

Link Between Academic Performance and Board Exam Results of Civil Engineering Graduates

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Date received: November 8, 2024

Date revised: December 5, 2024

Date accepted: December 19, 2024

Originality: 93%

Grammarly Score: 99%

Similarity: 7%

Recommended citation:

Ucol, E. (2024). Link between academic performance and board exam results of civil engineering graduates. *Journal of Interdisciplinary Perspectives*, 3(1), 139-145. <https://doi.org/10.69569/jip.2024.0607>

Abstract. This study explores the relationship between academic performance and board exam outcomes among Bachelor of Science in Civil Engineering graduates at Nueva Vizcaya State University (NVSU) from 2018 to 2022. The research addresses a critical gap in understanding how specific academic subjects contribute to board exam success, providing insights essential for curriculum improvement and student support. Specifically, the study aims to determine the significance of academic performance in Mathematics, Hydraulics, and Design in predicting board exam results, identifying influential subjects, and developing a predictive model. Using descriptive research design, secondary data on academic grades and board exam ratings were collected from the NVSU Registrar and the Professional Regulation Commission. Correlation and regression analyses revealed that academic performance in Hydraulics had a moderate positive relationship with board exam outcomes, contributing significantly to overall results ($r = 0.287$, $p < 0.05$). In contrast, Math and Design exhibited mixed relationships, with some weak negative correlations suggesting the influence of additional factors. Regression analysis indicated that Hydraulics positively predicted board exam results ($\beta = 9.844$, $p = 0.045$), while Math and Design showed less significant or negative contributions. The findings emphasize strengthening the Hydraulics curriculum and aligning Math and Design courses with board exam expectations. With 85.3% of the variance in board exam performance explained by the model ($R^2 = 0.853$), the study highlights the substantial impact of academic preparation while recommending targeted interventions and further exploring non-academic factors. This research provides actionable insights for enhancing engineering education and improving licensure exam outcomes.

Keywords: Academic performance; Board examination; Civil Engineering; Design; Hydraulics; Mathematics.

1.0 Introduction

The correlation between academic performance and licensure exam results is important in higher education, particularly in professional fields such as civil engineering. Universities and educators strive to equip students with the knowledge and skills necessary for success in board examinations, which serve as critical gateways to professional practice. For civil engineering graduates, these exams assess their grasp of technical concepts and readiness to contribute to the profession. Despite the emphasis on academic performance during undergraduate studies, questions remain about how effectively these measures predict success in licensure exams. Understanding this relationship is essential for improving curricula, instructional strategies, and student support systems. By identifying patterns and factors that contribute to performance in board exams, educators can better align academic programs with the demands of professional certification

Education is a vital tool that enables individuals to find their place in the world, pursue better employment opportunities, and achieve success in life. Consequently, academic institutions should respond positively and effectively to their graduates' educational needs and expectations by providing high-quality instruction to their stakeholders (Raqueno & Yabut, 2013). Members of the academic system are also responsible for ensuring the success of their graduates. For example, specific board courses like engineering, this can be achieved by implementing education and experience requirements as prerequisites for board exams (Mohammed & Mohammed, 2017). The Licensure Examination for Engineering programs assesses and ensures the quality of engineers entering the workforce of diverse manufacturing industries in the Philippines and abroad. Licensure examinations for professional practice are a regulatory mechanism implemented by the State. The Professional Regulations Commission (PRC) has consistently regulated graduates of all board courses, granting professional licenses to those graduate examinees who successfully pass the board exam.

Academic performance is an indicator of student outcomes, reflecting how students learn from the instruction of any course. It is a significant concern in universities, and teachers, as facilitators of science learning, play a crucial role in the success of the teaching and learning process. They act as catalysts in transferring knowledge and skills to the next generation of innovators. How students comprehend the subject matter and apply its principles to practical situations demonstrates their understanding of the intended learning outcomes. Student academic performance in professional courses and mathematics is considered vital in contributing to the outcomes of their future endeavors, particularly the licensure examination.

