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Perceived effectiveness of digital training programs in physical education: Perspectives of physical education teachers

Khalaf Diabat[1]
Saleh Hammad[2]✉
Ismail Abouddaka[3]


(✉ Corresponding Author)

[1]*Department of Administrative and Financial Sciences, College of Technical Education, Al al-Bayt University, Mafraq 25113, Jordan.*
[1]*Email: diabat.khalaf@aabu.edu.jo*
[2]*Department of Administration and Curriculum, Program of Sports Management and Training, Faculty of Arts and Educational Sciences, Middle East University, Jordan.*
[2]*Email: S.hammad@meu.edu.jo*
[3]*Multidisciplinary Laboratory in Education Sciences and Training Engineering. Sport Science Assessment and Physical Activity Didactic. Normal Higher School (ENS-C), Hassan II University of Casablanca, Morocco.*
[3]*Email: Abouddaka70@gmail.com*

Abstract

Despite the growing integration of digital technologies into school physical education, limited evidence exists regarding teachers' perceptions of digital training programs. This study examined physical education teachers' perceptions of the effectiveness, motivational value, contextual suitability, and overall acceptance of such programs, as well as differences based on sex and school types. A cross-sectional survey design was employed with 287 upper basic physical education teachers from public and private schools. Data were collected using a 16-item questionnaire covering four dimensions. The instrument demonstrated strong reliability, with Cronbach's alpha coefficients ranging from 0.843 to 0.945 (overall $\alpha = 0.911$). Descriptive statistics and independent-samples t-tests were used for data analysis. Results indicated generally low perceptions of digital training programs, with an overall mean score of 2.25 (SD = 0.54). Private school teachers reported significantly more positive perceptions than public school teachers, particularly regarding suitability and general attitudes ($p < 0.001$). Male teachers also reported higher perceptions than female teachers in effectiveness and suitability. The findings suggest that digital training programs are perceived as insufficiently effective in supporting physical education instruction. The study recommends targeted professional development and greater institutional support to enhance the integration of digital technologies into physical education.

Keywords: Digital training programs, Physical education, Teacher perceptions, Technology integration, Instructional effectiveness, Professional development, Digital learning, Educational technology.

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Contents

Contribution of this paper to the literature

This study contributes to the literature by providing empirical evidence from Jordan on physical education teachers' perceptions of digital training programs. It identifies significant differences based on sex and school type and offers practical recommendations for improving professional development and strengthening the integration of educational technology in physical education.

1. Introduction

Teachers' utilization of digital tools in the area of physical education is generally viewed through the lens of the Technology Acceptance Model (TAM), which proposes that perceived usefulness and ease of use are primary predictors of technology adoption (Davis, 1989). Self-Determination Theory (SDT) further explains teachers' motivation to engage with digital tools, emphasizing autonomy, competence, and relatedness as key factors in fostering supportive learning and professional development environments (Deci & Ryan, 2000). The TPACK framework highlights the integration of technological, pedagogical, and content knowledge to effectively design and implement digital resources aligned with learning outcomes in physical education (Mishra & Koehler, 2006; Sullivan, Wintle, Campbell, & Roberts, 2024). Recent literature indicates that digital technologies such as video feedback systems, wearable devices, and online learning platforms can enhance teaching effectiveness in physical education by supporting feedback, skill acquisition, and student engagement (Harding, Fajardo, & Berenguer, 2021). However, most empirical studies rely on self-reported questionnaire data, which limits the ability to establish causal relationships between technology use and learning outcomes (Sullivan et al., 2024).

In addition, many existing instruments measuring TAM and TPACK are not fully adapted to the embodied and movement-based nature of physical education (Liu, 2013; Sullivan et al., 2024). Furthermore, the literature shows a lack of methodological diversity, with limited use of mixed-methods designs that combine perception measures with observational or performance-based indicators (Harding et al., 2021; Liu, 2013). Evidence also suggests that contextual factors such as institutional support, teacher motivation, and access to professional development significantly influence technology integration in education (Gasaymeh, Al-Hasanat, Kraishan, & Abutayeh, 2017). Research in physical education technology is still dominated by studies from Western contexts, with limited representation from Arab and developing countries, despite increasing digital adoption in these regions (Harding et al., 2021). Previous studies in Jordan on ICT integration in education were conducted before the widespread adoption of mobile and cloud-based technologies, limiting their relevance to current practices (Al-Zaidiyeen, Mei, & Fook, 2010).

Overall, existing research indicates that successful integration of digital tools in physical education depends not only on technology availability but also on teacher competencies, motivation, and sustained professional development (De Souza Júnior, de Oliveira, & de Araújo, 2022; Sullivan et al., 2024). However, there remains a clear gap in understanding how Jordanian upper basic physical education teachers perceive the effectiveness of digital training programs, particularly across different school types and teacher characteristics.

