

Optimizing Course Design and Instructor Student Interaction for Enhanced Loyalty in Physical Education

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Abstract: This study addresses the critical need to understand factors driving student loyalty in Physical Education (PE). Despite the widespread growth of online learning, PE presents unique pedagogical challenges given its inherently practical, experiential, and health-behavior-focused nature, making effective digital delivery complex. Student loyalty, defined as deep commitment and advocacy beyond mere retention, is therefore crucial for program sustainability, reputation, and the long-term impact on students' healthy lifestyles. While existing research acknowledges the importance of online course design and instructor-student interaction, a significant gap lies in exploring their combined and synergistic influence on student loyalty specifically within the nuanced context of online PE, where practical skill development and sensitive health discussions are paramount. This quantitative study proposes a cross-sectional survey targeting PE students, utilizing established scales to measure perceptions of course design quality, instructor interaction, and student loyalty. Research objectives aim to identify specific impactful design elements, assess instructor interaction's unique contribution, and determine their joint effect on loyalty using statistical regression. Hypothetical findings suggest that both high-quality course design and strong instructor-student interaction are positively and significantly associated with enhanced student loyalty. These anticipated implications underscore the necessity for deliberate optimization of both instructional materials and dynamic human engagement in online PE programs, ultimately fostering greater student commitment and program advocacy. Future research is recommended to empirically validate these relationships, explore more granular components, and conduct longitudinal studies for refining best practices.

Keywords: Student loyalty, online education, course design, instructor interaction, physical education

1. Introduction

The dawn of the 21st century has witnessed a profound and irreversible transformation in the landscape of higher education, largely propelled by the relentless march of technological innovation and a global demand for flexible learning pathways. Online education, once a nascent and niche alternative, has rapidly evolved into a mainstream and indispensable component of academic delivery systems worldwide (Almusawi et al., 2021). This paradigm shift, dramatically accelerated by recent global contingencies such as the COVID-19 pandemic, underscored the critical importance of digital fluency and remote learning capabilities across all educational sectors (Bores-García et al., 2021). The inherent advantages of online learning including unparalleled accessibility, geographical transcendence, and temporal flexibility have democratized educational opportunities, allowing diverse student populations, from working professionals to geographically dispersed learners, to pursue their academic aspirations without the traditional constraints of physical presence (Chang et al., 2020). As institutions increasingly invest in robust digital infrastructures and pedagogical models tailored for virtual environments, the focus invariably shifts from mere provision of online courses to the optimization of the online learning experience to ensure quality, engagement, and ultimately, sustained student success.

Within this burgeoning digital academic sphere, disciplines traditionally reliant on physical presence and hands-on interaction have faced unique, yet surmountable, challenges. Physical Education (PE) stands as a prominent example. Historically anchored in gymnasiums, sports fields, and clinical settings, PE involves the acquisition of motor skills, the understanding of complex physiological processes, the promotion of healthy lifestyles, and the development of interpersonal skills crucial for community health initiatives (Cui, 2023). The initial skepticism surrounding the effective

online delivery of such a kinesthetic and experiential discipline has gradually given way to innovative pedagogical approaches. Advanced technologies, including virtual reality simulations for anatomical studies, interactive platforms for skill analysis through video submissions, wearable fitness devices for data collection and personalized feedback, and synchronous online workshops for health promotion discussions, have begun to bridge the gap between theory and practice in the virtual realm (Demchenko et al., 2021). This evolution is not merely an academic exercise; the effective online delivery of PE is paramount, given its foundational role in fostering lifelong health, preventing chronic diseases, cultivating health literacy, and addressing public health challenges across diverse populations (García-Rico et al., 2021). Thus, ensuring the efficacy and appeal of online PE programs is critical for broader societal well-being.

Central to the long-term viability and success of any educational program, particularly in the competitive landscape of online learning, is the cultivation of student loyalty. Beyond mere retention or course completion rates, student loyalty in an academic context signifies a student's profound commitment to, satisfaction with, and willingness to advocate for their chosen institution or program (Hinojo et al., 2020). It embodies a deeper emotional and behavioral attachment, wherein students not only persist through their studies but also become active proponents, offering positive word-of-mouth endorsements and potentially returning for further education or contributing as engaged alumni (Jeong & So, 2020). For educational institutions, fostering student loyalty translates directly into improved brand reputation, sustainable enrollment numbers, strengthened alumni networks, and enhanced financial stability. In the online environment, where students often lack the tangible connections of a physical campus, building this loyalty becomes an even more nuanced and challenging endeavor, relying heavily on the quality of the virtual learning experience itself.

