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An Analytical Study of The Impact of Online Physical Education Classes on Student Engagement and Performance Post-Pandemic

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Abstract

Physical education (PE), which has historically relied on in-person engagement and physical connection, was one of the areas of education that was profoundly altered by the COVID-19 epidemic. Analysing the effects of online physical education courses on student performance and participation in the post-pandemic setting is the goal of this study. The study uses a quantitative approach with performance records and institutional reports from different schools and institutions, and it only uses secondary data. Data from 25 instructors and 250 students are included in the sample. Changes in theoretical knowledge, physical performance, and engagement patterns were evaluated using descriptive statistical analysis. According to the results, students' theoretical comprehension significantly improved as a result of the flexible online content, but their physical fitness and motor skill execution significantly declined. Furthermore, there were disparities in the levels of involvement; whereas technology tools increased participation, they did not increase motivation for independent exercise. Effectively monitoring, providing feedback, and overseeing online physical education courses presented additional difficulties for instructors. The study concludes that while online platforms made physical education more accessible, a hybrid approach that combines online flexibility with hands-on physical involvement is crucial for the overall efficacy of physical education sessions.

Keywords: Physical Education, Online Learning, Post-Pandemic Education, Student Engagement, Academic Performance.

1. INTRODUCTION

The emergence of the COVID-19 pandemic induced factors that have never been seen before in the global education system, whereby educational institutions were forced to shift and change the education system suddenly, which was based on the traditional classroom learning to the virtual forms of learning. Whereas theoretic and cognitive subjects were relatively easily transferred to an online format, skill-based and practical subjects such as Physical Education (PE) were greatly impaired. PE, in its turn, focuses on physical exercise, coordination, cooperation, and direct communication, which is hard to achieve in the digital format. Such a rapid transition caused critical questions about how effective online PE can be in terms of preserving the physical health of students, their motivation and engagement, and overall performance.

With schools and colleges implementing digital technologies to provide PE content including pre-recorded videos and live fitness classes, mobile fitness apps, and activity tracker software, students have had unequal opportunities to engage, participate, and learn. Online platforms offered more flexibility and convenience but usually did not provide the physical supervision, space, and resources to engage in practice effectively. Learners with varied social-economic statuses faced unequal chances of participation because of the variance in access to technology, space, and equipment at home. Moreover, educators were struggling to track student progress, and offer immediate feedback in real-time, and ensure the same level of engagement through virtual learning environments.

The purpose of the study is the critical analysis of the effects of physical education classes online on student engagement and performance in the post-pandemic environment. It explores the effects that digital PE instruction had on the theoretical knowledge of the students, their physical fitness, performance of skills, and the desire to engage in physical exercises. It also looks at the difficulties experienced by teachers in the transition to online PE instruction and their impact on the quality of instruction. Through the secondary data obtained exclusively through academic records, institutional reports, and instructor feedback, the study offers

evidence-based review of the efficiency and shortcomings of online PE. The results will contribute to shaping the approaches to the development of future PE programs that will be able to take advantage of both digital adaptability and physical contact to guarantee the comprehensive evolution of students.

2. LITERATURE REVIEW

Ng and Lo (2022) studied involving two cycles to explore the pedagogical implications of the sudden transition to online teaching in higher education institutions in China. Their experiment included 76 adult learners, three instructors, and three teaching assistants, which reveals the importance of techno-pedagogical integration to cope with the crisis-prompted change of educational delivery. Their action research had all the characteristics of student disengagement and loss of performance in the initial cycle of the research, replicating the concerns about the long-term viability of fully online instruction expressed worldwide. Nevertheless, when a gamified flipped classroom model was implemented in the second cycle, the engagement of students as well as their performance increased considerably. Upon their results, they have suggested the F.A.C.T.S. framework, Flexibility, All-in-inclusive learning, Competitive learning, Technical support, and Sustainable learning as a systematic way of understanding how effective online pedagogies can be implemented in the present and future education even after the pandemic. The present study highlights the promises of gamification and strategic pedagogical redesign in making online learning effective.

Sharma and Saini (2024) covered the under-researched post-pandemic effects of online learning on student learning and academic performance. They applied a large-scale quantitative research method Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM) to test six major constructs that defined the perceptions and experiences of students regarding e-learning in the post-pandemic era. Their survey-research was carried out on the sample of students of Higher Educational Institutions (HEIs), who had the experience of using digital teaching platforms in the time of the pandemic. The findings of the work stipulated that online learning after the pandemic necessitates a reconsideration of approaches to teaching that would be more in line with the behavioral model and learning demands of students. Sharma and Saini pointed to the increased flexibility of instructional models required and the improved teacher-student interaction to maintain academic performance in a digitally-mediated environment. The contribution of their study to the existing body of knowledge is the provision of a formal and theoretically supported framework of how to optimize online learning not only in the emergency situation (as was the case with the pandemic).