Therefore, the present study aims to examine the perceived effectiveness of digital training programs among Jordanian upper basic physical education teachers and to investigate differences based on teacher sex and school type, in order to provide context-specific evidence for improving technology integration in physical education.

2. Review of Literature

2.1. Theoretical Foundations of Technology Use in Physical Education

The adoption and use of digital technologies in physical education (PE) can be explained through several established theoretical frameworks. The Technology Acceptance Model (TAM) posits that perceived usefulness and ease of use are key determinants of technology adoption among teachers (Davis, 1989). In the context of PE, these perceptions influence the extent to which teachers integrate digital tools into instructional practices.

Self-Determination Theory (SDT) further explains the motivational aspects of technology integration by emphasizing autonomy, competence, and relatedness as essential psychological needs that support sustained engagement with professional development and pedagogical innovation (Deci & Ryan, 2000). Similarly, the Technological Pedagogical Content Knowledge (TPACK) framework highlights the importance of integrating technological knowledge with pedagogical strategies and content expertise to ensure effective instructional design in PE settings (Mishra & Koehler, 2006; Sullivan et al., 2024).

2.2. Digital Technologies in Physical Education

Recent literature indicates that digital technologies such as video feedback systems, wearable devices, and online learning platforms can enhance teaching and learning processes in physical education. These tools support skill acquisition, provide immediate feedback, and improve student engagement when used within structured pedagogical frameworks (Harding et al., 2021).

However, despite these potential benefits, the effectiveness of digital tools depends largely on teachers' pedagogical decisions and contextual readiness. Many studies emphasize that technology alone does not guarantee improved learning outcomes unless it is integrated meaningfully into teaching practice (Sullivan et al., 2024).

2.3. Measurement and Methodological Issues in Previous Research

Most empirical studies on technology integration in PE rely heavily on self-reported questionnaire data, particularly within TAM and TPACK-based research designs. While these instruments provide valuable insights into teacher perceptions, they are limited in their ability to establish causal relationships between technology use and student learning outcomes (Sullivan et al., 2024).

Additionally, existing measurement tools are often adapted from general education contexts and may not fully capture the embodied, movement-based nature of physical education, which requires context-specific validation (Liu, 2013; Sullivan et al., 2024).

2.4. Contextual and Institutional Factors

Research shows that technology integration in education is influenced by multiple contextual factors, including institutional support, access to resources, teacher motivation, and availability of professional development opportunities (Gasaymeh et al., 2017). These factors are particularly important in practice-based subjects such as physical education, where implementation requires both technical and pedagogical adaptation.

Studies also suggest that differences in school environments, such as between public and private institutions, may affect teachers' access to training and resources, thereby influencing their perceptions and use of digital technologies.

2.5. Geographic and Contextual Gaps in the Literature

A significant portion of the existing literature on educational technology in PE is dominated by research from Western and European contexts, with limited representation from Arab and developing countries (Harding et al., 2021). This creates a gap in understanding how digital training programs are perceived and implemented in different cultural and educational settings.

In Jordan, previous studies on ICT integration in education were conducted before the widespread adoption of mobile and cloud-based technologies, making their findings less applicable to current digital learning environments (Al-Zaidiyeen et al., 2010). As a result, there is a need for updated empirical evidence that reflects current technological realities in schools.

2.6. Summary of Literature and Research Gap

Overall, the literature suggests that successful integration of digital technologies in physical education depends on a combination of teacher competencies, motivational factors, institutional support, and sustained professional development. However, there remains a lack of empirical research focusing specifically on Jordanian upper basic PE teachers' perceptions of digital training programs.

Furthermore, limited attention has been given to examining how these perceptions vary according to teacher characteristics such as sex and school type. Addressing these gaps is essential for informing context-sensitive strategies to improve the effectiveness of digital training programs in physical education.

3. Materials and Methods

The present study employed a descriptive cross-sectional analytical design to examine upper basic physical education teachers' perceptions of the perceived effectiveness of digital training programs in physical education instruction and to investigate differences according to selected demographic variables.

3.1. Population and Sampling

The target population comprised all physical education teachers teaching the upper basic stage (Grades 8–10) in public and private schools across Irbid Governorate during the 2025/2026 academic year. The total population was estimated at N = 800 teachers.

To determine the minimum required sample size, G*Power software was used based on an alpha level of 0.05, statistical power of 0.80, and a medium effect size, resulting in a minimum recommended sample of 226 participants. To increase statistical precision and to ensure sufficient representation of subgroups, a total of 287 teachers were recruited through a proportionate convenience sampling method with regard to having similar representation between public and private schools.

