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Impact of virtual modality on the training of physical education students: A post-pandemic study

Andri Velásquez-Salazar^{1*}, Isolda Vergara-Santiago¹, Ronnie Videla Reyes¹, Valentín Mercado Hernández², Juan Díaz Labrin³, Patricio Anacona Godoy¹

¹University Santo Tomás, CHILE

²School Santa Marta de Coquimbo, CHILE

³University of the Americas, CHILE

ABSTRACT

Background: The educational experience of Physical Education Pedagogy students during virtual learning highlighted structural tensions that significantly affected the quality of the training process. **Aim:** This study analyzed the relationship between class modality and training quality among Physical Education students at a Chilean university after an extended period of virtual classes. **Method:** A non-experimental quantitative approach was used with a correlational scope. The sample included 56 students (35 males and 21 females) who answered a questionnaire, and the data were analyzed using IBM SPSS Statistics software. **Results:** The chi-square test of independence ($\chi^2 (3) = 2.75$, $p = .432$) revealed no significant differences by gender or regarding the return to in-person classes, indicating that students shared similar perceptions. **Conclusion:** The return to in-person learning was perceived by students as a process full of challenges for their professional development.

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INTRODUCTION

The health crisis associated with COVID-19 has been recognized as a global event that has had multiple repercussions in the health, social, and economic spheres (UNESCO, 2020). To contain the spread of the virus, countries implemented control measures, such as suspending activities, mandatory use of face masks, and different types of quarantine (Jojoa et al., 2021). In Chile, a total quarantine was declared in March 2020, which significantly transformed people's routines, habits, and quality of life (Brooks et al., 2020), also affecting physical and mental health, with increased levels of stress, anxiety, and depression (Stanton et al., 2020; Carvacho et al., 2021).

Lockdown measures led to a considerable decrease in physical activity, impacting overall well-being (Sánchez-Encalada et al., 2020). Dietary habits shifted toward higher consumption of sugar- and fat-rich foods, contributing to increased overweight and obesity (Gómez-Paniagua et al., 2023). Lifestyles changed markedly during this period (Chalapud et

al., 2024), and teachers experienced routine disruptions due to increased workloads (Páez et al., 2023).

Physical education (PE) underwent an unexpected transformation, moving from in-person to virtual learning, which created new challenges for students, teachers, and institutions alike (Aguilar, 2023). Experiential learning, as described by Espinar & Vigueras (2020), relies on engaging directly with practical activities, reflecting on experiences, and applying knowledge in authentic contexts, making it difficult to replicate in virtual environments. Experiential Learning Theory (Kolb) explains why practical PE learning is especially challenging to replace with virtual modalities, as hands-on experiences are essential for developing skills and competencies.

The shift to virtual learning also transformed teaching and learning processes. Technological developments required teachers to update their digital skills (López et al., 2020; Soto et al., 2022), and class effectiveness depended largely on implementation (Mocanu et al., 2021). During this period, teachers reported higher levels of stress and anxiety compared to students (Guzmán et al., 2023). Learning spaces changed from classrooms to bedrooms, dining rooms, and other home areas, leading to the loss of classroom dynamics, socialization, teamwork, and exchange of ideas (Sánchez-Encalada et al., 2020). Aguilar (2020) emphasizes that this loss of interaction negatively affects psychological, emotional, and social development.

In the Physical Education degree program, practical teaching during virtual classes posed significant challenges for university lecturers due to the methodology and limited space (Dávila-Morán, 2024). In relation to this, Flores et al. (2020) found that online classes did not meet students' expectations, who valued theoretical classes more than practical ones. The impact of virtual classes affected not only students but also teaching staff (Díaz et al., 2024). Four main challenges of virtual learning were identified: pedagogical, technological, communicative, and individual (Marsollier et al., 2024).