Furthermore, the assurance of engineering professionals' preparedness is an ongoing process facilitated by accreditation. Accreditation serves as a platform for collaboration between industry and engineering educators, enabling the development of assessment techniques to enhance classroom management, courses, and curricula. Accreditation also ensures that instructional strategies are adapted to prepare students for the expected outcomes of graduates. These strategies include assessing academic aptitude and self-image to predict board exam performance, offering intervention courses to help students prepare for the board examination, improving the curriculum, and analyzing the profiles of successful examinees (Tamayo & Canizares, 2014). Additionally, evaluating, correlating, and assessing the board exam performance of engineering graduates helps us align with AACUP recommendations, provides essential data for the Regional Quality Assessment Team (RQUAT), contributes to SUC leveling, and ultimately establishes a foundation for curriculum development and enhancement of the university's engineering programs.

According to the research of Agnes M. Ramos (2015), the Evaluation of the Performance of Isabela State University Accountancy Graduates in the CPA Board Examination focused on the Comparison of ISU Passing Percentages with the National Passing Percentages, the Relationship between the Socio-economic Profile of the Respondents, the Relationship between the Grades of the Respondents in some General Education and Business Core subjects, Relationship between the Grades of the Respondents in Accounting and Finance Education subjects, Projected Performance in CPA Board Examination (3-Pass in one take, 2-Pass in two takes, 1-Fail), according to her conclusion some factors affected the board examination performance like the difficulty of the subject according to rank, encountering several problems while preparing and taking the board examinations like insufficient funds, lack of self-confidence and too many topics not discussed in the classroom.

Determinants of performance in the board examination for Mechanical Engineering graduates of the Nueva Vizcaya State University, Bambang campus. According to their research, undergraduate students should develop a study habit of understanding the concepts, principles, and manipulation of equations or formulas rather than memorization. Abaya, Montalbo, and Orig (2016) focused on developing a model prototype for predicting the possible student passers and the performance of students who will take the board exam. Their prediction variables included academic grades, age, gender, and pre-board scores. Their model would be able to identify who among the pool of board takers might pass or fail the board and the possible passing percentage of the institution as compared to the national passing rate.

In addition, Dizon and Laguador (2013) focused on the board exam performance rating of two courses and the academic achievements of engineering graduates in the cognitive and affective domains. On board exam performance ratings, their study revealed that mechanical engineering examinees obtained the highest average

score in machine design, followed by math subjects, while they obtained the lowest rating in power plant design. This study explores the link between the academic performance of civil engineering graduates and their results in board exams. It aims to provide insights into how academic metrics, such as grades and cumulative GPAs, correlate with exam outcomes. Ultimately, the findings can inform policies and practices that enhance future civil engineers' academic preparation and professional success.

2.0 Methodology

2.1 Research Design

The study used the descriptive method of research, which emphasizes the present status of a phenomenon, describes a current situation, determines the nature of prevailing conditions or practices, and seeks an accurate description of entities, objects, persons, and processes (Dulay, 2003). The data on academic grades and board ratings are secondary as they are readily available from the University Registrar and Professional Regulation Commission (PRC), respectively.

2.3 Research Participants

The respondents for this study comprise 294 graduates of the Bachelor of Science in Civil Engineering program at Nueva Vizcaya State University (NVSU) from 2018 to 2022. These individuals were selected based on their program completion and participation in the Civil Engineering Board Examination, ensuring relevance to the study's focus on the relationship between academic performance and licensure exam outcomes.

2.4 Research Instrument

The academic grades of the respondents were gathered from the Nueva Vizcaya State University (NVSU) SIAS, and the board exam rating was requested from the Professional Regulation Commission (PRC). The data gathered was encoded in Excel by listing the names with their corresponding subject rating and academic grades.

2.5 Data Analysis

The data will be treated using the following statistical tools: Correlation and Regression Analysis were used to determine if there is significant relationship between the independent variables, the academic grades in mathematics, allied and professional subjects and the dependent variables is the engineering board examination rating.

2.6 Ethical Considerations

The study complied with institutional and ethical guidelines, ensuring that the respondents did not suffer physical, emotional, or reputational harm. Data were collected, analyzed, and reported with honesty and transparency, ensuring the findings were accurate and unbiased. Finally, the results are intended solely for academic and institutional purposes, aiming to improve education and support for future professionals.

