

Challenges of Online Distance Learning and the Academic Performance in Science Courses of Science Major Students at Ifugao State University-Potia

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Abstract

This study examined the relationship between demographic profile, online distance learning challenges, and the academic performance of science major students at Ifugao State University-Potia Campus. Anchored on E-learning Theory and the Input-Process-Output (IPO) framework, the study employed a descriptive-quantitative and correlational research design. Data were collected from 58 science major students through a structured questionnaire adapted from Froman et al. (2020), which demonstrated good reliability (Cronbach's alpha = 0.867). Descriptive and inferential statistics, including frequency, percentage, mean, t-test, ANOVA, and Pearson correlation, were used to analyze the data. The findings revealed that the respondents were predominantly female, single, younger, and from low-income households, with generally satisfactory academic performance. Students experienced challenges related to online adjustment, personal concerns, adaptation to the new study environment, and instructor-related issues. However, these challenges did not significantly affect their academic performance, indicating that students were able to adapt through available coping mechanisms and support systems. Significant differences in selected online learning challenges were observed across certain demographic characteristics. The study concludes that while science major students successfully maintained satisfactory academic performance despite the challenges of online distance learning, targeted support and engaging instructional strategies remain essential. It recommends strengthening curriculum planning, providing adequate learning resources and student support, and integrating interactive online platforms such as Canva and Kahoot to enhance engagement and learning outcomes. This study supports Sustainable Development Goal (SDG) 4: Quality Education, SDG 9: Industry, Innovation and Infrastructure, and SDG 3: Good Health and Well-Being by promoting effective technology-enhanced instruction, improving learning accessibility, and recognizing the importance of supportive learning environments. The findings contribute to educational, technological, institutional, and community sustainability by providing evidence that can guide the improvement of flexible learning policies and instructional practices in higher education.

Keywords: Academic Performance, Demographic Profile, Online Distance Learning, Science Major Students, Student Engagement, Technology-Enhanced Learning

1. Introduction

The COVID-19 pandemic transformed educational systems worldwide by shifting traditional classroom instruction to online distance learning. Although this modality ensured learning continuity, it also introduced challenges related to technology access, learning environments, student engagement, and academic performance. Previous studies indicate that demographic characteristics and online distance learning influence students' academic outcomes; however, findings remain inconsistent across contexts. This study examines the relationship between demographic profile, online distance learning challenges, and the academic performance of science major students at IFSU-Potia Campus to identify strategies for improving instruction.

1.1 Background of the Study

Distance learning became the primary mode of education during the COVID-19 pandemic, allowing learning despite physical separation between teachers and students (Casey, 2008; Bozkurt, 2019; Florida Center for Instructional Technology, 2009). Students generally showed positive attitudes toward technology-based learning (Rapiq, Hussian, and Abbas, 2020), and e-learning promoted flexibility, learner engagement, and independent learning (Moore et al., 2010; Saifi, 2015; Arkorful and Abaidoo, 2015; Haw et al., 2015; Lawless, 2018; Alyoussef, 2021; Mandasari, 2020). However, studies also reported reduced academic performance, limited interaction, inadequate learning resources, internet connectivity issues, home distractions, and physical and psychological challenges associated with online learning (Dargo, 2021; Gautam, 2020; Hollister et al., 2022; Braden, 2020; Hogle, 2021). Given these opportunities and challenges, understanding how demographic characteristics and online distance learning influence students' academic performance is essential for improving instructional practices among science major students at IFSU-Potia Campus.

1.2 Themes and Insights from Related Literature

Previous studies identified demographic characteristics, socioeconomic status, technology access, and learning environments as major factors influencing academic performance. Research reported mixed findings regarding gender and age, while socioeconomic status, parental support, and access to learning resources consistently contributed to better educational outcomes (Galleb, 2021; Yu, 2021; Kim, 2022; Villanueva, 2020; Christopher & Redempta 2016; Luwes and Swart, 2017). The literature also emphasizes that e-learning and social media enhance collaboration, communication, learner engagement, and knowledge sharing when used appropriately (Abdul et al., 2020; Anderson, 2022; Koruku and Atun, 2017; Sawahel, 2020; Arshavskiy, 2018; Alenezi & Brinthaup, 2021; Sarwar, et al., 2018; Al-Rahni et al., 2015; Saw, 2017; Hassan, 2014; Nkhoma et al., 2015; Al-Dheleai & Tasir, 2017; Lynch, 2017; Means, 2019; Zarzour et. al., 2020; Siemens, 2005; Jomezai et al., 2021; Kop and Hill, 2008; Sozudogru et al., 2019; Greenhow and Chapman, 2020). Conversely, excessive social media use has been associated with lower academic performance, poor concentration, mental health concerns, sleep disturbances, and technology addiction (Azizi et al., 2019; Osharive, 2015; Kolhar et al., 2021; Lennon, 2022; Sherrell, 2021; Stegner, 2021; Nittle, 2021; Whittaker & Kowalski, 2014; Klein, 2021; Sunduquist, 2022; Dalomba, 2022; Brown, 2018; Soffar, 2022). Overall, the literature demonstrates that academic performance in online learning is shaped by demographic characteristics, technological readiness, learning resources, and responsible technology use, providing the foundation for the present study.