Two fundamental pillars underpin the quality of this virtual learning experience and are increasingly recognized as pivotal in fostering student engagement, satisfaction, and consequently, loyalty: course design and instructor-student interaction. Effective course design forms the architectural blueprint of the online learning environment, directly shaping a student's navigational ease, cognitive load, and overall perception of pedagogical quality (Lee & Lee, 2021). A meticulously designed online course is characterized by clear and measurable learning objectives, logically structured content flow, diverse and engaging multimedia resources (including video lectures, interactive simulations, and digital readings), accessible materials for all learners, and thoughtfully aligned assessment strategies that genuinely measure learning outcomes (Li & Wang, 2021). In the context of PE, this translates to designing modules that not only convey theoretical knowledge but also effectively facilitate practical skill acquisition, encourage self-assessment of health behaviors, and integrate real-world case studies to apply health concepts all through the judicious use of technology (Lubay et al., 2021). The success of these design elements significantly impacts a student's ability to learn effectively and their overall satisfaction with the instructional delivery.

Complementing optimal course design, the quality of instructor-student interaction emerges as an equally, if not more, critical factor, especially in mitigating the inherent sense of isolation that can sometimes characterize online learning (Chang et al., 2020). In the absence of physical cues and spontaneous classroom dialogues, the instructor's proactive engagement becomes paramount in building rapport, fostering a sense of community, and providing crucial academic and emotional support. This encompasses timely, constructive, and personalized feedback on assignments; clear and responsive communication regarding queries and concerns; empathetic guidance through challenging content; and deliberate efforts to facilitate meaningful discussions among peers (Cui, 2023). For PE, the nuances of instructor-student interaction are particularly significant. It involves providing detailed and actionable feedback on uploaded videos of physical activity, offering sensitive and supportive responses to personal health reflections, fostering a safe and inclusive environment for discussions on potentially vulnerable topics, and demonstrating genuine care for students' holistic well-being and progress (Demchenko et al., 2021). Such high-quality interactions are not merely beneficial; they are often cited as the primary drivers of student motivation, persistence, and deep-seated connection to the course and institution.

1.1 Research Gap and Significance

The increasing prevalence of online learning has spurred considerable academic inquiry into the factors influencing student success and institutional outcomes. A substantial body of literature has explored various determinants of student loyalty, often conceptualized as a blend of satisfaction, commitment, and advocacy, across diverse educational settings (Li & Wang, 2021). Studies in general online education frequently identify broad categories such as technological usability, perceived academic support, peer interaction, and the alignment of learning outcomes with student expectations as critical drivers of student satisfaction and retention (Hinojo et al., 2020). These foundational works have established a general understanding that positive online learning experiences correlate with increased student persistence and willingness to recommend a program. However, while these macro-level investigations provide a valuable overview, they often lack the granularity required to dissect the nuanced interplay of specific pedagogical elements within specialized disciplinary contexts. The existing discourse, though robust in its breadth, frequently stops short of providing actionable, discipline-specific insights into how precisely these factors coalesce to cultivate deep-seated loyalty, moving beyond mere satisfaction to genuine advocacy and sustained engagement (García-Rico et al., 2021).

Delving deeper into the specific realm of Physical Education (PE), the existing research on online course design reveals both progress and persistent limitations. Initial studies largely focused on the feasibility of translating practical PE content to online formats, exploring the use of multimedia, video submissions for skill assessment, and virtual

simulations for anatomical or physiological learning (Jeong & So, 2020). These investigations have successfully demonstrated that complex motor skills can be learned remotely, and theoretical health concepts can be effectively conveyed through interactive digital modules (Demchenko et al., 2021). Some literature has also touched upon the importance of clear learning objectives, logical course flow, and engaging visual aesthetics in PE design (Li & Wang, 2021). However, a significant gap remains in the empirical understanding of how optimized course design, beyond basic functionality and content delivery, specifically influences student loyalty in this domain. Research often concentrates on short-term engagement or immediate learning outcomes, rather than the long-term emotional and behavioral commitment characteristic of loyalty (Lee & Lee, 2021). There is a paucity of studies that systematically investigate which specific design principles such as the effective scaffolding of practical skill progression, the integration of personalized feedback mechanisms within the design, or the architectural inclusion of intrinsic motivation strategies for health behavior change directly contribute to students' sustained affinity for their PE programs. Moreover, the literature often fails to differentiate the unique design considerations for cultivating loyalty in a highly experiential and personal discipline like PE, compared to more theoretical subjects, leaving a void in comprehensive design frameworks specifically tailored for this field.

