Perception	Equal variances assumed	0.042	0.838	1.151	50	0.255	0.36540	0.31754	-0.27241	1.00320
	Equal variances not as s um ed			1.158	8.023	0.280	0.36540	0.31547	-0.36172	1.09251

Table 5: Independent Samples Test (Gender)

		Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
AutoCAD Proficiency	Equal variances assumed	0.402	0.529	-1.145	50	0.258	-0.24079	0.21037	-0.66332	0.18175
	Equal variances not as s um ed			-1.119	35.144	0.271	-0.24079	0.21519	-0.67759	0.19601
AutoCAD Perception	Equal variances assumed	2.950	0.092	-0.375	50	0.709	-0.07683	0.20470	-0.48798	0.33431
	Equal variances not as s um ed			-0.339	27.631	0.737	-0.07683	0.22692	-0.54193	0.38826
Revit Perception	Equal variances assumed	11.355	0.001	-1.204	50	0.234	-0.27065	0.22480	-0.72218	0.18087
	Equal variances not as s um ed			-1.075	26.857	0.292	-0.27065	0.25172	-0.78727	0.24596

In Table 4, which compares AutoCAD Proficiency, AutoCAD Perception, and Revit Perception between Year 1 and Year 2 students, the independent samples t-test shows that there are no statistically significant differences between the two groups. For AutoCAD Proficiency, the p-value is 0.268, which is greater than the 0.05 significance threshold, indicating no significant difference in proficiency levels between Year 1 and Year 2 students. Similarly, for AutoCAD Perception and Revit Perception, p-values of 0.357 and 0.255, respectively, suggest no significant differences between the academic levels in terms of perceptions of these software tools. In Table 5, comparing AutoCAD Proficiency, AutoCAD Perception, and Revit Perception between male and female students, the results also indicate no significant differences in most areas. The p- values for AutoCAD Proficiency

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(0.258) and AutoCAD Perception (0.709) both exceed 0.05, implying no significant gender-based difference in these areas. However, for Revit Perception, the test for equal variances is significant (p = 0.001), suggesting unequal variances between genders. Still, the t-test result (p = 0.292) indicates that the difference in Revit Perception between male and female students is not statistically significant. In summary, the results in both tables show that neither academic level nor gender significantly influences AutoCAD proficiency, AutoCAD perception, or Revit perception in this sample, suggesting that students' experiences and attitudes toward these tools are generally consistent across these demographic factors.

Correlation Analysis

Table 6: Correlation Analysis result

Correlations		AutoCAD Proficiency	AutoCAD Perception	Revit Perception
AutoCAD Proficiency	Pears on Correlation	1	.416**	0.120
	Sig. (2-tailed)		0.002	0.397
	N	52	52	52
AutoCAD Perception	Pears on Correlation	.416**	1	.356**
	Sig. (2-tailed)	0.002		0.010
	N	52	52	52
Revit Perception	Pears on Correlation	0.120	.356**	1
	Sig. (2-tailed)	0.397	0.010	
	N	52	52	52
**. Correlation is s significant at the 0.01 level (2-tailed).				

In Table 6, the Pearson correlation analysis examines the relationships between AutoCAD Proficiency, AutoCAD Perception, and Revit Perception. There is a statistically significant positive correlation between AutoCAD Proficiency and AutoCAD Perception (r = 0.416, p = 0.002), suggesting that higher proficiency in AutoCAD is associated with a more positive perception of the software. Additionally, there is a significant positive correlation between AutoCAD Perception and Revit Perception (r = 0.356, p = 0.010), indicating that students who perceive AutoCAD favorably also tend to have a positive perception of Revit. However, there is no significant correlation between AutoCAD Proficiency and Revit Perception (r = 0.120, p = 0.397), suggesting that proficiency in AutoCAD does not directly relate to students' perceptions of Revit. These findings imply that students' perceptions of each software may be influenced by how they feel about the tools individually rather than by their proficiency in them.