Hendrowati, et al. (2025) undertook a thorough study to investigate the impact of hybrid learning, which is an educational framework that integrates face-to-face and online learning, on engagement and performance of elementary students in science education. The study adopted a mixed-methods design in 20 elementary schools in Lampung Province and revealed that hybrid models produced a significant increase in student engagement due to the increased flexibility and self-pacing of learning. The online elements incorporated into it enabled students to re-access materials and contribute at their own time, thus augmenting independence and decreasing anxiety. Further, the academic scores were significantly higher in subjects that demanded analytical ability and practical investigation. Nevertheless, the research also indicated the existence of long-standing barriers, including unequal access to digital infrastructure and an urgent necessity of professional development among teaching staff to adjust to the hybrid mode of delivery. These results emphasize the value of equal digital opportunity and institutional teacher assistance in the long-term maintenance of hybrid education formats.

Gómez Chacón, et al. (2024) changed the emphasis to physical and psychological impacts of the pandemic on university students. Their research filled an important gap in the literature because it investigated the effect of decreasing levels of physical activity on the psychosocial

strengths of students (namely optimism, self-efficacy, resilience, engagement, and hope). Using the sample of 897 students in two waves (pre-pandemic and during-pandemic), they showed that physically active students received higher marks in these psychological properties even during the stressful situation of the pandemic. Students who were physically active, especially in the COVID-19 phase, demonstrated higher resilience and self-efficacy, highlighting the importance of physical education and guided movement even in online settings. The authors encourage universities to implement physical wellness programs as a way of not only returning to previous levels of physical activity but also building the psychological resilience of students against future disruptions.

3. RESEARCH METHODOLOGY

3.1. Research Design

The research design can be defined as quantitative because the study is purely based on the secondary data to determine the effectiveness of online physical education (PE) classes on student engagement and performance in the post-pandemic environment. This study aims at analyzing the available academic records, institutional reports, and any documentation that can be obtained through educational institutions that offered PE classes online during the COVID-19 pandemic or following it.

3.2. Population and Sample

The desired population in this research consists of students and physical education teachers in different secondary schools and undergraduate colleges, which shifted to online PE courses. Institutions that kept good and detailed records of student performance and engagement throughout the period of online learning were identified using a purposive sampling technique.

- Students sampled: 250
- Instructors: 25

3.3. Data Collection Method

The study data was sourced through institutional databases, such as archival PE classes attendance records, online attendance records, assignment submission records, physical fitness tests data, and theoretical exam scores. The difficulties encountered by the instructors were compiled through documented responses given to the school administrations and internal reports, such that no primary sources were utilized.

3.4. Data Analysis

Descriptive statistics including frequency distribution and percentage analysis were applied to the collected data in order to determine the trends and patterns of student engagement and performance. Theoretical and physical comparative insights on the PE performance were made during the online teaching session. Microsoft Excel was used in all statistical analysis.

4. DATA ANALYSIS AND INTERPRETATION

The following section consists of data analysis and interpretation of the information gathered on the institutional records concerning student engagement and performance in online physical education classes.

4.1. Impact on Academic Performance

The review of academic reports showed ambiguous results of the students attending online PE courses. Theoretical knowledge was enhanced in a part of the cases, but physical performance got worse in a significant number of students.

Table 1: Student Performance in Online PE Classes

Performance Category	Improved (%)	No Change (%)	Declined (%)
Theoretical Knowledge	68%	22%	10%
Physical Fitness Assessment	25%	30%	45%
Skill Execution (Motor Skills)	30%	34%	36%

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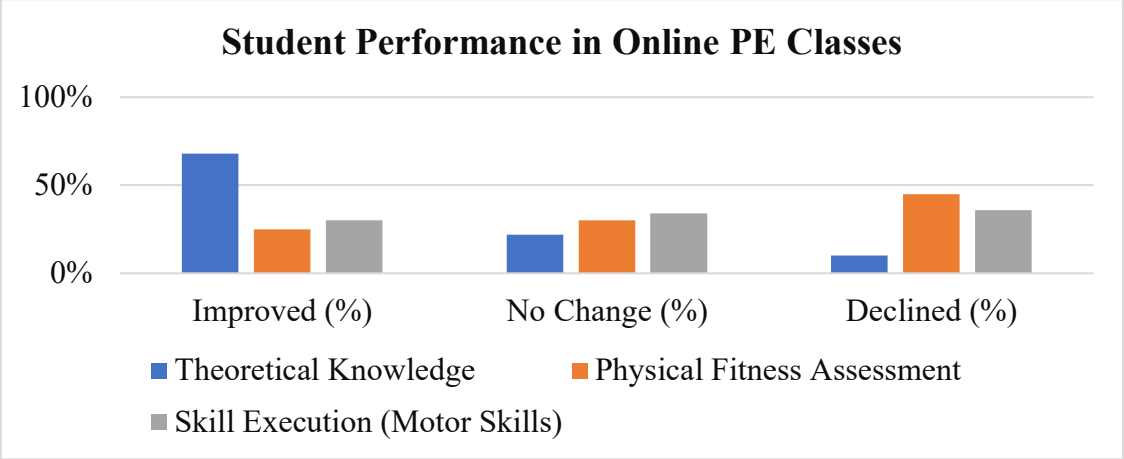