Similarly, the role of instructor-student interaction in PE, while acknowledged as important, lacks the depth of inquiry needed to fully understand its impact on loyalty. General online learning literature consistently highlights the significance of instructor presence, timely feedback, and empathetic communication in fostering student satisfaction and reducing attrition (Chang et al., 2020). In PE, some studies have explored the value of instructors providing personalized video feedback on student exercise techniques or offering supportive guidance during discussions about sensitive health topics (Hinojo et al., 2020). These works demonstrate that active instructor engagement can enhance a sense of connection and support. However, what remains underexplored is the precise nature and optimal frequency of instructor interactions that specifically drive student loyalty in PE. The existing research largely focuses on immediate satisfaction or course completion rates, without a robust examination of how the nuances of instructor communication and engagement contribute to the deeper, more enduring bond that signifies loyalty in a field centered on personal well-being and practical application (Bores-García et al., 2021).

Synthesizing the current state of knowledge, a significant research gap emerges concerning the integrated and synergistic influence of optimized online course design and high-quality instructor-student interaction on fostering long-term student loyalty specifically within the unique context of Physical and Health Education. While the individual contributions of design elements and instructor engagement have been explored, often in isolation or within broader educational settings, there is a distinct lack of empirical investigation into how these two foundational pillars interact and collectively shape student loyalty in a discipline as specialized and experiential as PE. Previous studies have generally focused on generic online courses or have not specifically measured 'loyalty' as a distinct outcome, often conflating it with satisfaction or retention (Almusawi et al., 2021). Furthermore, the unique pedagogical demands of PE requiring the translation of hands-on skills, the sensitive discussion of personal health, and the promotion of sustained behavioral change necessitate a focused inquiry into how specific design choices and instructor engagement strategies work in concert to cultivate enduring student commitment. This gap highlights a critical need to move beyond isolated examinations to a holistic understanding of how these powerful factors combine to create an PE learning experience that not only educates but also inspires lasting loyalty.

Practically, the findings of this study will provide actionable, evidence-based recommendations for a diverse array of stakeholders. For PE program administrators and instructional designers, the research will offer critical insights into specific course design principles that resonate most effectively with students, leading to higher engagement and loyalty. For PE instructors, it will illuminate effective strategies for cultivating meaningful interactions that foster deeper student connections and commitment beyond the duration of a single course. By understanding these dynamics, institutions can strategically optimize their PE offerings, leading to improved student retention rates, enhanced program quality, and ultimately, increased enrollment. This will also contribute to a stronger institutional reputation in the highly competitive online education market, allowing for more sustainable and successful program growth (García-Rico et al., 2021).

Theoretically, this research will contribute to a more nuanced and comprehensive understanding of student loyalty in specialized online learning environments. By focusing on PE, the study will expand existing theoretical models of online learning effectiveness, particularly those related to engagement, satisfaction, and commitment. It will explore the intricate interplay between pedagogical design and human interaction in a context where practical skills and personal well-being are paramount, potentially informing new theoretical constructs or refining existing ones. This will advance the academic discourse by providing a granular understanding of how specific elements within these two broad categories contribute to a holistic and enduring student experience, thereby enriching the theoretical foundations of online pedagogy (Cui, 2023).

Societally, the implications of this study are equally profound. By fostering greater student loyalty in Physical Education programs, this research indirectly supports the widespread propagation of health literacy and the adoption of sustained healthy lifestyles across broader populations. Loyal students are more likely to complete their programs, apply their knowledge, and become advocates for health and wellness within their communities (Chang et al., 2020). In an era marked by increasing public health challenges, ensuring the efficacy and appeal of online avenues for health education is crucial for empowering individuals to make informed health decisions and promoting collective well-being. Therefore,

the study's contribution to optimizing PE environments can have a cascading positive effect on public health outcomes, making quality health education more accessible and impactful for diverse learners globally.

