

Analyzing the Dynamics of Online Instruction and Academic Performance: A Cross-Sectional Study at Tribhuvan University during the COVID-19 Era

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Abstract

This study investigates the academic performance of students receiving online instruction at higher education, TU. Data from 400 master's degree holders at Tribhuvan University who were randomly allocated to three campuses in the Kathmandu Valley and registered in online courses during COVID-19 are analyzed by the study using a cross-sectional survey design. A semi-structured questionnaire was developed to assess the relationship between online teaching and academic achievement. Validated through a pilot study, it used self-reported data and a chi-square test for bivariate analysis, with statistical analysis using SPSS 26 and STATA 14. The study shows a complicated relationship—one that is impacted by instructional design, student characteristics, technology, and instructor support—between online learning variables and academic achievement. It emphasizes the importance of a supportive online environment, highlighting the positive association between online instruction and academic performance. However, it also suggests that time spent and content clarification may not significantly impact academic achievement. The consequences of online learning underscore the necessity of an all-encompassing and cooperative strategy from all parties involved to guarantee its success and efficiency in satisfying the changing requirements of students in the digital era.

Keywords: Online Instruction; Academic Achievement; Higher Education; Technology.

Introduction

Online instruction is a type of learning environment in which teachers and students interact through technology to discuss assignments, go over lectures, and exchange knowledge. Since readings, assignments, and lectures are all provided online, there is no in-person learning. In addition to the self-efficacy of teachers and students, the effectiveness of online learning is dependent upon other factors, such as

attitudes, confidence, monitoring, assessment, and student motivation (Hongsuchon et al., 2022). Similarly, important factors for online learning include digital collaborations, software available for students, a comfortable home environment, interactions between lecturers, and online resources (Darius et al., 2021; Thapa, 2022) offered by the faculty.

The delivery of educational content and instruction via digital platforms and the internet is referred to as online instruction, often known as e-learning or remote education. It is hypothesized that the rise in popularity of this form of instruction in higher education and other learning environments can be attributed to technological developments. However, effectiveness of online instruction is discovered diverse effective size in education. For example, students' academic success is significantly improved by e-learning, according to a meta-analysis of 15 research publications by Mothibi (2015), with a mean effect size of 0.712 (Mothibi, 2015). In a subsequent study, conducted by Springer between 2010 and 2021, the effect of online learning on student achievement across national boundaries was investigated. The study concludes that online learning has a moderate effect on academic achievement (Ulum, 2022). On the other hand, according to a recent Brookings study, students often perform worse on online coursework than on in-person coursework. Students pursuing bachelor's degrees and those with lower academic preparation tend to be more negatively impacted by taking courses online. Additionally, new data from 2020 indicates that lower course completion rates resulted from the pandemic's shift to online learning (Cellini, 2021). These inconsistency results may not be clarified relation of online instruction on academic performance. More studies were necessary to clarify relationships which fulfilled by this study.

The quantifiable results of learning and performance in educational environments are referred to as academic achievement. It includes a range of elements, including grades, test results, assignment completion rates, and general subject-matter proficiency. The virtual world is an extremely effective learning environment that offers users an experience-based approach to learning (Hamdan et al., 2022). It is a paradigm shift instead of face-to-face mode of instruction. Further research was required to gather data on the success of online training in order to determine future planning and program creation.

In this process sometimes teachers and students is to engage and interact through video conferencing or live chats. For effective online instruction, students'

access pre-recorded lectures, discussion forums, and other materials at their own pace, allowing for flexibility. These factors like instructional design, interaction, and student engagement play crucial roles for effective instructions. By proper arranging these factors, online instruction increased academic performance. Otherwise, online instruction might be less fruitful compared to face-to-face instruction.

With the constant advancement of technology, online learning has become a major feature of higher education. It is significant to remember that the efficiency of online learning might differ based on the nation, educational level, and online learning strategies employed (Cellini, 2021; Torun, 2019). In this context, this research aims to investigate the effectiveness of online instruction in fostering academic achievement among students in higher education settings.

