A Comparative Study on the Effect of In-Person Classes Compared to Online Classes in Student Academic Performance

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Abstract - This study investigates the impact of online versus in-person classes on student academic performance and engagement at the School of Engineering and Architecture, Holy Angel University. Using a quantitative research design, test scores and engagement metrics were collected from students enrolled in Engineering Economics and analyzed using dependent t-tests. Results show a significantly higher level of engagement during in-person classes compared to online sessions, as evidenced by attendance records and Canvas page views. Academic performance, as measured by test scores, also favored in-person instruction, though specific statistical outcomes varied slightly between groups. The study concludes that in-person classes provide a more effective learning environment in terms of student participation and achievement. These findings support the continued use of traditional classroom settings, especially for subjects requiring high engagement, while also highlighting areas where online learning can be enhanced.

Indexed Terms - Online Learning, In-Person Classes, Hybrid Learning, Engineering Education

I. INTRODUCTION

A. Background of the Study

The COVID-19 pandemic, which compelled educational institutions all over the world to use online learning as their main teaching method, has accelerated the global trend toward digital education in recent years [1]. This shift renewed the interest in comparing the effectiveness of traditional in-person training with online learning. The increasing integration of technology into learning settings by educational institutions has made it crucial to do research on the effects of these two modalities on student performance, engagement, and satisfaction.

The benefits and drawbacks of both forms have been the subject of several studies. Adult learners and students with different schedules may find online classes especially helpful since they provide flexibility, accessibility, and the opportunity to learn at their own pace [2]. On the other hand, face-to-face instruction offers organized learning environments, instant feedback, and direct social interaction – all of which are frequently mentioned as critical components of student motivation and academic achievement [3].

However, a number of variables, including the subject content, instructional design, learner autonomy, and digital literacy, can affect the effectiveness of online learning [4]. Concerns regarding educational equity have also been highlighted by differences in access to technology and the internet. Some studies suggest that online learning may be less effective for some student populations, particularly those who need more support [5], while other research shows that students in online environments perform on par with or even better than their peers in face-to-face settings [6].

Given these mixed findings, this study aims to contribute to the ongoing discourse by systematically comparing the effectiveness of online and in-person classes. The researchers examined student academic performance and their engagement under the two modalities.

B. Objective of the Study

General Objective:

The main objective of this study is to investigate the impact of online classes compared to in-person classes in selected

courses in the School of Engineering and Architecture of Holy Angel University (SEA-HAU).

Specific Objectives:

1. determine the engagement of the students in online classes compared to in-person classes.

2. compare the academic performance of students under online classes compared to in-person classes.

C. Significance of the Study

The findings of this study will be beneficial to the students, faculty members, and administrators of SEA-HAU. The administrators and faculty members will be able to assess the best modality in delivering the courses to attain the outcomes specified in the syllabi. The students will also be able to genuinely gain the knowledge they need to progress in their chosen field.

II. METHODOLOGY

A. Research Design

This study utilized a quantitative research design using inferential methods. The independent t-test method determined the engagement of the students in online classes compared to in-person classes. The inferential method determined if there's a significant difference between the means of two related groups (like pre- and post-test scores of the same individuals).

B. Population and Sample of the Study

The researchers homogeneous purposive sampling method. The researchers selected 2 sections of students taking Engineering Economics (ENGGECON) to evaluate the impact of online classes compared to in-person classes

C. Research Instruments

This study used test scores to measure the academic performance of students in both online and in-person classes. The test will be composed of items aligned with the learning objectives of the course. The test scores gathered are from lessons taught online and lessons taught in-person. The scores obtained served as quantitative data to assess the effectiveness of each teaching modality. These scores were statistically analyzed to determine if there are significant differences in academic performance based on the mode of instruction.

D. Data Collection Procedure

The researchers sought ethical clearance and permission from school authorities. Questionnaires were administered to respondents. Academic records were obtained with consent.