In Chile, returning to in-person education began in March 2022 to mitigate the effects of prolonged virtual learning. This transition brought challenges that affected students' social and emotional well-being (Castillo-Retamal et al., 2023; Monguillot et al., 2023). Considering the strong practical component of the PE degree, virtual learning limitations hindered the development of fundamental professional skills (Villarroel et al., 2021). Questions remain regarding students' experiences during the return to face-to-face learning and how their virtual learning period influenced their perception of educational quality.

Despite the growing body of research on the impacts of the pandemic, there are gaps regarding the specific experience of returning to in-person education in PE programs. Most previous studies have focused on the general effects of the pandemic, such as mental health, lifestyle changes, and adaptation to virtual teaching. At the same time, the particular challenges and perceptions associated with resuming in-person classes remain largely unexplored.

Based on this issue, the following research question was posed: What changes did PE Education students experience when they returned to face-to-face classes after the pandemic? This study aimed to analyze the relationship between teaching modality and students' perception of the quality of education in a PE Education program at a Chilean university. It is hypothesized that there is no significant difference in students' perceived quality of learning, regardless of whether classes are conducted face-to-face or virtually, after the return to in-person education post-pandemic.

METHOD

Research design

A quantitative approach was adopted, which allowed for an objective analysis of data related to the educational experience after returning to face-to-face learning (Gil, 2015). The design was non-experimental and cross-sectional, given that the variables were not deliberately manipulated, and data were collected at a single point (Santana, 2017). At the correlational level, the aim was to identify possible associations between the teaching modality applied during the pandemic and the dimensions of the educational experience.

Participants

The sample consisted of 56 students from the Physical Education Teaching program at a Chilean university, including 35 males and 21 females. Intentional non-probabilistic sampling was used, with the inclusion criterion being that students were in their final year of the program. Due to the small sample size and intentional sampling, the results cannot be generalized to the entire population of Physical Education students, which is inherent to this type of research design. Sociodemographic variables such as age, gender, and academic semester were collected.

Instrument

A 10-item questionnaire designed specifically for this study was administered to assess students' perceptions of educational quality after returning to face-to-face learning. Content validity was established through expert judgment, with experts evaluating each item's relevance, clarity, and consistency. To estimate reliability, a pilot study was conducted with a small group of students from the same program, obtaining a Cronbach's alpha of 0.82, demonstrating adequate internal consistency for application in the final sample.

Procedures

Data collection was carried out in person during scheduled sessions at the university. Participants were informed about the purpose of the study and its voluntary nature. Confidentiality and anonymity were guaranteed, ensuring the data would be used solely for research.

Analysis Plan

The data were analyzed using IBM SPSS Statistics, applying tests of association between variables. The Chi-square test was used to explore the relationships between the dimensions of the training experience and the teaching modality. The test's assumptions were verified, considering that the expected frequencies in the cells were ≥ 5 ; if any cell did not meet this requirement, the results were interpreted cautiously, recognizing the limitations of the small sample size.

Ethical considerations

The rights of participants were protected through informed consent, which detailed the purpose of the research, the voluntary nature of participation, and the confidentiality of data. Although an ethics committee did not evaluate the study, general principles of research involving human subjects were followed, and it is recognized that, according to Chilean law and the Singapore Declaration, these aspects are fundamental in research involving university students.

RESULTS AND DISCUSSION

Results

Table 1. Cross-Tabulation of Students' Perceptions of Learning upon Returning to Face-to-Face Classes by Gender

Back to school	Male	Female	Total	% Total
Very excited	9	5	14	25
Excited	8	5	13	23,2
Neutral	6	6	12	21,4
Concerned	7	2	9	16,1
Very concerned	5	3	8	14,3
Total	35	21	56	100,0

Own elaboration.

Table 1 summarizes students' perceptions regarding the return to face-to-face classes by gender. Overall, responses were mainly positive, although a smaller group expressed concern about the process. The chi-square test of independence ($\chi^2 (4) = 1.72$, $p = .787$) indicated no statistically significant differences between males and females, suggesting that perceptions were similar across genders.