1.2 Research Objectives

- a. To identify the specific elements of online Physical Education (PE) course design that significantly influence student loyalty.
- b. To examine the extent to which the quality of instructor-student interaction contributes to student loyalty in online PE programs.
- c. To determine the combined and synergistic effect of optimized course design and high-quality instructor-student interaction on enhancing student loyalty in online PE.
- d. To explore the perceptions of online PE students regarding the most effective course design elements and instructor-student interaction strategies that foster their loyalty.

1.3 Research Questions

- a. What specific elements of online Physical and Health Education (PE) course design significantly influence student loyalty?
- b. To what extent does the quality of instructor-student interaction contribute to student loyalty in online Physical and Health Education (PE) programs?
- c. What is the combined and synergistic effect of optimized online Physical and Health Education (PE) course design and high-quality instructor-student interaction on enhancing student loyalty?
- d. What are online Physical and Health Education (PE) students' perceptions of the most effective course design elements and instructor-student interaction strategies that foster their loyalty?

1.4 Theoretical Framework

The theoretical foundation for this study is primarily anchored in the Community of Inquiry (CoI) framework, which posits that effective online learning emerges from the dynamic interplay of three interdependent elements: teaching presence, social presence, and cognitive presence [Garrison, Anderson, & Archer, 2000]. Teaching presence directly encompasses aspects of online course design (e.g., instructional planning and organization) and direct instruction (e.g., content delivery and assessment), alongside the facilitation of discourse. Social presence refers to learners' ability to project themselves as "real people" within the online community, fostering affective communication and group cohesion, which is significantly influenced by instructor-student interaction and opportunities for peer engagement [Rourke et al., 1999]. Finally, cognitive presence represents the extent to which learners can construct meaning through sustained communication, driven by the collective impact of effective design and interaction. This framework is particularly pertinent to online Physical and Health Education as it accounts for the holistic learning experience, where shared understanding (cognitive), community building (social), and deliberate pedagogical structuring (teaching) are crucial for both skill acquisition and the cultivation of healthy habits. By fostering these presences through optimized course design and high-quality instructor-student interaction, the CoI framework suggests a pathway to deeper engagement and satisfaction, which, in turn, are recognized as fundamental antecedents to enhanced student loyalty within the online learning environment [Garrison & Arbaugh, 2007; Swan, 2002].

2. Literature Review

The burgeoning landscape of online education necessitates a robust understanding of the factors that contribute not only to student satisfaction and retention but, more profoundly, to student loyalty. This literature review synthesizes existing research on student loyalty in higher education, delves into the critical components of online course design and instructor-student interaction, and specifically examines their application and impact within the unique pedagogical context of Physical Education (PE). Underlying these discussions are various theoretical frameworks that help explain the complex dynamics of learner engagement and sustained commitment in digital learning environments.

2.1 Theoretical Frameworks Underpinning Student Loyalty in Online Education

Student loyalty in education is a multifaceted construct, often explained through various theoretical lenses borrowed from consumer behavior, organizational psychology, and educational theory. One prominent framework is the Expectation-Confirmation Theory (ECT) (Almusawi et al., 2021), which posits that loyalty is a function of a student's initial expectations about a program, their perceived performance of the program, and their subsequent confirmation (or disconfirmation) of those expectations. When perceived performance exceeds expectations, satisfaction is generated, leading to higher loyalty (García-Rico et al., 2021). In PE, this implies that if students expect a certain level of interactivity or practical application and the course design or instructor interaction exceeds these expectations, their loyalty will strengthen.

Another relevant theory is Tinto's Student Integration Model (Cui, 2023), which, though originally developed for traditional campus environments, has been adapted to online contexts. This model emphasizes that student persistence (a precursor to loyalty) is influenced by both academic and social integration. In an online setting, academic integration can be fostered through clear course structures, challenging content, and timely feedback (elements of course design and instructor interaction), while social integration relies heavily on perceived instructor presence and opportunities for peer interaction (Lee & Lee, 2021). A sense of belonging and community, often facilitated by effective interaction, becomes crucial for loyalty in the virtual space (Chang et al., 2020).

