

Technology Use and its Effects to Academic Performance

Floria C. Dialde, MA

Faculty, College of Teacher Education, Surigao del Norte State University, Del Carmen, Philippines

Abstract: *This study aimed to determine the perception of senior high school students on the effects of technology use in their academic performance. The study found that students strongly agreed with the positive effects of technology on their ability to research, access educational resources, and participate in online learning opportunities. However, they slightly agreed that technology has increased their motivation to learn and provided more opportunities for personalized learning. On the negative side, students agreed that technology has caused distractions, reduced the quality of their note-taking, and made them more reliant on external sources of information. The study concludes that technology use has both positive and negative effects on student learning, and educators should consider implementing strategies to mitigate negative impacts and leverage positive impacts. Recommendations include encouraging students to use technology as a tool for learning, providing guidelines for technology use in the classroom, investing in technological infrastructure, incorporating technology into lessons, and conducting further research to determine the long-term effects of technology on student learning.*

Keywords: technology use, online learning, academic performance, senior high school

I. INTRODUCTION

With the advent of online learning, technology use in the education industry has grown significantly during the past several years. The usage of online platforms for education has increased as a result of the quick development of technology. Although it is thought that technology use can have a big impact on academic performance, there is still a lot of disagreement over how well it works in both online and in-person learning settings.

According to a meta-analysis conducted by Tamim et al. (2011), there is evidence to suggest that technology can have a positive impact on academic achievement, particularly in science and mathematics. Similarly, a study by Wu et al. (2013) found that the use of technology in teaching can improve academic performance and increase student engagement. However, there are also studies that suggest that technology use can have a negative effect on academic performance. For instance, a study by Wood et al. (2012) found that the use of technology in the classroom can lead to distraction and poor academic performance.

Despite the numerous studies on the impact of technology use on academic performance, there is still much that is unknown. For instance, it is unclear how the use of technology affects academic performance in online learning versus face-to-face learning. Some studies suggest that online learning can be just as effective as face-to-face learning (Bernard et al., 2004; Means et al., 2010), while others suggest that face-to-face learning is more effective (Allen & Seaman, 2014). Therefore, it is important to explore the relationship between technology use and academic performance in both online and face-to-face learning environments.

The purpose of this study is to explore the relationship between technology use and academic performance in online and face-to-face learning. Specifically, we aim to investigate the impact of technology use on academic performance in both settings, and to compare the effectiveness of online learning versus face-to-face learning in terms of academic performance. This research aims to provide insights into the effectiveness of technology use in supporting student academic performance in different learning environments. Additionally, insights gained from this study can inform decisions about the optimal mix of online and face-to-face learning modalities to achieve the best learning outcomes.

II. METHODOLOGY

The methodological processes used to gather the data relevant to the study concerns are covered in this chapter. It provides a description of the research design, study area, sample and sampling technique for the research. The specifics are outlined below.

This study employed a descriptive research approach to determine the effects of technology use on the academic performance of students. Both quantitative and qualitative methods will be employed. It entails gathering quantitative data that is tabulated to describe information category descriptions in a group setting. In the qualitative, it provides a better and deeper understanding of a phenomena that serves as the foundation for a phenomenon-specific investigation.

The study was conducted in Surigao del Norte State University – Del Carmen Campus (SNSU - DC) Purok-6, Brgy. San Jose, Del Carmen Siargao Island, Surigao del Norte Caraga Region, Philippines. SNSU - DC offers Junior High School, Grade 8, 9 and 10, and Senior High School, Grade 11 - STEM and ICT, and Grade 12 - STEM, HE and ICT. The researcher obtained permission from the school administration to conduct the research on their premises, and the research will be conducted during school hours to ensure maximum participation from the respondents

The sample composed of Grade 12 - STEM students from SNSU – DC. The Grade 12 STEM students were chosen as they are at a critical stage in their academic journey, where their academic performance is of utmost importance for their future educational and career goals. Additionally, STEM students are likely to have higher levels of exposure to technology as they are often required to use technology in their coursework.

The primary instruments for this involved the academic records of the students to determine their academic performance. The academic records obtained from the Registrar's office of SNSU - DC. The data includes the students' grades. The academic records were accessed with the permission of the educational institutions and in compliance with their ethical guidelines.