Table 1. Demographic characteristics of the study participants (N = 287)

Variables	Category	Frequency	Percentage (%)
Sex	Male	257	89.5
	Female	30	10.5
	Total	287	100
School Sector	Public	197	68.6
	Private	90	31.4
	Total	287	100

Table 1 presents the demographic characteristics of the study participants. The sample consisted of 287 physical education teachers, of whom 257 (89.5%) were male, and 30 (10.5%) were female. Regarding the school sector, 197 participants (68.6%) were employed in public schools, whereas 90 participants (31.4%) were employed in private schools.

3.2. Research Instrument

The instruments used in this study to evaluate teachers' attitudes toward the utilization of digital learning and game-based educational technologies in physical education were based on the frameworks provided by Camacho-Sánchez, Manzano-León, Rodríguez-Ferrer, Serna, and Lavega-Burgués (2023) However, we adapted the items on

the instruments to fit both the context of physical education as well as the relevant local education system, while still maintaining the same conceptual arrangement of each of the original scales.

The final questionnaire consisted of two sections.

1. Demographic Information: sex and school sector.
2. Perception Scale: 16 items distributed across four subscales.

- Effectiveness of Digital Programs in Motor Learning (Items 1–4).
- Interaction and Motivation (Items 5–8).
- Suitability of Digital Programs for Students (Items 9–12).
- General Attitudes toward the Use of Digital Programs (Items 13–16).

Respondents provided answers using a 5-point Likert scaling method, with point values of 'very great extent', 'great extent', 'somewhat', 'little extent', or 'not at all'. The researcher used the following cutoffs for interpreting mean scores through three classifications (high, moderate, and low), which were determined with intervals of equal length.

$$\text{Interval Length} = \frac{\text{Maximum value (5)} - \text{Minimum value (1)}}{\text{Number of levels (3)}} = 1.33 \quad (1)$$

Accordingly, the classification thresholds were established as:

Table 2. Criteria for interpreting mean scores used in the study.

Mean range	Level
1.00 – 2.33	Low
2.34 – 3.67	Moderate
3.68 – 5.00	High

Table 2 presents the criteria used for interpreting the mean scores in the present study. The mean values were classified into three levels: low (1.00–2.33), moderate (2.34–3.67), and high (3.68–5.00). This classification was used to determine the level of participants' responses across the study variables.

3.3. Validity of the Instrument

To establish the content validity of the instrument, a number of experts were used to evaluate. The instrument was sent out for review by a panel of ten faculty from various university faculties and ranks that specialize in curriculum and methods of instruction within physical education. All experts were asked to review each item for clarity, the items' alignment with the objectives of the study, and the relevance of each item to the designated subscale. Experts' feedback was utilized to make necessary changes to improve the clarity and conceptual representation of the items, thus establishing an acceptable level of content validity for the instrument.

To determine construct validity, Pearson correlation coefficients were calculated between each item and the corresponding subscale total score for each item using data collected from a sample of 38 individuals. These correlations between items and subscales produce a measurement of how accurately each item measures the specific construct it is intended to assess.

Table 3. Subscale construct validity coefficients for the physical education teachers' perceptions questionnaire — Pilot sample (n = 38).

Subscale No.	Effectiveness of digital programs in motor learning	Interaction & motivation	Suitability of digital programs for students	General Attitudes toward Use of Digital Programs
1	0.844**	0.861**	0.921**	0.936**
2	0.855**	0.863**	0.910**	0.835**
3	0.863**	0.764**	0.912**	0.959**
4	0.907**	0.810**	0.975**	0.874**

Note: ** Correlation is significant at the 0.01 level (two-tailed).

As shown in Table 3, all item-to-subscale correlations were significant at $p < .01$. The lowest correlation was found between Item 3 and the Interaction and Motivation subscale with an r value of .764; however, this still indicates a strong and reasonable relationship. Based on these results, it is clear that all items represent their respective constructs in a satisfactory manner.

Table 4. Subscale-Level construct validity coefficients for the physical education teachers' perceptions questionnaire — Pilot sample (n = 38).

Subscale	Correlation coefficient
Effectiveness of Digital Programs in Motor Learning	0.506**
Interaction and Motivation	0.618**
Suitability of Digital Programs for Students	0.911**
General Attitudes toward Use of Digital Programs	0.882**

Note: ** Correlation is significant at the 0.01 level (two-tailed).

Each subscale's correlation to the overall scale is illustrated in Table 4. The Effectiveness of Digital Programs in Motor Learning subscale had the lowest correlation ($r = 0.506$) while remaining statistically significant (and thus acceptable), indicating that each subscale has made a real contribution to the construct in question.

To assess internal consistency reliability of the instrument, Cronbach's alpha coefficient was utilized; the instrument had an overall reliability of $\alpha = 0.911$, indicating the instrument has a high degree of internal consistency. Reliability coefficients for all subscales are presented in Table 5.