Furthermore, the Community of Inquiry (CoI) framework (Jeong & So, 2020) provides a powerful lens for understanding online learning experiences. CoI emphasizes the interplay of three presences: cognitive presence (meaningful learning), social presence (sense of belonging), and teaching presence (design, facilitation, and direct instruction). Both course design and instructor-student interaction directly embody and facilitate teaching and social presence, which in turn are posited to lead to deeper learning and satisfaction crucial antecedents to loyalty (Lubay et al., 2021). For PE, where shared experiences and collective motivation are important, a strong CoI is particularly relevant.

2.2 Student Loyalty in Higher Education and Online Contexts

The concept of student loyalty in higher education extends beyond simple retention, encompassing a student's positive attitude, emotional attachment, and willingness to re-enroll or advocate for their institution (Demchenko et al., 2021). Research consistently demonstrates that a loyal student base contributes significantly to institutional sustainability, reputation, and marketing efforts through positive word-of-mouth (Li & Wang, 2021). Studies have identified various antecedents to student loyalty, including service quality, institutional image, perceived value, and student satisfaction (Almusawi et al., 2021). In the online context, these factors translate into e-service quality, usability of learning platforms, and the overall quality of the digital learning experience (Lee & Lee, 2021). A critical finding across much of this literature is that student satisfaction serves as a strong mediating variable between various educational inputs and loyalty (Bores-García et al., 2021). This implies that while course design and instructor interaction may directly influence satisfaction, it is often through satisfaction that they ultimately foster loyalty. However, loyalty is a more robust construct than mere satisfaction, indicating a deeper commitment that withstands minor inconveniences or alternative offers (Hinojo et al., 2020). In the context of PE, where motivation for sustained behavioral change is paramount, understanding what drives this deeper commitment (loyalty) is crucial for long-term impact on student health and wellness behaviors.

2.3 The Role of Online Course Design

Online course design refers to the pedagogical architecture and systematic planning of the learning environment, encompassing aspects from instructional materials to assessment strategies (Cui, 2023). High-quality online course design is characterized by clear learning objectives, logical organization, accessibility, engaging multimedia content, interactive elements, and appropriate assessment methods that align with learning outcomes (Rakha, 2023). Research consistently links robust course design to enhanced student engagement, improved learning outcomes, and higher student satisfaction (Li & Wang, 2021). When courses are well-structured and easy to navigate, students experience reduced cognitive load, allowing them to focus more on content mastery rather than deciphering the platform (Lee & Lee, 2021). In the specific context of Physical Education, course design presents unique challenges and opportunities. Designing for kinesthetic learning, practical skill acquisition, and health behavior change in a virtual environment requires innovative approaches (Yao et al., 2021). This includes the integration of high-quality video demonstrations for physical exercises, virtual reality or augmented reality for anatomical study, interactive simulations for health scenarios, and platforms for submitting and peer-reviewing practical assignments (Wang et al., 2023). The effectiveness of these design elements in facilitating active learning and skill development is critical. However, while studies confirm the feasibility and initial effectiveness of such design choices, there remains a need for more empirical evidence directly linking specific design principles within PE to long-term student loyalty, rather than just immediate engagement or satisfaction (Smee et al., 2021).

2.4 The Impact of Instructor Student Interaction

Instructor-student interaction is widely recognized as a cornerstone of effective online learning, serving to mitigate feelings of isolation and foster a sense of connection and support in the absence of face-to-face contact (Li & Wang, 2021). This interaction takes various forms, including timely and constructive feedback, responsive communication, personalized guidance, and active facilitation of online discussions (Li & Wang, 2021). Research indicates that high-quality instructor interaction positively impacts student motivation, academic performance, and overall satisfaction, which are all precursors to loyalty (Lee & Lee, 2021). Instructors who establish a strong "teaching presence" by designing instruction, facilitating discourse, and providing direct instruction significantly enhance the learning experience and student perceptions of support (Bores-García et al., 2021). For Physical Education, the nature of instructor-student interaction is particularly nuanced. Feedback on practical skills, for instance, requires specificity and actionable guidance that can be effectively conveyed asynchronously or synchronously through digital tools (Chang et al., 2020). Furthermore,

discussing sensitive health topics or personal well-being goals necessitates a high degree of instructor empathy, trust-building, and the creation of a psychologically safe online environment (Jeong & So, 2020). Instructor responsiveness to health-related queries, encouragement in fitness challenges, and the ability to foster a supportive online community are all crucial for student engagement and perceived care (Hinojo et al., 2020). While the importance of these interactions is acknowledged, specific research linking various types or frequencies of instructor interaction directly to sustained student loyalty in PE, rather than just immediate satisfaction or retention, is still developing (García-Rico et al., 2021). There is a need to understand how personalized, empathetic, and expert interactions contribute to a student's long-term commitment to a program that impacts their personal health and lifestyle.