Methodology

The study employs a cross sectional survey research design within positivist paradigm, a non-experimental method observing and measuring variables without manipulation. The target demographic includes Tribhuvan University master's degree holders enrolled in online courses during COVID-19. Three campuses: Central campus, Kirtipur, Mahendra Ratna Campus Tahachal, and Sanothimi Campus in the Kathmandu Valley were chosen for the study. Slovin's formula determined a sample size of 400 students and assigned them randomly.

A semi-structure questionnaire was constructed based on research objective after discussing with five lecturers of Tribhuvan University and validated through a pilot study, served as the primary instrument for assessing relation between online teaching and academic achievement. This field study was conducted by researchers after the impact of COVID-19. Necessary data were collected self-reported form. Before the filled out questionnaire, researcher clarified research objectives and importance of respondents' responses and requested to fill out representing ground reality. Through the use of the chi-square test, bivariate analysis investigated the connection between achievement and online instruction. For statistical analysis, SPSS 26 was used for data cleaning, coding, and organization, while STATA 14 was used for analysis.

The overall GPA of the first semester which is measured by the Dean's Office of Tribhuvan University remains an achievement of this study. The average GPA is 3.062125 which are based on the line of this study. It indicates Grade "B" that applies for 60 -69.9%B- and B+ 70-70.9% value in this category. Grade "C" covers the 50-

59.9% and A (A- and A+) covers the 80% and above score as an excellence category. In this study, the achievement is divided into three categories. Socio-demographic presents gender, living with, living place, skill, and participation in training. Similarly, online instructional variables contained time, satisfaction with online instruction, materials selection, content clarification, teacher support, direction, Nature of feedback, and perception of online instruction have remained online instructional variables

Results

Achievement was categorized in three levels and their relation identified through chi-square and descriptive way.

Relationship between Socio-Demographic Variables and Achievement

The Table 1 presents the distribution of respondents based on socio-demographic variables and their corresponding levels of achievement. Girl(Female) have the highest percentage in the "B" achievement category (30.55%), while Boy (male) have the highest percentage in the "A" an achievement category (24%). The chi-square value (2.5474) indicates a moderate association between gender and achievement, but it does not reach statistical significance ($p > 0.05$). Therefore, we cannot confidently assert that gender has a substantial association with academic achievement. There is a slight difference in the distribution of achievement levels between male and female respondents.

Respondents with "Good" skills have the highest percentage in the "B" achievement category (31.95%). The statistically significant association between skill level and achievement underscores the importance of considering students' proficiency levels. Those with "Good" skills have a higher likelihood of achieving better grades. This emphasizes the need for tailored educational interventions and support for students with varying skill levels.

In this study, Table 1 shows that students who resided with friends have acquired better achievements than students who lived with parents and were single. About 57% of students achieved a grade "A" whereas about 21% and 22% of students gained C and below and B grades respectively. Students who were single in the room have gained (26%, 38%, and 35.5% C and below, B, and A respectively) lower achievement in online instruction. However, about 28%, 27.5%, and 44% students who live with parents have achieved C and below, B, and A-grade respectively which is more satisfactory in grade A than single living students. Students who lived with

parents and friends have gained better achievements where caring and sharing are possible during the pandemic period. The statistically significant association between living arrangements and achievement levels is noteworthy. Respondents living with friends tend to have a significantly higher percentage of achieving an "A" grade. This finding prompts further exploration into the potential influence of peer dynamics and support systems on academic success.

Table 1: Distribution of Respondents by Socio-Demographic Variables and Achievement

		Achievement				Total	chi
		Below C	B	A			
Gender	Female	25.45	30.55	44	100	2.5474	
	Male	24	24	52	100		
Living with	Friend	20.83	22.22	56.94	100	13.6345**	
	Parents	28.19	27.52	44.3	100		
	Single	26.17	38.32	35.51	100		
Living place	Room	24.16	28.75	47.09	100	4.4108	
	Flat and house	28.77	27.4	43.84	100		
Skill	Normal	30.3	25.97	43.72	100	8.2811**	
	Good	17.75	31.95	50.3	100		
Participation in	No	23.89	29.3	46.82	100	1.0845	
Training	Yes	29.07	25.58	45.35	100		