Before accessing the academic records of the students, the researchers obtained informed consent from the participants or their legal guardians, depending on the age of the students. The participants were informed about the purpose of the study, their rights, and how the collected data will be used. The participants will be given the option to decline participation or withdraw at any time during the study. The participants' academic records will be accessed with their consent and kept confidential. The researchers will ensure that the data is securely stored and only accessible to authorized personnel. The participants' identities will be protected by assigning a unique identifier to each participant, and the data will be analyzed anonymously.

The researcher obtained permission from the educational institutions where the participants are enrolled to access their academic records. The researcher collected academic records such as grades from the selected participants' schools and universities. The collected data was securely stored and only accessible to authorized personnel.

Frequency distribution and percentages were used to describe the demographic characteristics of the respondents, such as age, gender.

Mean and standard deviation were used to describe the effects of technology on academic performance of students during full online learning and full face-to-face learning.

The data collected from the survey questionnaire was presented using tables to facilitate the interpretation of the findings. The results will be organized according to the research questions, and the significant findings will be highlighted.

II. REVIEW OF RELATED LITERATURE

The integration of technology in education has transformed the way students learn, and has provided a range of resources to support learning experiences. In recent years, the COVID-19 pandemic has accelerated the adoption of online learning, making it a critical aspect of education. The purpose of this literature review is to examine the relationship between technology use and academic performance in both face-to-face and online learning environments.

A study by McHaney et al. (2012) found that students who used technology extensively in their online learning had a higher grade point average (GPA) compared to those who did not use technology as much. The study also found that technology use increased student engagement and participation in online courses, which positively impacted academic performance. Similarly, a study by El-Deghaidy et al. (2016) found that technology use had a positive impact on

academic performance in online learning. The study revealed that students who used technology for online discussions and online quizzes had better grades than those who did not.

Another study by Hsu and Ching (2020), the use of technology can have a positive impact on academic performance. The study found that students who used technology more frequently had higher GPAs than those who did not. Similarly, a study by Wang and Chen (2020), the use of technology in online learning can positively affect students' engagement and motivation, leading to better academic performance. The study revealed that students who used technology-based learning tools were more likely to engage in the learning process, leading to improved academic performance.

A study by Liao et al. (2019) found that online learning with interactive technologies enhances student learning outcomes. Similarly, a study by Wang and Wu (2020) reported that the use of technology in online learning improves student engagement and academic performance.

According to a study by Zhang et al. (2016), the level of technology acceptance among students is positively correlated with academic performance. This suggests that students who have a positive attitude towards technology are more likely to perform better academically in online learning. A study by Zhang and Li (2020) found that online interaction among students and teachers significantly improved academic performance. Additionally, a study by Hsieh and Cho (2016) reported that peer interaction in online learning improved academic performance.

A study by Kim and Frick (2018) found that students with high levels of digital literacy were more likely to perform better academically in online learning. Similarly, a study by Shen et al. (2020) reported that students' digital literacy skills significantly influenced their academic performance in online learning.

However, there are also studies that suggest that technology use may have a negative effect on academic performance. A study by Li and Ranieri (2020) found that excessive use of technology was associated with lower academic performance. The study found that students who spent more time on social media had lower GPAs than those who spent less time on social media. Similarly, a study by Junco and Cotten (2012) found that students who used Facebook and other social media platforms for non-academic purposes had lower GPAs than those who did not. Additionally, a study by Liu and Liu (2020) found that excessive use of smartphones was negatively related to academic performance.

Another study by Kirschner and Karpinski (2010) found that students who used Facebook while studying had lower grades than those who did not. Similarly, a study by Junco (2012) found that excessive use of Twitter and other social media platforms can lead to lower GPAs.

A study by Kay and LeSage (2016) found that excessive use of technology, particularly smartphones and social media, was negatively related to academic performance among college students. The study surveyed 328 undergraduate students and found that those who reported higher levels of technology use also had lower GPAs.

Another study by Rosen, Carrier, and Cheever (2013) found that technology use during class was associated with lower academic performance among college students. The study surveyed 263 students and found that those who reported using laptops, smartphones, or tablets during class had lower grades than those who did not use technology during class.

However, some studies have found positive effects of technology use on academic performance. For example, a study by Adnan and Anwar (2017) found that the use of educational technology, such as online quizzes and videos, improved the academic performance of college students in face-to-face learning environments. The study surveyed 245 undergraduate students and found that those who did not use educational technology.