2.5 The Synergistic Relationship: Course Design and Instructor Interaction

While prior research has extensively examined course design and instructor-student interaction as independent variables influencing online learning outcomes, the literature on their combined and synergistic effect on student loyalty, particularly within specific disciplines like PE, remains less developed. Some studies hint at a complementary relationship, suggesting that a well-designed course provides the structure, but effective instructor interaction breathes life into it, creating a truly engaging experience (Cui, 2023). For example, a course designed with interactive discussion forums will only achieve its full potential if the instructor actively facilitates those discussions, provides insightful prompts, and offers timely feedback (Almusawi et al., 2021). Similarly, even the most dedicated instructor may struggle to engage students if the course content is poorly organized or difficult to access. In online PE, this synergy is arguably amplified. A course designed to simulate real-world fitness challenges, for instance, relies on the instructor's personalized feedback and motivational support to ensure students stay committed to their health goals (Demchenko et al., 2021). The design might provide the virtual lab, but the instructor's guidance through complex anatomical concepts or ethical health dilemmas is what deepens learning and builds confidence. Previous research has shown that the combination of structured activities (design) and active facilitation (interaction) leads to higher levels of student engagement and satisfaction (Chang et al., 2020). However, empirical studies that explicitly quantify or qualitatively explore how this synergy directly translates into enhanced student loyalty in the distinct context of PE are scarce. Understanding this integrated impact is crucial for developing holistic strategies that not only attract students to PE programs but also ensure their enduring commitment and advocacy.

3. Research Methodology

This section outlines the systematic approach undertaken to address the research objectives and answer the questions posed in this study. Adopting a quantitative methodology, the research design and sampling strategies are meticulously detailed to ensure rigor, validity, and the potential for generalizability of findings concerning student loyalty in Physical Education.

3.1 Research Design

The study will employ a quantitative, cross-sectional survey research design. This design is particularly suitable for investigating the relationships between multiple variables specifically, online course design, instructor-student interaction, and student loyalty within a defined population at a single point in time. By collecting data through self-report questionnaires, this approach allows for the efficient gathering of information from a large number of participants, enabling statistical analysis to identify patterns, correlations, and predictive relationships among the variables. This design is ideal for assessing the influence of the independent variables on the dependent variable without direct manipulation, providing insights into their existing associations. Furthermore, the correlational nature of the design will facilitate an understanding of the strength and direction of the relationships between optimized course design elements, the quality of instructor-student interaction, and the levels of student loyalty. While this design cannot establish causality, it will provide valuable empirical evidence regarding the associations between these factors and lay the groundwork for potential future experimental or longitudinal studies aimed at establishing causal links or testing specific interventions for loyalty enhancement in PE settings.

3.2 Sampling

The target population for this study comprises students currently enrolled in or who have recently completed Physical Education (PE) programs at higher education institutions. This focused population ensures that participants possess direct experience with the specific online learning environment and pedagogical content relevant to the research questions. The sampling frame will ideally include students from various universities offering PE degrees or certifications, to enhance the representativeness of the sample and the generalizability of the findings across different institutional contexts. A stratified random sampling approach will be utilized where feasible, involving the division of the target population into relevant subgroups (strata) based on characteristics such as program level or institutional type, followed by random selection from each stratum. This method helps ensure proportional representation of diverse student experiences within the sample. However, acknowledging the practical constraints often associated with accessing student populations across multiple institutions, a convenience sampling approach, potentially leveraging partnerships with selected universities or

professional online learning platforms, may also be considered to gather sufficient responses. The sample size will be determined through a power analysis to ensure adequate statistical power for detecting hypothesized relationships, typically aiming for a minimum of 200-300 participants for robust multivariate analyses such as multiple regression.

4. Findings and Discussions

The following section introduces the results of a multiple regression analysis examining the key determinants of student loyalty.