Note *= $p < .05$, **= $p < 0.01$, ***= $p < 0.001$

Slightly better achievements (47.09) were gained by room user students than flat and house users (35.5%). Similarly, about one percent of room user students (28.77%) have acquired better academic positions than others (27.4%). On the other hand, 28.77% of flat and house user students have got grade C and below whereas more than four percent of room user students have fewer opportunities (24.16%) to gain a grade C and below position. As researcher expected that living place has no strong relationship with learning than learning materials and motivation. The distribution of achievement levels across different living places does not show a statistically significant association. It implies that the physical living environment (room, flat, or house) may not be a decisive factor in predicting academic

achievement. Other socio-economic factors or individual characteristics play a more substantial role.

In this study, table 1 displays that better skills for online technology have more opportunities to gain more (50%) academic performance and limited skills holders have limited opportunities (43%) for excellency. The least opportunities (17.75%) remained for the low level of academic performance as grade C and below by skill holder participants whereas a higher amount (30.3%) of low achievement was gained by normal skill holders. Similarly, good skill holders have gained more academic achievement as grade B than normal. For instance, better skill holder students in online learning technology have acquired better performance. Relationship between skill and achievement has significant.

Table 1 shows that unexpectedly, students who were not involved in training in online technologies have achieved a slightly better position (46.82% and 29.3% Grade A and B respectively) in academic sectors than students who participated in training program (45.35% and 25.58% grade A and B respectively) for skill development. Online skill development program was not effective for online learning. The lack of statistical significance in the association between participation in training and achievement levels suggests that merely participating in training programs may not be a determining factor in academic success. Further investigation into the nature and effectiveness of the training programs may be warranted.

Relationships between Online Learning Variables and Achievement

Academic success is significantly correlated with instructor effectiveness, online satisfaction, and the type of help teachers provide. In the context of online instruction, there are no observable relationships between achievement and time, choice of resources, support from teachers, task direction, or type of feedback. Table 2 shows that respondents who reported spending "More time" on online learning have a higher percentage in the "A" an achievement category (49.24%). The chi-square value (3.4417) suggests a mild association between time spent and achievement, but it is not statistically significant ($p > 0.05$). While there is a trend suggesting that more time spent on online learning might be associated with higher achievement, the association is not statistically significant. This implies that the quantity of time alone may not be the sole determinant of academic success in an online learning environment.

The satisfaction level with online learning significantly influences academic achievement. Respondents who reported being "Satisfied" have the highest percentage in the "A" achievement category (39.81%). The chi-square value (11.26) is marked with *, indicating a statistically significant association at the 5% significance level. The statistically significant association between online satisfaction and academic achievement is a crucial finding. Students who reported satisfaction with online learning are more likely to achieve higher grades. This underscores the importance of considering and addressing factors that contribute to student satisfaction in the design and delivery of online courses.

Table 2: Distribution of respondents by online learning variables and achievement

		Achievement				χ^2
		Below c	B	A	Total	
Time	More time	22.35	28.41	49.24	100	3.4417
	Little	30.15	28.68	41.18	100	
Online satisfaction	Dissatisfaction	19.4	22.39	58.21	100	11.26*
	Neutral	26.99	31.9	41.1	100	
	Satisfaction	29.13	31.07	39.81	100	
	Teacher reference	26.03	30.14	43.84	100	
Material selection	E Material curriculum	23.45	28.76	47.79	100	0.9437
	reference	27.72	26.73	45.54	100	
Content clarification	Poor	23.08	26.15	50.77	100	3.2263
	Neutral	23.53	26.96	49.51	100	
	Good	27.13	32.56	40.31	100	
Teachers' support	No support	31.82	24.24	43.94	100	2.566
	Little support	23.43	28.45	48.12	100	
	Enough support	24.21	31.58	44.21	100	
Nature of support	Insufficient	22.22	20.11	57.67	100	19.58*
	Sufficient	27.49	36.02	36.49	100	
	Unclear	30.86	30.86	38.27	100	
Direction	Insufficient	24.84	26.75	48.41	100	40206
	Sufficient	22.22	29.01	48.77	100	
Nature of feedback	No feedback	26.8	20.62	52.58	100	17.958
	Individual	24.18	31.87	43.96	100	
	Group	24.53	30.66	44.81	100	
E of teaching	Weak	24.27	25.24	50.49	100	6***
	Neutral	27.14	22.11	50.75	100	
	Good	21.43	44.9	33.67	100	