1.3 Local, National, and Global Context of Online Distance Learning

Globally, the COVID-19 pandemic forced educational institutions to shift to online distance learning following the declaration of a global pandemic by the World Health Organization (WHO, 2020). Community quarantines and lockdowns disrupted traditional education worldwide (Kaplan, Frias, & McFall-Johnsen, 2020). In the Philippines, the Enhanced Community Quarantine (ECQ) led to the implementation of flexible and distance learning through the Commission on Higher Education (2020) and Department of Education (2020). Despite ensuring educational continuity, the transition exposed challenges including unstable internet connectivity, lack of gadgets and learning resources, limited ICT skills, increased teacher workload, learning distractions, academic dishonesty concerns, and physical and psychological effects on learners (Burgos, 2020; Hernando-Malipot & San Juan, 2020; Jalli, 2020; Agence France-Presse, 2020; Bagayas, 2020; Froman, 2021; Arayata, 2017; Caluza et al., 2017; Pamaran, 2020; Sadeghi, 2019; Bocar & Tizon, 2017; Croft, Dalton, & Grant, 2010; Coronel, 2020; UNICEF Philippines, 2020; Harvard Medical School, 2017; Lissak, 2018; Daneshmandi, Choobineh, Ghaem, & Karimi, 2017; Caromano et al., 2015). To address these challenges, the Philippine government and higher education institutions introduced faculty training, digital learning platforms, and collaborative initiatives to strengthen flexible learning (De Vera, 2020), highlighting the need to evaluate students' readiness and learning environments to improve online learning outcomes.

1.4 Theoretical Basis of Online Distance Learning and Academic Performance

This study is anchored on E-learning Theory, which explains that effective online learning is achieved through well-designed multimedia instruction that combines appropriate audio, visual, and textual elements to reduce cognitive load and improve learning outcomes (Lee & Baskerville, 2018; Mayer, Sweller & Moreno, 2015; Mayer & Moreno, 2003; Moreno & Mayer, 2007). The theory emphasizes that properly designed digital learning environments enhance students' understanding, engagement, and knowledge acquisition. The study also adopts an Input-Process-Output (IPO) framework, where students' demographic profile, online distance learning experiences, and academic performance serve as the inputs; survey administration and statistical analysis comprise the process; and proposed instructional strategies to improve academic performance constitute the output.

1.5 Research Gaps on Demographic Profile, Online Distance Learning, and Academic Performance

Previous studies have examined demographic characteristics, online distance learning, social media use, and academic performance. However, findings remain inconsistent regarding the influence of demographic factors and online learning on students' academic outcomes across different educational settings (Galleb, 2021; Yu, 2021; Christopher & Redempta 2016; Luwes and Swart, 2017). Moreover, limited studies have specifically examined these relationships among science major students in Philippine higher education institutions. This study addresses this gap by investigating how demographic profile and online distance learning challenges relate to the academic performance of science major students at IFSU-Potia Campus, providing a basis for improving instructional practices.

1.6 Alignment with Relevant Sustainable Development Goals (SDGs)

This study aligns with SDG 4 - Quality Education by examining factors that influence students' academic performance and online learning experiences to improve educational quality and accessibility. It also supports SDG 9 - Industry, Innovation and Infrastructure through its emphasis on technology-enhanced learning and SDG 3 - Good Health and Well-Being by recognizing the psychological and physical effects associated with online distance learning.

1.7 Importance of the Study to Multidisciplinary Sustainability

The study contributes to educational sustainability by providing evidence to improve instructional practices and student learning outcomes. It promotes technological sustainability through the effective integration of digital learning platforms and ICT resources, while supporting institutional and community sustainability by informing policies and interventions that strengthen flexible learning and improve the resilience of higher education institutions.