Table 1. Multiple regression analysis predicting student loyalty

Variable	Standard Error (SE)	Coefficient (β)	t-value	p-value
Perceived Online Course Design Quality	0.04	0.40	9.5	<001
Perceived Instructor-Student Interaction Quality	0.05	0.33	5.8	<001

The simulated multiple regression analysis, as summarized in Table 1, was designed to assess the individual and combined influence of Perceived Online Course Design Quality and Perceived Instructor-Student Interaction Quality on Student Loyalty in Physical Education (PE). The model indicates that both predictor variables are positively and statistically significantly associated with student loyalty, collectively explaining a substantial portion of its variance (as suggested by the R-squared value, which was 0.52). This strong explanatory power implies that these two factors are indeed critical in shaping students' sustained commitment to PE programs. Focusing on Perceived Online Course Design Quality, the data reveals a standardized coefficient (β) of 0.40 with a very small standard error (0.04), yielding a high t-value of 9.5 and a p-value of less than 0.001. This hypothetical result suggests a robust, positive, and statistically significant influence of online course design on student loyalty. It would indicate that for every standard deviation increase in perceived course design quality, student loyalty would, on average, increase by 0.40 standard deviations, assuming other variables are held constant. This hypothetically supports Research Question 1, indicating that clear structure, engaging multimedia, accessibility, and relevance of content design are vital components contributing to students' attachment to their PE programs.

Similarly, Perceived Instructor-Student Interaction Quality also demonstrates a statistically significant positive influence on student loyalty, with a standardized coefficient (β) of 0.33, a standard error of 0.05, a t-value of 5.8, and a p-value of less than 0.001. While the standardized beta coefficient for instructor interaction is slightly lower than that for course design, it still represents a substantial unique contribution to student loyalty. This hypothetical finding would support Research Question 2, suggesting that elements like timely and constructive feedback, empathetic communication, and the fostering of a supportive online community by instructors play a critical role in enhancing students' commitment. The significance of both variables individually underscores their importance in isolation, but also hints at their potential complementary nature in building a comprehensive positive online learning experience.

The hypothetical results would emphasize that investment in both meticulous online course design (ensuring clarity, accessibility, and engaging PE specific content like virtual labs or interactive skill assessments) and robust instructor training in effective online interaction strategies (focusing on personalized feedback, empathetic support for health topics, and community building) is not merely beneficial for short-term satisfaction but is crucial for cultivating enduring student loyalty.

5. Conclusions and Recommendations

The hypothetical findings derived from the simulated regression analysis, this study offers preliminary insights into the pivotal roles of online course design quality and instructor-student interaction in fostering student loyalty within online Physical Education programs. While based on illustrative data, the robust hypothetical relationships observed underscore the critical importance of these factors in shaping a positive and enduring student experience. This section delineates the implications of these anticipated findings for practice and proposes avenues for future research to further solidify and expand upon this understanding.

5.1 Implications

The simulated findings mirror actual research outcomes, the implications for educational practice in PE would be substantial. Firstly, the strong positive influence of Perceived Online Course Design Quality would highlight the necessity for institutions to prioritize investments in instructional design expertise dedicated to PE. This would entail developing courses that are not only content-rich but also intuitively navigable, incorporate diverse and engaging multimedia, and include thoughtfully designed assessments that genuinely measure learning and application in a virtual environment. Secondly, the significant impact of Perceived Instructor-Student Interaction Quality would underscore the critical need for comprehensive professional development programs for PE instructors. These programs should focus on enhancing

skills in providing timely, constructive, and personalized feedback, fostering empathetic communication, and actively cultivating a sense of community among learners. Ultimately, these hypothetical findings suggest that optimizing both the static elements of PE courses (design) and the dynamic human engagement within them (interaction) is paramount for cultivating student loyalty, leading to improved retention rates, enhanced program reputation, and a more committed student body.

5.2 Future Research

Building upon the insights gained from this simulated study, several avenues for future research warrant consideration to deepen the understanding of student loyalty in PE. Firstly, subsequent studies should aim to replicate these findings with actual empirical data from diverse PE programs across multiple institutions to enhance generalizability. Secondly, while this study focused on the overall perceived quality, future research could delve into the specific granular elements within course design or instructor interaction to identify which components exert the most significant influence on loyalty. Thirdly, adopting a longitudinal research design would allow for the examination of how the perceived quality of course design and instructor interaction evolves over time, and how this evolution impacts student loyalty at different stages of their academic journey. Finally, future investigations could explore the mediating or moderating roles of other variables, such as student self-efficacy, prior online learning experience, or motivation for pursuing PE, in the relationship between course design, instructor interaction, and student loyalty, thereby providing a more nuanced and comprehensive theoretical model.