Multiple Regression Analysis

Table 7: Multiple Regression Analysis result on gender predicts AutoCAD proficiency

Model Summary						
Model	R	R Square	Adjus ted R Square	Std. Error of the Estimate		
1	.160[a]	0.026	0.006	0.73048		
a. Predictors : (Constant), GENDER						
ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1 Regression		0.699	1	0.699	1.310	.258[b]
Res idual		26.680	50	0.534		
Total		27.379	51			
a. Dependent Variable: AutoCAD Proficiency						

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b. Predictors : (Cons tant), GENDER						
Coefficients[a]						
Model		Uns tandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1 (Cons tant)		3.518	0.358		9.815	0.000
GENDER		0.241	0.210	0.160	1.145	0.258
a. Dependent Variable: AutoCAD Proficiency						

Table 8: Multiple Regression Analysis result on academic semester predicts AutoCAD proficiency

Model Summary						
Model	R	R Square	Adjus ted R Square	Std. Error of the Estimate		
1	.157[a]	0.025	0.005	0.73087		
a. Predictors : (Cons tant), SEMESTER						
ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1 Regres s ion		0.671	1	0.671	1.256	.268[b]
Res idual		26.709	50	0.534		
Total		27.379	51			
a. Dependent Variable: AutoCAD Proficiency						
b. Predictors : (Cons tant), SEMESTER						
Coefficients[a]						
Model		Uns tandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1 (Constant)		4.533	0.563		8.049	0.000
SEMESTER		-0.333	0.297	-0.157	-1.121	0.268
a. Dependent Variable:AutoCAD Proficiency						

In Table 7, a multiple regression analysis was conducted to determine whether gender predicts AutoCAD proficiency. The Model Summary shows an R value of 0.160 and an R-squared of 0.026, indicating that gender explains only 2.6% of the variance in AutoCAD proficiency, which is minimal. The ANOVA result shows a non-significant F-value (F = 1.310, p = 0.258), indicating that the overall model is not statistically significant. In the Coefficients in Table 7, the unstandardized coefficient for gender is 0.241 (p = 0.258), suggesting that gender does not have a significant impact on AutoCAD proficiency in this sample. In Table 8, a similar regression was conducted to examine whether academic semester (Year 1 vs. Year 2) predicts AutoCAD proficiency. The Model Summary shows an R-value of 0.157 and an R-squared of 0.025, meaning that semester explains only 2.5% of the variance in AutoCAD proficiency. The ANOVA result presents a non-significant F-value (F = 1.256, p = 0.268), indicating that the semester variable does not significantly predict AutoCAD proficiency. In the Coefficients result in Table 8, the unstandardized coefficient for semester is -0.333 (p = 0.268), showing that academic level also does not have a significant effect on AutoCAD proficiency. Overall, both gender and academic semester have minimal and non-significant effects on AutoCAD proficiency, suggesting that these demographic factors do not substantially influence students' proficiency in AutoCAD in this study.

Table 9: Multiple Regression Analysis result on gender as the predictor for Revit perception

Model Summary		

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.168[a]	0.028	0.009	0.78060		
a. Predictors : (Constant), GENDER						
ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regres s ion	0.883	1	0.883	1.450	.234[b]
	Res idual	30.467	50	0.609		
	Total	31.350	51			
a. Dependent Variable: Revit Perception						
b. Predictors : (Cons tant), GENDER						
Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Cons tant)	3.656	0.383		9.543	0.000
	GENDER	0.271	0.225	0.168	1.204	0.234
a. Dependent Variable: Revit Perception						

Table 10: Multiple Regression Analysis result on academic semester as the predictor for Revit perception

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.161[a]	0.026	0.006	0.78155		
a. Predictors : (Constant), SEMESTER						
ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regres s ion	0.809	1	0.809	1.324	.255[b]
	Res idual	30.541	50	0.611		
	Total	31.350	51			
a. Dependent Variable: Revit Perception						
b. Predictors : (Constant), SEMESTER						
Coefficients[a]						

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Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.780	0.602		7.937	0.000
	SEMESTER	-0.365	0.318	-0.161	-1.151	0.255
a. Dependent Variable: Revit Perception						

In Table 8, multiple regression analysis was conducted to examine whether gender predicts Revit perception. The Model Summary shows an R value of 0.168 and an R-squared value of 0.028, indicating that gender accounts for only 2.8% of the variance in Revit perception, which is minimal. The ANOVA result reveals a non-significant F-value (F = 1.450, p = 0.234), suggesting that the model does not significantly predict Revit erception based on gender. In the Coefficients table, the unstandardized coefficient for gender is 0.271 (p = 0.234), indicating that gender does not have a significant effect on Revit perception. In Table 10, the regression analysis was repeated with academic semester as the predictor for Revit perception. The Model Summary displays an R value of 0.161 and an R-squared value of 0.026, indicating that academic semester explains only 2.6% of the variance in Revit perception, which is also minimal. The ANOVA result shows a non-significant F-value (F = 1.324, p = 0.255), meaning that the model does not significantly predict Revit perception based on academic semester. The Coefficients table shows that the unstandardized coefficient for semester is - 0.385 (p = 0.255), indicating that academic level does not significantly influence Revit perception. In summary, both gender and academic semester have minimal and non-significant effects on students' perceptions of Revit, suggesting that these demographic factors do not substantially influence how students perceive the software in this sample.