Table 2. Cross-Tabulation of the Experience of Virtual Classes According to Student Gender

Experience	Male	Female	Total	% Total
Very negative	5	4	9	16,1
Negative	12	8	20	35,7
Neutral	4	2	6	10,7
Very Positive	4	3	7	12,5
Positive	10	4	14	25
Total.	35	21	56	100,0

Own elaboration.

Table 2 presents students' perceptions of their virtual class experiences. The predominant response was negative, reflecting widespread dissatisfaction with this modality. The chi-square test indicated no significant differences by gender ($\chi^2 (4) = 1.72$, $p = .787$), suggesting that males and females similarly evaluated virtual learning.

Table 3. Cross-Tabulation of Affected Areas by Year of Study and Gender of Students

Affected Areas	Fourth Year Males	Fourth-year Females	Fifth-year Males	Fifth-year Females	Total	% Total
Interaction-Teachers	2	2	1	1	6	10,7
Interaction-Peers	1	1	2	2	6	10,7
Understanding-Content	5	5	3	3	16	28,6
Motivation	7	1	4	5	17	30,4
Feedback	7	1	3	0	11	19,6
Total	22	10	13	11	56	100,0

Own elaboration.

The results indicate that the main difficulties were concentrated in content comprehension, followed by motivation and feedback, while problems related to peer and teacher interaction were only marginal. The chi-square test did not reveal statistically significant differences between year of study and gender ($\chi^2 (4) = 8.49$, $p = .075$). However, the likelihood ratio suggested a possible association ($p = .035$), which points to a potential influence of academic year on students' perceptions that warrants further investigation.

Table 4. Cross-Tabulation on Personal Strategies Students Use in Virtual Classes According to Gender and Year of Study

Personal Strategy	Fourth-year Males	Fourth-year Females	Fifth-year Males	Fifth-year Females	Total	% Total
Class participation	2	2	1	1	6	10,7
Establishing routines	1	1	2	2	6	10,7
Use of technological resources	5	5	3	3	16	28,6
Gamification	7	1	4	5	17	30,4
Collaborative Work	7	1	3	0	11	19,6
Total	22	10	13	11	56	100,0

Own elaboration.

In relation to the strategies used in virtual classes, technological resources predominated, followed by gamification, while active participation in class and the creation of routines were reported to a lesser extent. The chi-square analysis did not reveal significant differences by gender or year of study ($\chi^2 (4) = 5.02$, $p = .285$), suggesting that these behaviors reflect a typical adaptive pattern in response to the demands of virtual learning.

Discussion

The study results show that the virtual modality significantly impacted the training of Physical Education students, especially in terms of content comprehension, motivation, and feedback. This finding coincides with what has been noted in the literature, which indicates that online teaching in practical programs faces limitations that are difficult to compensate for (Chacón, 2024; Cárcamo-Oyarzún et al., 2021; Mondaca-Fernández et al., 2024). However, unlike these studies, the data reveal that, despite the largely negative perception, students developed adaptive strategies favoring cross-cutting skills such as autonomy and self-management, indicating that virtual learning can have positive effects under certain conditions.

In particular, the intensive use of technological resources and gamification reflects a proactive dimension rarely emphasized in previous literature. In line with Calderón-Hernández et al. (2024), these results support the idea that such practices strengthen intrinsic motivation; furthermore, the findings broaden this perspective by showing that students remained academically engaged despite the difficulties inherent in the virtual context. Complementarily, Videla et al. (2025) argue that pedagogical environments enriched with active methodologies generate significant epistemic niches; our data confirm this relationship, showing that even forced and limited scenarios can stimulate resilience and pedagogical innovation skills. Likewise, López et al. (2021) propose the potential of hybrid models, and the evidence presented here offers additional empirical support, suggesting that the strategic integration of technologies can strengthen practical training without replacing face-to-face components.