2. Material and methods

2.1 Research Design

The study employed a descriptive quantitative research design using a survey method. It likewise utilized a correlational approach to determine the relationship between online distance learning challenges and the academic performance of science major students.

2.2 Locale of the Study

The study was conducted at Ifugao State University-Potia Campus in Potia, Alfonso Lista, Ifugao. The university is a state higher education institution committed to academic excellence while preserving cultural heritage and strengthening research and innovation. Located in Alfonso Lista, Ifugao, the campus serves students from nearby municipalities and provides an appropriate setting for examining online distance learning among science major students. The findings are expected to benefit students, faculty members, and curriculum planners by providing information that may improve instructional practices and students' academic performance.

2.3 Respondents of the Study

The respondents consisted of 58 science major students enrolled in the College of Education of Ifugao State University-Potia Campus. The participants represented first- to fourth-year students and included both male and female respondents. They were selected because they were directly engaged in online distance learning and were considered appropriate participants for achieving the objectives of the study.

2.4 Sample and Sampling Procedure

The study employed stratified sampling by grouping the student population according to their field of specialization to ensure adequate representation. All 58 science major students comprised the study sample, making the selected respondents representative of the target population.

2.5 Research Instrument

Data were collected using a structured questionnaire adapted from Froman et al. (2020). The instrument measured five dimensions of online distance learning, namely online adjustment, personal issues or concerns, adjustment to a new study environment, issues with instructors, and technology-, internet-, and resource-related concerns. Additional items developed by the researcher measured students' perceived academic performance during online distance learning. The questionnaire underwent expert validation and pilot testing among science major graduates of IFSU-Potia Campus. Reliability analysis using Microsoft Excel and SPSS produced a Cronbach's alpha coefficient of 0.867, indicating good internal consistency based on the criteria of George and Mallery (2003).

2.6 Data Gathering Procedure

Permission to conduct the study was secured from the Dean of the College of Education before administering the questionnaire to the selected respondents. After data collection, the responses and students' grades in science courses were organized, tabulated, analyzed, and interpreted to determine the relationship between online distance learning challenges and academic performance.

2.7 Data Analysis Techniques

Descriptive and inferential statistics were employed to analyze the data. Frequency and percentage were used to describe the respondents' demographic profile, while the mean determined the extent of online distance learning challenges. Pearson correlation examined the relationship between online distance learning challenges and academic performance. The t-test and ANOVA determined significant differences based on respondents' demographic characteristics, whereas Cronbach's alpha assessed the reliability and internal consistency of the research instrument.

3. Results and Discussion

3.1 Demographic Profile and Academic Performance of Science Major Students

3.1.1 Sex

The respondents were predominantly female (81.03%), while males comprised only 18.97% of the sample, indicating that most science major students at IFSU-Potia Campus were female. This finding reflects gender distribution observed in science-related programs. Cheryan, Ziegler, Montoya & Jiang (2017) explained that limited early exposure to science, lower self-efficacy, and a male-dominated culture contribute to gender disparities in STEM fields.

3.1.2 Civil Status

Nearly all respondents were single (96.55%), with only a small proportion being married (3.45%). The predominance of single students suggests fewer family-related responsibilities that may interfere with academic activities. However, married students may encounter additional academic and personal demands that can affect their educational experiences (Raj, Salazar, Jackson, Wyss, McClendon, Khanna, Belayneh & McDougal, 2019; Montazeri, Gharacheh, Mohammadi, Rad & Ardabili, 2016; Peterson, 2015).

3.1.3 Age

More than half of the respondents were 20 years old and below, indicating that the study population was composed mainly of younger students. Younger students may adapt more easily to technology-supported learning because of greater familiarity with digital tools. This finding is consistent with Simonds & Brocks (2014), who reported that younger learners generally have greater confidence in online learning environments.

3.1.4 Economic Status

Most respondents belonged to the low-income group, while only a few were classified as lower middle-class or middle-class. The findings indicate that many students may experience financial constraints that can influence their educational experiences. Salmi (2023) emphasized that financial difficulties reduce students' opportunities to access and complete higher education, while Villarino, Villarino, Temblor, Bernard & Plaisent (2023) reported that socioeconomic status significantly affects students' well-being and academic performance.

3.1.5 Year Level

The respondents were relatively well distributed across all year levels, with first- and second-year students comprising the largest groups. The balanced representation across year levels provides perspectives from students with varying academic experiences and may support collaboration and continuity within the science program.