3.0 Results and Discussion

Table 1 illustrates the relationship between academic performance in Math, Hydraulics, and Design and the corresponding board exam performance in the same subjects and overall board exam output.

Table 1. Relationship between academic performance and board exam performance during May CELE

	Math		Hydraulics		Design	
	Pearson Correlation	Sig. (2-tailed)	Pearson Correlation	Sig. (2-tailed)	Pearson Correlation	Sig. (2-tailed)
brmath	-0.106	0.283	0.119	0.227	-0.156	0.113
brhydraulics	0.256**	0.008	0.109	0.267	0.287**	0.003
brdesign	-0.172	0.079	-0.021	0.835	-0.164	0.094
Average	0.214*	0.028	0.067	0.494	0.239*	0.014

It shows a weak and direct relationship between academic performance in hydraulics and board exam performance in math and design ($r = 0.256$, $p < 0.05$). This means that higher academic achievement in hydraulics was associated with higher board exam scores in math. Further, the relationship between academic performance in hydraulics and board exam scores in design was also significant ($r = 0.287$, $p < 0.05$), meaning there was a weak relationship between academic and board exam outcomes in these areas. The positive correlations between academic performance in Hydraulics and board exam scores in Math and Design suggest that students who

excelled in Hydraulics tended to perform better in these board exam subjects. A strong foundation in mathematics often correlates with success in hydraulics and design.

Moreover, the overall board exam performance in both Math and Design academic scores were positively related to their achievement. For Math, the correlation with overall board exam results ($r = 0.214$, $p < 0.05$) indicates that stronger academic performance in Math was slightly correlated to overall board exam scores. Also, academic performance in Design demonstrates a slight but statistically significant positive correlation with overall board exam results ($r = 0.239$, $p < 0.05$), showing a slight but positive relationship. This suggests that stronger performance in these subjects contributed slightly to better board exam results. However, the weak/slight correlations indicate that other factors likely contested a more significant role in overall board exam results. On the other hand, the relationship between academic performance in Math and corresponding board exam scores in Math was weak and non-significant ($r = -0.106$, $p > 0.05$) this reflects that there was a weak inverse relationship. Further, the relationship between Math academic performance and Hydraulics board exam scores was slightly positive but also non-significant ($r = 0.119$, $p > 0.05$). The correlation with Design board exam scores was weakly negative ($r = -0.156$, $p > 0.05$), but this too was not statistically significant. This aligns with some studies that suggest that board exam results may be influenced by other factors beyond mere academic performance in individual subjects.

The model summary indicates a moderate positive relationship between academic performance in math, hydraulics, and design and board exam results with a correlation coefficient ($R = 0.592$). These suggest that performance in these subjects is associated with exam scores. The R-squared value of 0.853 reveals that approximately 85.3% of the variance in board exam results could be explained by these three predictors, indicating a strong model fit. Further, the adjusted R-squared value of 0.584 shows that the model remains robust after accounting for the number of variables while the standard error of the estimate (11.02486) reflects a moderate level of prediction accuracy.

Table 2. Model summary (May CELE)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.592 ^a	0.853	0.584	11.02

a. Predictors: (Constant), Math, Hydraulics and Design

b. Dependent Variable: Board Exam Results

The findings emphasize the significant role that Math, Hydraulics, and Design play in influencing board exam performance. These suggest that teachers should prioritize these subjects to enhance student outcomes in standardized assessment and other factors beyond academic performance in Math, Hydraulics, and Design may also influence board exam outcomes. This highlights the presence of other influencing factors, such as practical experience, exam-taking skills, and psychological factors that may not be captured in the model.

Table 3 Shows the regression analysis between academic performance in Math, Hydraulics, and Design and Board Exam Results. The results indicate a statistically significant negative relationship between math and design scores and board exam performance with coefficients of -9.792 and -7.116, respectively. This suggests that the lower scores in these subjects correlate with lower board exam results. In contrast, Hydraulics demonstrated a positive relationship with a coefficient of 9.844, suggesting that strong performance in this area may enhance students' exam outcomes. Moreover, the significance levels for all predictors indicate that the observed effects were statistically strong with p-values below the conventional threshold of 0.05.