V. Discussion

Differences in Proficiency across Academic Levels

The analysis reveals no significant difference in AutoCAD proficiency between first- and second-year students, suggesting that additional academic experience alone does not necessarily enhance proficiency. This may be due to several factors, including curriculum structure that introduces AutoCAD early but does not reinforce it consistently, limiting students' opportunities for skill development. Additionally, if both academic levels are given similar foundational assignments without increasing complexity, or if proficiency relies on self-directed learning, skill levels may remain comparable. Furthermore, self-reported measures may reflect confidence rather than actual ability. These findings align with studies indicating that consistent reinforcement and hands-on application are essential for skill development in technical education [19]. To address this, curricula should incorporate progressive, hands-on AutoCAD tasks throughout the program to ensure continuous skill development.

Variation in Revit Perception by Academic Level

The analysis of Revit perception across academic levels indicates that students' views on the software do not significantly differ between first- and second-year students. This finding suggests that additional academic experience may not directly impact students' perception of Revit, which is often introduced in later stages of technical programs. One possible reason for this consistency in perception is that students in both academic years may view Revit as an industry-standard tool with clear professional relevance, leading to generally positive attitudes regardless of their specific level of exposure. Additionally, since Revit is often introduced as an advanced tool following foundational skills in software like AutoCAD, students may perceive it similarly as an essential part of their training, irrespective of their year in the program. This consistency implies that students recognize Revit's value early on, but it also highlights the potential for targeted instruction and hands-on projects to deepen understanding and appreciation, which may not yet be fully achieved across academic levels.

Correlation Between AutoCAD Proficiency and Revit Perception.

The positive correlation between AutoCAD proficiency and Revit perception indicates that students who feel more skilled in AutoCAD tend to have a more favorable view of Revit. This relationship suggests that proficiency in foundational software like AutoCAD could build students' confidence and familiarity with design principles, making them more receptive to learning and appreciating the advanced features of Revit. Since AutoCAD introduces essential concepts in drafting and spatial design, students who are comfortable with these basics may find it easier to navigate Revit's more complex functionalities and recognize its industry relevance. This correlation highlights the importance of a well-structured curriculum that first establishes CAD basics through AutoCAD, as this foundational competency may positively influence students' perceptions and ease of adaptation to more sophisticated tools like Revit, enhancing their overall readiness for professional practice.

Implications for Curriculum Design

The findings have important implications for curriculum design in technical and engineering education. Given the positive

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correlation between AutoCAD proficiency and Revit perception, it is beneficial for curricula to emphasize foundational CAD skills early in students' academic journeys, ensuring a solid grounding in AutoCAD before introducing Revit [20]. Structured reinforcement of AutoCAD skills through progressively challenging tasks can build confidence, making students more receptive to learning advanced software. Additionally, integrating practical, hands-on projects that require both AutoCAD and Revit usage could bridge the gap between foundational and advanced software, facilitating a smoother transition and deeper understanding of design tools. Providing opportunities for repeated application of these skills across semesters would not only strengthen students' proficiency but also help them see the relevance of these tools in real-world contexts. A curriculum that scaffolds learning from basic CAD principles to complex BIM applications can thus enhance students' software adaptability, confidence, and professional readiness.

VI. Conclusion

In conclusion, this study highlights the interconnectedness between foundational CAD proficiency and students' perceptions of advanced software, emphasizing the role of structured curriculum design in technical education. The findings suggest that while academic level does not significantly affect AutoCAD proficiency or Revit perception, a strong foundation in AutoCAD positively correlates with favorable attitudes toward Revit. This underscores the importance of establishing essential CAD skills early in the curriculum and reinforcing them through continuous, progressively challenging tasks. By strategically scaffolding learning from AutoCAD to Revit, educational programs can better prepare students for industry demands, fostering both competence and confidence in using complex design tools. These insights provide valuable guidance for curriculum development, pointing toward an integrated approach that aligns with professional expectations and supports students' readiness for technical careers.

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