Figure 1: Student Performance in Online PE Classes

As shown in Table 1, there is an evident discrepancy between theoretical and practical work of the students during online physical education (PE) classes. The improvement in theoretical knowledge was observed in a large proportion (68%) of the students and could be explained by the fact that online learning is highly flexible and that the remotely delivered instructional material is easy to access. Yet, the motor skill performance and physical fitness measurement, which are the practical components of PE, did not improve as positively. Fitness improvement was seen in only a quarter of them, with 45 percent showing a decrease, suggesting the difficulties of adhering to physical activity levels without organized, face-to-face oversight. Equally, performance in motor skills deteriorated among 36 percent of the students, as there was less chance of practical assignments, interaction with peers, and immediate feedback of the instructor in real-time. These results indicate that although online PE classes proved efficient in teaching theoretical material, they were not as efficient in maintaining the practical and physical aspects that are critical to physical education.

4.2. Student Engagement Trends

The levels of engagement were different based on the instructional practices, access to space/equipment at home, and access to digital fitness tools.

Table 2: Self-Reported Student Engagement Levels

Engagement Factor	High (%)	Moderate (%)	Low (%)
Interest in PE Assignments	28%	40%	32%
Participation in Live Sessions	36%	44%	20%
Use of Fitness Apps or Trackers	42%	30%	28%
Motivation to Exercise Independently	24%	38%	38%

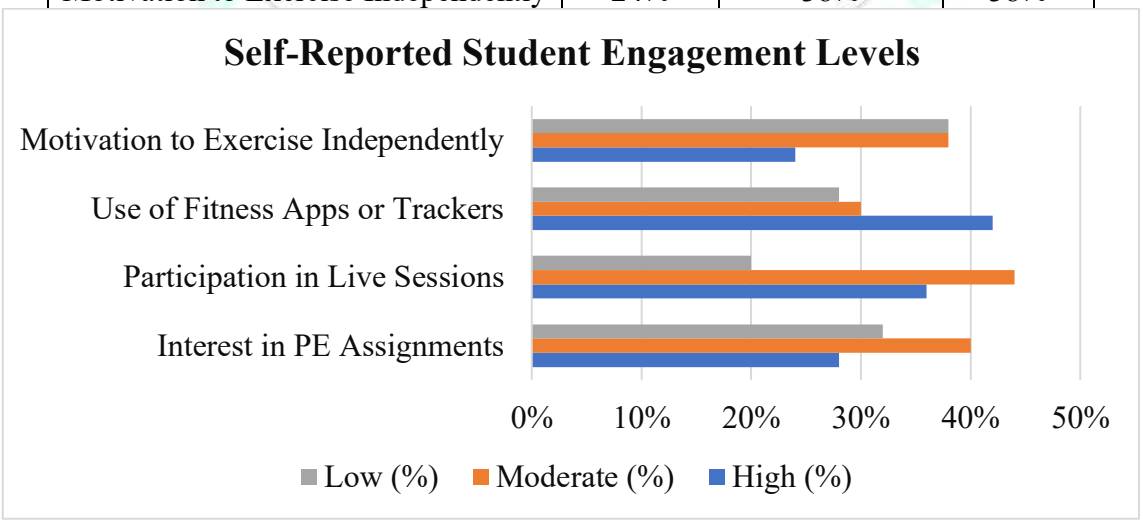

Figure 2: Self-Reported Student Engagement Levels

As shown in Table 2, some factors affected student engagement in online physical education classes, such as digital tools use, instructional practices, and home environments. Use of fitness apps or trackers demonstrated the highest level of engagement, with 42% of students being highly engaged in this behavior, which may indicate that technology had a positive effect in maintaining physical activity. Live session attendance also demonstrated positive findings, as 36% of high and 44% of moderate engagement indicate the significance of real-time communication with tutors. But the interest decreased in case of independent motivation to exercise, with only a quarter of the respondents having high motivation and a considerable 38% having low motivation, meaning that self-discipline and home barriers were important issues. Also, although 40 percent of students were moderately interested in PE assignments, a significant number (32 percent) were lowly interested, which is an indication that more interactive and interesting materials should be introduced. Altogether, these data highlight that despite the possibility of engagement increase with the help of digital tools, intrinsic motivation and appropriate home conditions are still the gaping holes in online PE learning.