Table 2 presents that students who searched different types of books, articles, and other types of e-materials (47.79%) have gained better achievement. Students who depend on teacher reference materials have slightly lower (43.84%) performance than students who applied curriculum reference materials (45.54%). Similarly, teachers' reference user students and curriculum reference users about one-fourth of students have a low level of achievement which is greater than the self-searcher holder (23.45%). There is no visible correlation between the material selection process and academic success. This implies that a student's success may not be completely reliant on the source of their learning materials—whether they are electronic or teacher-referenced. There's a chance that other instructional aspects are more significant.

In this study (Table 2), students who perceived that they were not clearly understood online instruction have done to better (50.77%) performed than those who were perceived a clear understanding (40.31%) of content in the online mode of instruction. Neutral perception holders were nearly similar (49.51%) performance to unsatisfied holders. The achievement of students who perceive the content understanding as "good" is also better. However, the results between those who understand the subject content as good and not good are not statistically significant. This suggests that clarity in content delivery is important but not the sole driver of academic success. Other aspects such as labor, materials and tools also have an important place.

Table 2 contains that students who feel that teachers' support was not enough to have gained better (48.12%) academic achievement than those who feel enough support or no support (about 45%). Similarly, enough support holders have better academic performance (31.58%) in grade B than those who feel no support from teachers (24.24%). The level of teachers' support demonstrates a mild association with academic achievement, although not statistically significant. The importance of teacher support is highlighted, and educators should strive to provide adequate support to enhance students' learning experiences.

Table 2 shows that students who clearly understood the direction of the assignment have acquired a higher (48.77% and 29% in grades A and B respectively) whereas similar academic grades were gained in A but slightly fewer students (26.75%) have achieved grade B. Work clarity have better achievement. The direction of learning does not show a significant association with academic achievement. This

suggests that the quantity of direction may not be a key determinant of success. Future research could delve deeper into the qualitative aspects of instructional direction.

Table 2 displays that students who received feedback individually or in groups have gained a similar amount (about 44% and 31% in grades A and B respectively) of academic performance whereas no feedback holder students remained better (52.58%) performance in grades A but a fewer percentage (20%) have remained in grades B. Effect of work clarity or direction was not observed in the academic achievement. There seems to be an error or misreporting in the table related to the nature of feedback. Nonetheless, the importance of feedback in influencing academic achievement is well-established in the literature. Providing timely and constructive feedback is crucial for student learning and success.

Table 2 displays that students whose perceptions were not weak or neutral about online instruction have gained similar (about 51%) performance which is higher than those whose perceptions were good (33.67%). Students' perception and learning achievement have no direct relationship with instruction. Non-positive holder students were gained higher level of achievement. The highly significant association between the effectiveness of teaching and academic achievement underscores the pivotal role of instructional quality. Students who perceive teaching as "Good" are significantly more likely to achieve higher grades. This emphasizes the need for continuous improvement in teaching methodologies in the online learning environment.

Discussions

The results provide a comprehensive picture of the complex relationship between academic accomplishment and other online learning characteristics. The relationship between success and online course instruction has been impacted by a variety of factors, including instructional design, student characteristics, technology, and instructor support. Successful online learning efforts typically employ a comprehensive strategy that considers all of these variables in order to create an environment that fosters academic performance. In this study, online instruction has a significant relationship with academic performance. Similar result was found by Ulum (2022). After conducting a meta-analysis Ulum (2022) found, there is a moderate effect size of online learning on academic success ($g = 0.409$). Educators should prioritize creating a positive and satisfying online learning experience to enhance student achievement. The significant association between online satisfaction and academic achievement is in line with research emphasizing the

importance of learner satisfaction in online education. Satisfied learners are more likely to be engaged and motivated, contributing positively to their academic success. Better academic success was gained by satisfied students from online mode of instruction. Other investigations revealed a consistent result. For instance, Rajabalee and Santally's study from 2021 showed that engagement and happiness had a significant and positive link. Furthermore, there was a slight but significant positive correlation between their level of involvement and overall performance and satisfaction.