Similarly, a study by Lim, So, and Tan (2016) found that the use of a mobile learning platform improved the academic performance of college students in face-to-face learning environments. The study surveyed 66 undergraduate students and found that those who used the mobile learning platform had higher exam scores than those who did not use the platform.

Overall, the literature suggests that technology use can positively impact academic performance in both face-to-face and online learning environments, particularly when it is used appropriately. Technology use can improve engagement, motivation, and participation in learning activities. However, excessive technology use, particularly social media and smartphones, can negatively impact academic performance. Therefore, educators should encourage appropriate technology use and provide guidelines on how to use technology effectively to improve academic performance.

III. RESULTS AND DISCUSSION

The findings of the study are presented and their implications are discussed. The data is presented in the same order as the problems stated in the study objectives.

Table 1. Profile of Respondents in terms of Age

Age	No. of Responses	Relative Frequency
16 years old and below	0	0%
17 years old	8	33.33%
18 years old	15	62.50%
19 years old and above	1	4.17%
TOTAL	24	100.00%

Table 1 presents the profile of respondents in terms of their age. The table shows that the majority of the respondents were 18 years old (15 responses) followed by 17 years old (8 responses), while only one respondent was 19 years old or above. None of the respondents were 16 years old or below. The relative frequency column provides information on the percentage of respondents in each age category relative to the total number of respondents. The highest relative frequency was for 18-year-olds, comprising 62.50% of these total respondents. 17-year-olds had a relative frequency of 33.33%, while respondents aged 19 years old and above had a relative frequency of only 4.17%.

Table 2. Profile of Respondents in terms of Gender

Gender	No. of Responses	Relative Frequency
Male	5	20.83%
Female	19	79.17%
TOTAL	24	100%

Table 2 presents the profile of the respondents in terms of gender. The data indicates that the majority of the respondents were female, with 19 responses (79.17%), while only 5 respondents (20.83%) were male. The total number of respondents in this study was 24. The relative frequency column shows the percentage of respondents in each gender category relative to the total number of respondents. The female respondents had a higher relative frequency of 79.17%, while the male respondents had a lower relative frequency of 20.83%.

Table 3. Profile of Respondents in terms of Strand

Strand	No. of Responses	Relative Frequency
STEM	24	100%
ICT	0	0%
TOTAL	24	100%

Table 3 shows the profile of the respondents in terms of their strand. The data indicates that all 24 respondents belonged to the STEM strand, while none of them belonged to the ICT strand. The total number of respondents in this study was 24. The relative frequency column indicates the percentage of respondents in each strand category relative to the total number of respondents. Since all the respondents belonged to the STEM strand, its relative frequency was 100%, while the relative frequency of the ICT strand was 0%.

Table 4. Profile of Respondents in terms of Grade Point Average during Online Class

Grade	No. of Responses	Relative Frequency
79 and below	0	0%
80-84	0	0%
85-89	13	54.167%
90-94	11	45.833%
95 and above	0	0%
TOTAL	24	100%

Table 4 presents the profile of the respondents in terms of their grade point average (GPA) during online classes. The data shows that the majority of the respondents had a GPA within the range of 85-89 (13 respondents or 54.167%), while 11 respondents (45.833%) had a GPA within the range of 90-94. None of the respondents had a GPA below 79 or above 95.

The relative frequency column provides information on the percentage of respondents in each GPA range relative to the total number of respondents. The highest relative frequency was for the GPA range of 85-89, which comprised 54.167% of the total respondents. The GPA range of 90-94 had a relative frequency of 45.833%, while the GPA ranges of 79 and below and 95 and above had a relative frequency of 0%.

Table 5. Profile of Respondents in terms of Grade Point Average during Full Face-to- Face Class

Grade	No. of Responses	Relative Frequency
79 and below	0	0%
80-84	1	4.167%
85-89	0	0%
90-94	23	95.833%
95 and above	0	0%
TOTAL	24	100%

Table 5 presents the profile of the respondents in terms of their grade point average (GPA) during full face-to-face classes. The data shows that the majority of the respondents had a GPA within the range of 90-94 (23 respondents or 95.833%), while only 1 respondent (4.167%) had a GPA within the range of 80-84. None of the respondents had a GPA below 79 or above 95.

The relative frequency column provides information on the percentage of respondents in each GPA range relative to the total number of respondents. The highest relative frequency was for the GPA range of 90-94, which comprised 95.833% of the total respondents. The GPA range of 80-84 had a relative frequency of 4.167%, while the GPA ranges of 79 and below and 95 and above had a relative frequency of 0%.