E. Statistical Treatment

SEA-HAU implements a hybrid modality in academic instructions. A course is delivered one meeting in-person and one meeting online in one week. It is a 50-50 split for the in-person and online instructions.

The researchers analyzed the attendance record of the students during in-person classes from 2nd Semester of S.Y. 2024-2025 comparing it to the page views of the same students during the online classes. The data was used to compare the level of engagement of online classes compared to in-person classes.

The mean of the test scores gathered from lessons taught online and lessons taught in-person were compared using a dependent t-test to determine whether there is a statistically significant difference between these means.

III. RESULTS

Table 1. ENGGECON AE-203 Student Engagement

ENGGECON AE-203 (46 students)		
	# of students present (In-person)	# of page views in Canvas (Online)
Week 1 (Nov. 25-29)	35	0
Week 2 (Dec. 2-6)	44	0
Week 3 (Dec. 9-13)	44	9
Week 4 (Dec. 16-20)	41	2
Week 5 (Jan. 6-10)	39	10
Week 6 (Jan. 13-17)	42	16
Week 7 (Jan. 20-24)	40	3
Week 8 (Jan. 27-31)	44	11
Week 9 (Feb. 3-7)	44	17
Week 10 (Feb. 10-14)	43	21
Week 11 (Feb. 17-21)	42	0
Week 12 (Mar. 3-7)	41	18

Table 1 shows the engagement of ENGGECON AE-203 students in their in-person and online classes. There are a total of 46 students enrolled in the class. The highest number of students present during in-person classes is 44, while the highest number of page views in Canvas is 21. The null hypothesis is that there is no significant difference between the engagement of in-person and online classes.

Table 2. ENGGECON AE-203 Engagement t-Test: Two-Sample Assuming Unequal Variances

Modality	n	Mean	Standard Deviation	2-tailed test	
				t	Critical value
In-person	12	41.58	2.68	13.71	2.14
Online	12	8.92	7.81		

The engagement of in-person classes has a greater mean compared to the engagement of online classes. This difference is significant because the null hypothesis is rejected, t = 13.71, 13. 71 > 2.14. This shows that the higher engagement of students in in-person classes is significant compared to online classes.

Table 3. ENGGECON AE-203 Student Engagement

ENGGECON AE-204 (47 students)		
	# of students present (In-person)	# of page views in Canvas (Online)
Week 1 (Nov. 25-29)	42	22
Week 2 (Dec. 2-6)	44	46
Week 3 (Dec. 9-13)	36	27
Week 4 (Dec. 16-20)	39	4
Week 5 (Jan. 13-17)	37	25
Week 6 (Jan. 20-24)	37	10
Week 7 (Jan. 27-31)	40	13
Week 8 (Feb. 3-7)	39	26
Week 9 (Feb. 10-14)	38	41
Week 10 (Feb. 17-21)	43	6
Week 11 (Feb. 24-28)	42	7

Table 3 shows the engagement of ENGGECON AE-204 students in their in-person and online classes. There are a total of 47 students enrolled in the class. The highest number of students present during in-person classes is 44, while the highest number of page views in Canvas is 46. The null hypothesis is there is no significant difference between the student engagement of in-person and online classes.

Table 4. ENGGECON AE-204 Engagement t-Test: Two-Sample Assuming Unequal Variances

Modality	n	Mean	Standard Deviation	2-tailed test	
				t	Critical value
In-person	11	39.73	2.69	4.40	2.20
Online	11	7.22	14.13		

The student engagement of in-person classes has a greater mean compared to the engagement of online classes. This difference is significant because the null hypothesis is rejected, t = 4.40, 4.40 > 2.10. This shows that the higher engagement of students in in-person classes is significant compared to online classes.