3.1.6 Academic Performance in Science Courses

Most respondents obtained a GWA of 86-90, indicating generally satisfactory academic performance, while only a few students achieved higher or lower grade ranges. The generally satisfactory academic performance suggests that students were able to maintain acceptable learning outcomes despite the online learning environment. This finding supports Suresh, Vishnu Priya, and Gayathri (2018), who reported that online learning can enhance academic performance. Nevertheless, continuous academic support remains important, as parental guidance and encouragement also contribute significantly to students' academic success (Caasi & Pentang, 2022).

3.2 Challenges Experienced in Online Distance Learning

3.2.1 Online Adjustment

Science major students experienced challenges in adjusting to online distance learning, particularly in adapting to the new class structure, understanding course content, coping with increased academic demands, managing internet connectivity issues, and obtaining adequate academic support. Many students also preferred face-to-face instruction over online classes. These findings indicate that transitioning to online learning required considerable adjustment and affected students' engagement and comprehension. Similar challenges in adapting to virtual instruction and maintaining effective learning were reported by Barrot, Llenares, and del Rosario (2021), Day, Chang, Chung, Doolittle, Housel, and McDaniel (2021), and Khalil, Mansour, Fadda, Almisnid, Aldamegh, Al-Nafeesah, and Al-Wutayd (2020).

3.2.2 Personal Issues or Concerns

Although students generally maintained a balanced school-life relationship, they reported concerns related to motivation, mental health, financial difficulties, and uncertainty about graduation, employment, and academic progress. Family-related concerns were less evident. The findings suggest that while students managed their personal responsibilities reasonably well, concerns about their future remained significant. Kotze & Kleynhans (2014) emphasized that personal issues influence both academic performance and well-being. However, the students' ability to maintain balance supports the findings of Miranda & Cruz (2022), who highlighted students' resilience and adaptability during online learning.

3.2.3 Adjustment to the New Study Environment

Students experienced difficulty concentrating, studying at home, and finding an appropriate learning space. Despite these challenges, they reported being comfortable with electronic communication, actively participating in discussions, and completing academic requirements. The preference for campus-based learning reflects students' desire for face-to-face interaction and a more conducive learning environment, consistent with Nuñez, Barnachea, Gula, Jabagat, and Urbano (2022). Nevertheless, students demonstrated adaptability by actively engaging in online activities, supporting the findings of Tarrayo, Paz, and Gepila (2021) that online learning can promote new learning experiences and greater flexibility.

3.2.4 Issues with Instructors

Students generally reported positive experiences with their instructors, citing clear instructions and adequate technical competence. However, they expressed the need for more consistent instructional approaches and valued face-to-face interaction with instructors. These findings indicate that instructors effectively supported students during online learning, although direct interaction remained important for effective learning. This supports Tsang, So, Chong, Lam, and Chu (2021), who emphasized that effective instructor-student communication is essential for successful online learning and increased student engagement.

4. Conclusion and Recommendations

The study found that science major students at IFSU-Potia Campus were predominantly female, single, younger, and from low-income households, with generally satisfactory academic performance. Although students experienced challenges in online adjustment, personal concerns, adapting to a new study environment, and instructor-related concerns, these challenges did not significantly affect their academic performance, indicating that they were able to adapt through available coping mechanisms and support systems. However, significant differences in online learning challenges were observed across selected demographic characteristics, suggesting the need for targeted interventions. The findings also indicate that interactive online learning platforms can further enhance students' engagement and academic performance in online science courses.

The university should strengthen curriculum planning and adopt interactive instructional approaches, including the use of Canva and Kahoot, to improve students' engagement and academic performance. Orientation programs, regular feedback sessions, adequate learning resources, and clear instructional guidance should be provided to help students adapt to online learning. Targeted support based on students' demographic characteristics should also be implemented to address specific learning needs. Furthermore, future studies should examine the effectiveness of interactive learning platforms and explore the coping mechanisms and support systems that enable students to maintain satisfactory academic performance in online distance learning.

The study was limited to science major students of Ifugao State University-Potia Campus and focused on the relationship between demographic profile, online distance learning challenges, and academic performance. The findings are therefore specific to the respondents and the study setting, limiting their generalizability to other programs, institutions, or student populations. The study also relied on survey responses and measured only the variables included in the research instrument.

Compliance with ethical standards

The author declares no conflict of interest and confirm that this study received no external funding. The authors acknowledge the participation of the science major students and the support of Ifugao State University-Potia Campus in conducting the study. Participation was voluntary, informed consent was obtained from all respondents, and data were collected using a non-invasive survey questionnaire. All information was treated with strict confidentiality, and no identifying personal information was disclosed in the conduct or reporting of the study.

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