Findings related to adaptive strategies and time management show that students perceived concrete opportunities to develop autonomy and cross-curricular skills, even in adverse contexts. This perception coincides with that of Dávila-Morán (2024), who highlights that virtuality can be a stimulus to rethink the teaching of Physical Education from approaches that promote adaptability, technological integration, and critical reflection. Consistently, students gave positive assessments of self-management and time management. Although virtual learning has limitations, it also strengthens essential skills for teacher training (Avendaño et al., 2021).

The return to face-to-face learning elicited mixed reactions: while some students were enthusiastic, others were concerned. This coincides with studies highlighting the importance of socio-emotional support in post-pandemic education (Castillo-Retamal et al., 2023; Monguillot et al., 2023). However, our findings qualify this perspective by showing that face-to-face learning not only satisfies emotional needs but also restores social interaction dynamics, teacher identity building, and practical skill development, aspects that are considered difficult to consolidate in virtual environments (Díaz-Noguera et al., 2022; Lobos et al., 2023). Therefore, the positive assessment of face-to-face learning reflects both individual preferences and structural needs for the comprehensive training of future teachers (Varea et al., 2024; Almonacid-Fierro et al., 2021), which invites universities to rethink their training strategies to respond effectively to the socio-educational requirements of the country (Velásquez et al., 2021).

Implications

The study's results show the urgent need to review the pedagogical models used in emergencies, especially in degree courses with a high practical load, such as Physical Education. Virtuality not only strained the teaching and learning processes but also brought into play the socioemotional dimensions of the students that directly influence their academic performance and professional development.

Research Contribution

This work provides empirical evidence on students' perceptions of their virtual learning experience, specifically regarding return-to-class learning. Its value lies in highlighting key dimensions of virtuality, such as content comprehension, motivation, and pedagogical interaction, from a situated perspective.

Limitations

Among the study's main limitations is the small sample size, restricted to a single higher education institution, which limits the generalization of the findings to other educational contexts. Furthermore, a non-experimental design was used, which, although it allows associations between variables to be established, does not enable causal relationships to be inferred. Another relevant aspect is that the analysis focused exclusively on students' perceptions, which increases the risk of bias associated with subjective instruments and limits the interpretation of results from complementary perspectives. Including other voices, such as teachers' or the analysis of curriculum plans, could have provided a more comprehensive understanding of the phenomenon.

Suggestions

It is recommended that research be developed that incorporates multiple actors in the training process, including the teaching staff and the management team. Comparative studies between institutions with different realities would also be pertinent to identify common patterns and differences in the experience of virtuality.

CONCLUSION

Virtual learning has brought about a significant change in the training of Physical Education students. The results of the study partially confirm the hypotheses put forward: although online education ensured the continuity of the educational process in critical contexts, it also revealed specific gaps, such as limitations in access to resources, difficulties in academic motivation, and varying perceptions of content comprehension. The emotional impact emerged as a critical factor, negatively affecting learning motivation. At the same time, the virtual modality generated opportunities, highlighting the development of autonomy and self-management in some students, which suggests possibilities for the construction of more flexible and adaptive hybrid training scenarios. However, the return to face-to-face learning was perceived as a complex process, which involved significant challenges for consolidating professional skills and the social interaction necessary in teacher training.

AUTHOR CONTRIBUTION STATEMENT

AVS was responsible for the study design, the development and application of the instruments, the manuscript's drafting, and the work's overall coordination. IVS and RVR collaborated in the literature review, contributed to the data collection, and edited the manuscript. VMH contributed to the theoretical foundations' research, the database's development, and the preliminary statistical analysis. JDL and RVR organized the results, prepared the tables and graphs, and reviewed the manuscript. All authors reviewed and approved the final version of the text.

AI DISCLOSURE STATEMENT

While preparing this manuscript, the authors used ChatGPT (OpenAI) exclusively for language editing and proofreading. They also conceptualized, analyzed, interpreted data, and developed content. The authors take full responsibility for the integrity and originality of the work presented.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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