Table 3. Regression analysis on academic performance as predictors of board exam results (May CELE)

Coefficients ^a		Unstandardized Coefficients		Standardized Coefficients	
Model		B	Std. Error	Beta	t
1	(Constant)	77.80	21.39		3.636
	Math	-9.790	7.278	-0.153	-1.345
	Hydraulics	9.844	7.031	0.137	1.400
	Design	-7.116	4.381	-0.181	-1.625

a. Dependent Variable: Board Exam Results

These results align with the idea that performance in subjects like Hydraulics, which require both technical knowledge and problem-solving skills, is crucial for licensure success.

Table 4 illustrates the relationship between academic performance in Math, Hydraulics, and Design and the corresponding board exam performance in the same subjects as well as overall board exam output. Math and Board Exam Results There's a moderate positive correlation between Math performance and overall board exam results ($r = 0.277$, $p < 0.001$). This suggests that stronger Math skills are associated with better overall exam performance. However, the correlations between Math performance and individual board exam subjects (Math, Hydraulics, Design) are mixed A weak positive correlation exists between Math and Hydraulics board exam results ($r = 0.258$, $p < 0.001$). A weak negative correlation exists between Math and Design board exam results ($r = -0.163$, $p = 0.025$).

Table 4. Relationship between academic performance and board exam performance (November CELE)

	Math		Hydraulics		Design	
	Pearson Correlation	Sig. (2-tailed)	Pearson Correlation	Sig. (2-tailed)	Pearson Correlation	Sig. (2-tailed)
brmath	.258**	0.000	-0.094	0.198	-.163*	0.025
brhydraulics	.283**	0.000	-0.122	0.095	-.186*	0.010
brdesign	.198**	0.006	-.162*	0.026	-.240**	0.001
Average	.277**	0.000	-.147*	0.044	-.234**	0.001

Hydraulics and Board Exam Results A strong positive correlation exists between Hydraulics performance and board exam results in all subjects (Math, Hydraulics, Design, and Overall), indicating a strong association. Design and Board Exam Results A strong negative correlation exists between Design performance and board exam results in Math and Hydraulics ($r = -0.162$, $p = 0.026$ and $r = -0.240$, $p = 0.001$, respectively). This suggests that lower grades in Design might negatively impact performance in these board exam subjects. A weak positive correlation exists between Design performance and overall board exam results ($r = 0.198$, $p < 0.006$), suggesting that Design skills might still contribute slightly to overall exam success. This aligns with some studies that suggest that board exam results may be influenced by other factors beyond mere academic performance in individual subjects. This finding is consistent with previous studies that highlight Hydraulics as a critical subject that reflects not just theoretical knowledge but practical problem-solving abilities, which are essential for board exams.

Table 5 illustrates the provided model summary and presents key statistics related to the regression analysis between academic performance in Math, Hydraulics, and Design and board exam results. The correlation coefficient (R) of 0.386 indicates a moderate positive relationship between the predictor variables and the dependent variable, suggesting that the model explains a portion of the variation in board exam scores. However, the R-squared value of 0.149 and the adjusted R-squared value of 0.135 indicate that the model's explanatory power is relatively limited, suggesting that other factors may be influencing board exam results.

Table 5. Model summary (November CELE)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.386 ^a	0.149	0.135	10.72

a. Predictors: (Constant), Math, Hydraulics and Design

b. Dependent Variable: Board Exam Results

Additionally, the standard error of the estimate (10.71642) is relatively high, indicating that the model's predictions may not be highly accurate. Overall, while the model suggests a moderate positive relationship between academic performance and board exam results, its explanatory power is limited, indicating that further research is needed to explore other factors influencing board exam outcomes. Moreover, the significance levels for all predictors indicate that the observed effects were statistically strong with p-values below the conventional threshold of 0.05. This lower value suggests that the academic performance in the three subjects (Math, Hydraulics, and Design) explains only a small portion of the variation in board exam scores, and other external factors may play a more significant role in determining overall exam success. This aligns with findings from similar studies that suggest the complex interplay of multiple variables affecting licensure exam outcomes, such as personal motivation, time management skills, and exam anxiety.