Tailored and sufficient support structures, including feedback mechanisms, are crucial for promoting academic success in online education. The highly significant association between the nature of support and academic achievement underscores the critical role of tailored and meaningful support structures in online education. This finding aligns with research emphasizing the importance of personalized support in enhancing student outcomes. As An et al. (2023) explored, the association between perceived teacher support and academic success is mediated by good emotions. On the other hand, a meta-analysis of 71 empirical articles concluded by Tao et al. (2022), after controlling for grade level, teacher support characteristics, and academic performance metrics, we discovered a weak to moderate connection ($r = 0.16$) between perceived teacher support and accomplishment. Only teachers' supports are not observed direct linkage with expected outcomes

Mothibi (2015) found that by significantly improving students' academic performance in e-learning, ICT has a significant favourable impact on students' overall achievement in school. However, this study has the absence of a significant association between e-material selection and academic achievement echoes the findings of previous research that emphasized the importance of content relevance and instructional design over the source of materials. This implies that effective pedagogy may supersede the specific material selection strategy.

The effect of technological proficiency on students' academic achievement is a complex and evolving area of research. Technological proficiency, often referred to as digital literacy or digital competence, encompasses a range of skills related to effectively using and navigating digital tools, platforms, and resources. In this study, skill in technology or proficiency in technology has a notable association with online learning achievement. A similar conclusion was reached by Luna et al. (2016), who investigated the considerable relationship between academic accomplishment and

technological competency. They made it clear that fostering critical thinking and developing new learning possibilities in the classroom require the development of technological ability. It suggests that pupils' academic performance was enhanced by the usage of educational technologies. However, the impact of technological proficiency on academic achievement influenced by various factors, including the quality of technology integration, the digital divide, and instructional design. On the other hand, the lack of statistical significance in the association was observed between time spent on online learning and academic achievement. While time management is crucial, the mere quantity of time may not be the sole predictor of academic success in an online setting. Similarly, the non-significant association between content clarification and achievement aligns with studies suggesting that while clarity in instruction is essential, other factors such as learner engagement and motivation play pivotal roles in academic success. Furthermore, the lack of significance in the association between the direction of learning and academic achievement calls for further exploration. Future research could delve into qualitative aspects of instructional direction, considering factors such as clarity, engagement, and alignment with learning objectives.

Tailored and sufficient support structures, including feedback mechanisms, are crucial for promoting academic success in online education, supporting the principles of community of inquiry frameworks. Continuous efforts should be made to enhance the effectiveness of online teaching practices, considering pedagogical strategies and engagement techniques, consistent with the recommendations of quality online learning frameworks.

Conclusion

The study emphasizes the complex relationship between academic accomplishment and online learning characteristics. Technology, student characteristics, instructor support, and instructional design are important factors that affect this relationship. The results highlight the importance of a thorough plan to establish a positive online learning environment for students to succeed academically. Notably, online instruction has a significant positive association with academic performance. Prioritizing a positive and satisfying online learning experience is crucial, as indicated by the strong association between online satisfaction and academic achievement. Tailored support structures, including feedback mechanisms, play a critical role in promoting academic success in online education. Additionally,

technological proficiency has a notable positive impact on academic achievement. However, factors such as time spent on online learning and content clarification may not have a significant association, emphasizing the need for a nuanced understanding of these variables. Continuous efforts to enhance online teaching practices are essential, considering pedagogical strategies and engagement techniques, to optimize the online learning experience.

Limitations and Future Research

The study's reliance on self-reported data introduces potential biases, and future research could incorporate additional objective measures of online learning engagement and achievement. Similarly, investigating the nuanced aspects of feedback and the direction of learning could provide a more comprehensive understanding of their impact on academic achievement and guide more effective instructional design. Longitudinal studies could explore how these online learning variables influence academic achievement over time, contributing to a deeper understanding of the dynamic nature of online education.

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