Table 5. ENGGECON AE-203 Test Scores

Test Score In-person	Test Score Online
80	26
44	36
90	50
100	34
32	24
83	52
70	44
52	50
36	26
58	44
48	36
99	28
24	12
100	36
45	11
100	26
95	36
0	20
74	34
100	32
88	34
28	8

100	36
63	42
63	28
67	52
100	52
49	26
99	34
90	52
59	28
98	24
34	23
90	28
99	28
36	20
90	34
85	36
50	22
8	26
90	28
90	50
64	46
65	28

Table 5 shows the test scores of 44 ENGGECON AE-203 students under topics taught in-person versus topics taught online. The highest score under in-person is 100 and the lowest score is 0. The highest score under online is 52 and the lowest score is 8. The null hypothesis is there is no significant difference between the scores of students taught in-person compared to online.

Table 6. ENGGECON AE-203 Scores t-Test: Two-Sample Assuming Unequal Variances

Modality	n	Mean	Standard Deviation	2-tailed test	
				t	Critical value
In-person	44	68.98	27.94	7.96	2.00
Online	44	32.77	11.36		

The scores of students under topics taught in-person has a greater mean compared to the scores of online classes. This difference is significant because the null hypothesis is rejected, $t = 7.96$, $7.96 > 2.00$. This shows that the higher mean scores of students under topics taught in-person is significant compared to online classes.

Table 7. ENGGECON AE-204 Test Scores

Test Score In-person	Test Score Online
90	20
100	50
8	34
100	74
32	18
99	32
9	20
8	14
62	59
18	8
80	28
49	28
24	90
95	60
96	14
41	28
63	20
15	38
28	18
82	44
9	16
54	32
83	76
12	5
22	14
95	44
86	12
83	52
100	22
67	36
68	12
84	42
45	20
74	31
6	24
60	28
98	68
90	26

Table 7 shows the test scores of 38 ENGGECON AE-204 students under topics taught in-person versus topics taught online. The highest score under in-person is 100 and the lowest score is 6. The highest score under online is 90 and the lowest score is 5. The null hypothesis is there is no

significant difference between the scores of students taught in-person compared to online.

Table 8. ENGGECON AE-204 Scores t-Test: Two-Sample Assuming Unequal Variances

Modality	n	Mean	Standard Deviation	2-tailed test	
				t	Critical value
In-person	38	58.82	33.56	4.03	2.00
Online	38	33.08	20.51		

The scores of students under topics taught in-person has a greater mean compared to the scores of online classes. This difference is significant because the null hypothesis is rejected, t = 4.03, 4.03 > 2.00. This shows that the higher mean scores of students under topics taught in-person is significant compared to online classes.

CONCLUSION

This study compared the academic performance and student engagement under in-person classes versus online classes. The results show that when taking lessons in person as opposed to online, students were more engaged and performed better academically. This supports new research that highlights the advantages of in-person education in promoting cooperation and reliable performance.

For instance, a 2024 study by Znidi et al. compared online and F2F capstone projects in engineering education. The study found that while both modalities achieved comparable learning outcomes, F2F settings significantly enhanced teamwork and collaboration among students. The structured environment of in-person classes facilitated more consistent student performance and engagement [7].

Similarly, Ismael highlighted challenges in online engineering courses, particularly those with hands-on components. Students reported difficulties in collaborating with peers and applying practical skills in a virtual environment. The study recommended incorporating virtual and augmented reality technologies to enhance online hands-on learning experiences [8].

Moreover, employer perceptions reflect these findings. A 2023 Employer Satisfaction Survey revealed that supervisors rated the collaborative skills of face-to-face (F2F)/in-person and hybrid graduates higher than those of online graduates. This suggests that in-person education better prepares students for teamwork and collaboration in professional settings.

Online learning is flexible and accessible, but without integrating other strategies to boost student engagement and instructional efficacy, it would not be able to meet the needs of technical course participants. In order to increase academic achievement, Monash University's approach to online education places a strong emphasis on the value of supportive settings that address mental health and foster resilience [10].

SEA-HAU and other academic institutions should therefore take these findings into account when developing their course delivery strategies. In engineering and architectural disciplines, where application and conceptual understanding are crucial, a mostly in-person model might be more suitable to guarantee the best possible results for students. How online learning might be improved to close the performance and engagement gaps found in this study is a topic that should be investigated further.

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