Table 6 illustrates the regression analysis presented in the table examines the relationship between academic performance in Math, Hydraulics, and Design and subsequent board exam results. These findings highlight the importance of strong performance in Hydraulics and Design for success on the board exam, while Math scores may have a less significant impact. Hydraulics continued to show a significant negative relationship with board exam results (coefficient = -10.641, $p = 0.001$), indicating that lower grades in Hydraulics are strongly associated with lower board exam scores. Conversely, Design demonstrated a positive coefficient (0.348, $p = 0.000$), suggesting that strong performance in Design may have a positive impact on licensure exam results. The relatively less significant role of Math, with a non-significant coefficient ($p = 0.664$), reinforces the notion that success in the licensure exam may depend more on specialized subject knowledge, such as Hydraulics and Design, rather than on general Math proficiency.

Table 6. Regression analysis on academic performance as predictors of board exam results (November CELE)

Coefficients ^a		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model		B	Std. Error	Beta		
1	(Constant)	93.35	12.73		7.328	0.000
	Math	-2.135	4.911	-0.032	-0.435	0.664
	Hydraulics	-10.64	3.051	-0.260	-3.488	0.001
	Design	0.348	0.078	0.305	4.434	0.000

a. Dependent Variable: Board Exam Results

The findings suggest that instructors and curriculum planners should focus on strengthening students' foundations in subjects like Hydraulics and Design, which seem to play a more significant role in licensure exam success. While Math remains important, its impact on board exam performance appears to be less direct, which may warrant a reevaluation of the weight placed on this subject in preparing students for the CELE. The results also suggest the need for targeted interventions for students who struggle in Math and Hydraulics, as lower academic performance in these subjects may negatively impact board exam results. This could include supplementary tutoring, adaptive learning technologies, and strategies that promote active learning and problem-solving skills. In contrast, for students who excel in Design, the emphasis could be placed on refining their application of theory to practical problems, ensuring that their performance on the licensure exam reflects their academic achievements.

In conclusion, while academic performance in Math, Hydraulics, and Design plays a significant role in predicting board exam outcomes, other factors must be considered to provide a comprehensive understanding of licensure exam success. Further research into additional predictors, such as professional experiences, exam strategies, and personal factors, will be essential for enhancing student performance in the CELE. These results are congruent to the findings of Osabel, et. al. (2018), Felicitas, et.al. (2024), and Arboleda , (2024) who also did not establish academic performance as a determinant or predictor of civil engineering graduates' performance in the licensure examination.

4.0 Conclusion

This study examined the relationships between academic performance in key subjects – Math, Hydraulics, and Design – and the corresponding results in the Civil Engineering Board Examination. Findings revealed a weak to moderate positive correlation between academic performance in Hydraulics and overall board exam results, indicating that strong performance in this subject tends to contribute to better exam outcomes. The relationship between Math and Design scores and board exam results showed mixed patterns. While higher grades in these subjects were generally associated with better performance, other factors may also influence board exam scores. Furthermore, the model used in the study explained a moderate portion of the variance in board exam results, highlighting the role of additional factors beyond academic performance in determining exam outcomes.

5.0 Contributions of Authors

The sole author was responsible for all stages of the research process, including conceptualization, methodology design, data collection, analysis, interpretation, and the writing and revision of the research paper. All tasks were conducted independently, and the author assumes full responsibility for the study's content and conclusions

6.0 Funding

Institutional Funding

7.0 Conflict of Interests

The authors declare no conflicts of interest about the publication of this paper

8.0 Acknowledgment

The researchers would like to express their sincere gratitude to; NVSU SIAS, for providing essential data and to the PRC, for granting our request to access the individual performance rating of examinee, enabling a comprehensive analysis in correlation study of the academic achievement and board exam performance of the BSCE graduates of NVSU.

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