4.3. Instructor Challenges and Perceptions

Some barriers that affected the successful conduction of online PE classes by teachers were identified, such as the inability to assess the performance of all students or control participation in the classroom.

Table 3: Instructor-Reported Challenges

Challenge	Reported Frequency (%)
Difficulty Monitoring Student Performance	88%
Lack of Student Participation/Accountability	76%
Increased Preparation Time for Online Content	64%
Technology or Internet Issues	52%
Limited Feedback Mechanisms	60%

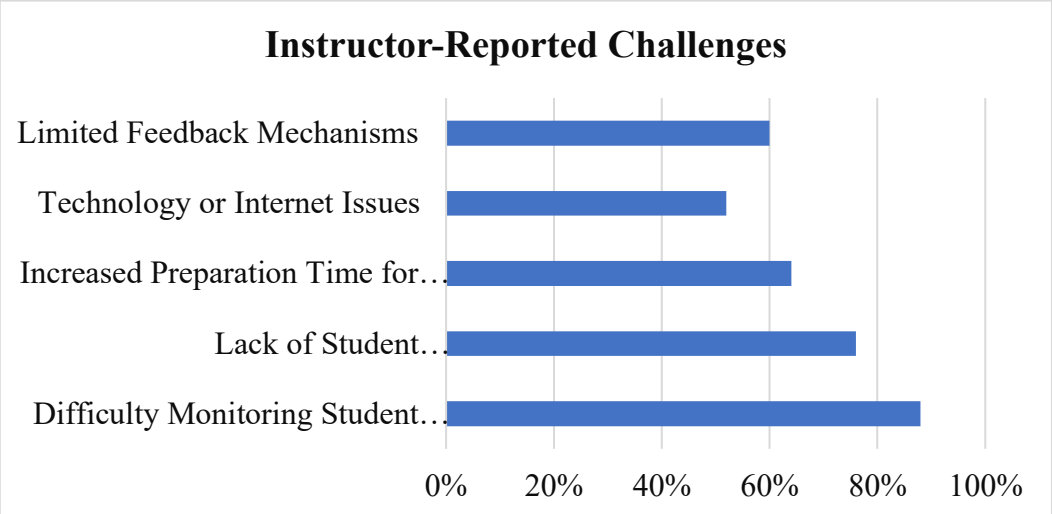

Figure 3: Instructor-Reported Challenges

Table 3 demonstrates the major difficulties encountered by teachers when teaching physical education online. The inability to track the performance of students was the most commonly described problem, with 88 percent of instructors reporting, representing a significant deficiency in assessing practical and skills-oriented tasks in an online environment. The other serious issue was the absence of student engagement and responsibility, which had impacted 76 percent of instructors, meaning that students tended to disengage or lack responsibility when learning online. Also, 64 percent indicated more time spent on preparation, which matches the additional workload to prepare useful digital material related to physical activities. Infrastructural constraints of online-teaching: Technological and internet-related concerns impacted 52 percent of instructors. Finally, 60 percent of teachers noted the existence of

insufficient feedback systems as an obstacle, which interfered with prompt advice and communication. These results emphasize the urgent necessity of stronger and more interactive online platforms dedicated to PE in particular to help instructors keep the engagement and the performance monitoring as well as efficient communication.

5. CONCLUSION

This study concludes that the transition to online physical education (PE) classes during the COVID-19 pandemic and after it affected student learning and engagement in a dual manner. Although the convenience and adaptability of online platforms enhanced theoretical learning in most students, most of the physical aspects of PE, which include motor skill acquisition and fitness, were greatly impaired because of the lack of direct instruction, immediate feedback, and guided spaces. The degree of student engagement was found to be vastly different, and technology tools were found to facilitate the engagement, yet the individual motivation and responsibility were also identified as significant challenges. Instructors were also under significant challenges in preparing contents, monitoring performance and keeping students engaged. These results demonstrate the drawbacks of a completely virtual PE model and emphasize the need to implement a hybrid system that combines the digital convenience with physical lessons taught by a tutor. To be prepared in the future, schools should invest in improved digital infrastructure, interactive platforms, and individual engagement approaches to improve the cognitive and physical outcomes of PE regardless of the learning mode.

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