Table I. The Mean Distribution for Interpretation of the Ratings

Scale	Parameters	Verbal Interpretation
5	4.46 – 5.00	Strongly Agree
4	3.46 – 4.45	Agree
3	2.46 – 3.45	Slightly Agree
2	1.46 – 2.45	Disagree
1	1.00 – 1.45	Strongly Disagree

TABLE II. EXTENT OF PERCEPTION ON THE EFFECTS OF TECHNOLOGY USE IN THE ACADEMIC PERFORMANCE OF SENIOR HIGH SCHOOL

PERCEPTION ON POSITIVE EFFECT OF TECHNOLOGY USE	Mean	Interpretation
1. Technology has improved my ability to research and gather information.	4.71	Strongly Agree
2. Technology has increased my motivation to learn.	3.38	Slightly Agree
3. Technology has improved my ability to collaborate with classmates.	4.08	Agree
4. Technology has enhanced my communication skills.	3.63	Agree
5. Technology has improved my ability to organize and manage my workload.	3.79	Agree
6. Technology has made it easier for me to access educational resources.	4.58	Strongly Agree
7. Technology has allowed me to participate in online learning opportunities.	4.25	Agree
8. Technology has increased my efficiency in completing assignments.	4.21	Agree
9. Technology has provided me with more opportunities for personalized learning.	3.79	Agree
10. Technology has made it easier for me to stay organized and on task.	3.5	Agree
MEAN AVERAGE	4.05	Agree

PERCEPTION ON NEGATIVE EFFECT OF TECHNOLOGY USE	Mean	Interpretation
1. Technology has caused me to be easily distracted during class.	3.58	Agree
2. Technology has reduced the quality of my note-taking.	3.63	Agree
3. Technology has made me more reliant on external sources of information.	3.63	Agree
4. Technology has increased my procrastination tendencies.	3.75	Agree

5. Technology has made it more difficult for me to concentrate on my work.	3.63	Agree
6. Technology has negatively impacted my ability to retain information.	3.13	Slightly Agree
7. Technology has increased my exposure to distractions while studying.	3.83	Agree
8. Technology has decreased my ability to communicate effectively with others.	3.13	Slightly Agree
9. Technology has increased my likelihood of plagiarism.	3.20	Slightly Agree
10. Technology has negatively impacted my overall academic performance.	2.38	Disagree
MEAN AVERAGE	3.39	Slightly Agree

The data above presents the mean distribution of perceptions on the effects of technology use in the academic performance of senior high school students. The scale used in the study ranges from 1 to 5, where 5 represents "Strongly Agree" and 1 represents "Strongly Disagree."

The results indicate that, on average, the students strongly agreed with the positive effects of technology use on their academic performance. Specifically, they believed that technology has improved their ability to research and gather information (4.71), made it easier for them to access educational resources (4.58), and allowed them to participate in online learning opportunities (4.25).

Furthermore, they agreed that technology has improved their ability to collaborate with classmates (4.08), manage their workload (3.79), and increase their efficiency in completing assignments (4.21). However, they only slightly agreed that technology has increased their motivation to learn (3.38) and provided more opportunities for personalized learning (3.79).

On the other hand, the students also agreed that technology has some negative effects on their academic performance. They believed that technology has caused them to be easily distracted during class (3.58), reduced the quality of their note-taking (3.63), and made them more reliant on external sources of information (3.63). They also agreed that technology has increased their procrastination tendencies (3.75) and exposure to distractions while studying (3.83).

Moreover, the students slightly agreed that technology has negatively impacted their ability to retain information (3.13) and communicate effectively with others (3.13), as well as increased their likelihood of plagiarism (3.20). However, they disagreed that technology has negatively impacted their overall academic performance (2.38).

Overall, the data suggests that technology use has both positive and negative effects on the academic performance of senior high school students. While it has improved their ability to research, collaborate, and manage their workload, it has also increased their exposure to distractions and reliance on external sources of information. Therefore, educators should consider implementing strategies to mitigate the negative effects of technology use and leverage its positive effects on student learning.

IV. CONCLUSION

Technology use has both positive and negative effects on the academic performance of senior high school students. While it can improve their learning experience, it can also have adverse impacts, such as distractions and over-reliance on external sources of information. Educators should consider implementing strategies to mitigate these negative effects and leverage technology's positive impacts on student learning.

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