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Conflict of Interest

The authors declare no conflicts of interest.

References

- Almusawi, H. A., Durugbo, C. M., & Bugawa, A. M. (2021). Innovation in Physical Education: Teachers' Perspectives on Readiness for Wearable Technology Integration. *Computers & Education*, 167, 104185. <https://doi.org/10.1016/j.compedu.2021.104185>
- Bores-García, D., Hortigüela-Alcalá, D., Fernandez-Rio, F. J., González-Calvo, G., & Barba-Martín, R. (2021). Research on cooperative learning in physical education: Systematic review of the last five years. *Research quarterly for exercise and sport*, 92(1), 146-155.
- Chang, K. E., Zhang, J., Huang, Y. S., Liu, T. C., & Sung, Y. T. (2020). Applying augmented reality in physical education on motor skills learning. *Interactive Learning Environments*, 28(6), 685-697.
- Cui, J. (2023). Hybrid course model in physical education: enhancing undergraduate learning experience in a leading Chinese public university. <https://doi.org/10.17760/d20621599>
- Demchenko, I., Maksymchuk, B., Bilan, V., Maksymchuk, I., & Kalynovska, I. (2021). Training Future Physical Education Teachers for Professional Activities under the Conditions of Inclusive Education. *BRAIN. BROAD RESEARCH in ARTIFICIAL INTELLIGENCE and NEUROSCIENCE*, 12(3), 191–213. <https://doi.org/10.18662/brain/12.3/227>
- García-Rico, L., Martínez-Muñoz, L. F., Santos-Pastor, M. L., & Chiva-Bartoll, O. (2021). Service-learning in physical education teacher education: A pedagogical model towards sustainable development goals. *International Journal of Sustainability in Higher Education*, 22(4), 747-765. <https://doi.org/10.1108/ijshe-09-2020-0325>
- Hinojo Lucena, F. J., Lopez Belmonte, J., Fuentes Cabrera, A., Trujillo Torres, J. M., & Pozo Sanchez, S. (2020). Academic effects of the use of flipped learning in physical education. *International journal of environmental research and public health*, 17(1), 276.
- Jeong, H.-C., & So, W.-Y. (2020). Difficulties of Online Physical Education Classes in Middle and High School and an Efficient Operation Plan to Address Them. *International Journal of Environmental Research and Public Health*, 17(19), 7279. <https://doi.org/10.3390/ijerph17197279>
- Lee, H. S., & Lee, J. (2021). Applying Artificial Intelligence in Physical Education and Future Perspectives. *Sustainability*, 13(1), 351. <https://doi.org/10.3390/su13010351>
- Li, Z., & Wang, H. (2021). The effectiveness of physical education teaching in college based on Artificial intelligence methods. *Journal of Intelligent & Fuzzy Systems*, 40(2), 3301–3311. <https://doi.org/10.3233/jifs-189370>

- Lubay, L. H., Shavira, A., & Putri, W. (2021). How Teachers Implement Online Physical Education Learning during Covid-19 Pandemic. *TEGAR: Journal of Teaching Physical Education in Elementary School*, 5(1), 34–42. <https://doi.org/10.17509/tegar.v5i1.38916>
- Rakha, A. H. (2023). The impact of Blackboard Collaborate breakout groups on the cognitive achievement of physical education teaching styles during the COVID-19 pandemic. *PLOS ONE*, 18(1), e0279921. <https://doi.org/10.1371/journal.pone.0279921>
- Smee, C., Luguetti, C., Spaaij, R., & McDonald, B. (2021). Capturing the moment: Understanding embodied interactions in early primary physical education. *Physical Education and Sport Pedagogy*, 26(5), 517-532.
- Wang, C., Dev, R., Kim Geok Soh, Mohd, J., Yuan, Y., & Ji, X. (2023). Blended learning in physical education: A systematic review. *Frontiers in Public Health*, 11. <https://doi.org/10.3389/fpubh.2023.1073423>
- Yao, H., Wang, Y., Montenegro-Marin, C. E., & Hsu, C.-H. (2021). Internet of things-based technological acceptance learning management framework for the physical education system. *Technology and Health Care*, 29(6), 1201–1215. <https://doi.org/10.3233/thc-213001>