Table 5. Internal consistency reliability (Cronbach's Alpha) for the physical education teachers' perceptions questionnaire — Pilot sample (n = 38).

Subscale	No. of Items	Cronbach's Alpha
Effectiveness of Digital Programs in Motor Learning	4	0.887
Interaction and Motivation	4	0.843
Suitability of Digital Programs for Students	4	0.945
General Attitudes toward Use of Digital Programs	4	0.923
Overall Scale	16	0.911

Table 5 displays the reliability coefficients for each of the subscales. They have all exceeded the minimum threshold of $\alpha = 0.70$ (Nunnally & Bernstein, 1994) with a range of coefficients from 0.843 to 0.945. Additionally, the overall Cronbach's alpha of .911 provides further support for the internal consistency of the instrument and demonstrates that it is appropriate to use in the primary study.

3.4. Study Variables

Digital training programs were viewed as the independent variable for this study and demographic independent variables were included as sex (male or female) and whether they work in the public or private sector of schools. Teachers from the upper basic stage of physical education will be viewed as the dependent variable in terms of their perception of digital training program effectiveness.

3.5. Study Procedures

This research study utilized a system of organized and structured procedures to complete its research goals. The first step was to conduct a thorough review of educational literature and studies relevant to the research question to identify the theoretical framework and to create a tool to collect data. The selected tool will be created through the adaptation of previously validated instruments. However, the previously validated instruments will be adapted to reflect the current research study's goals and the context of physical education.

The next step was for the newly created tool to be submitted to a panel of physical education experts (professional educators), curriculum designers, and instructors in order to assess the instrument's content validity. The feedback from the panel will be taken into consideration, and the appropriate modifications will be made to the created tool.

Once the instrument was modified and refined, a pilot study was conducted with a sample of 38 individuals selected from the target population, but not included in the main study sample, to evaluate the clarity of the wording and items used in the created tool as well as the overall functionality of the tool.

Finally, the final version of the questionnaire will be electronically distributed to all individuals in the main study sample. After the data has been collected, the participants' responses will be coded, entered into a statistical program (SPSS), and analyzed.

3.6. Data Analysis

The Statistical Package for the Social Sciences (SPSS) analyzed the participating subjects' survey data by using descriptive statistics established by calculating the means and standard deviations of participants' responses, while also providing an overview of how the data were distributed for each study variable. In addition to conducting an independent samples t-test to evaluate potential response differences based on each participant's sex and school sector, Cronbach's alpha coefficients were used to assess the internal consistency reliability of the research instrument. Lastly, to obtain adequate statistical power for the analyses, G*Power software assisted the researchers in establishing the minimum necessary sample size from a potential study population.

4. Results

4.1. Descriptive Statistics

Table 6. Mean score levels of physical education teachers' perception subscales regarding the effectiveness of digital training programs — Ranked in descending order (N = 287).

Subscale	Mean (M)	Standard Deviation	Perception Level
Interaction and Motivation	2.27	0.67	Low
Effectiveness of Digital Programs in Motor Learning	2.26	0.68	Low
General Attitudes toward the Use of Digital Programs	2.25	0.77	Low
Suitability of Digital Programs for Students	2.23	0.87	Low
Overall Perception Score	2.25	0.54	Low

Note: Mean score classification thresholds: 1.00–2.33 = Low; 2.34–3.67 = Moderate; 3.68–5.00 = High.

Table 6 presents multiple subscale results that all indicated low levels of perceived effectiveness of digital training programs among physical education teachers. The highest mean score was observed for the Interaction and Motivation subscale (M = 2.27, SD = 0.67) followed by Mean Effective Digital Programs in Motor Learning (M = 2.26, SD = 0.68), Mean General Attitudes Towards the Use of Digital Programs (M = 2.25, SD = 0.77), and Mean Suitability of Digital Programs for Students (M = 2.23, SD = 0.87).

Overall, the total mean perception score was 2.25 (SD = 0.54), indicating a low level of perceived effectiveness across all dimensions, so the digital training programs are viewed negatively / poorly as compared to traditional physical education training.

Table 7. Independent samples t-test results for differences in physical education teachers' perceptions of digital training program effectiveness according to sex (N = 287).

Subscale	Sex	n	M	SD	t	p
Effectiveness of Digital Programs in Motor Learning	Male	257	2.29	0.68	2.167	0.031*
	Female	30	2.01	0.58		
Interaction and Motivation	Male	257	2.25	0.69	0.937	0.349
	Female	30	2.38	0.52		
Suitability of Digital Programs for Students	Male	257	2.29	0.8	3.6	0.01**
	Female	30	1.7	1.19		
General Attitudes toward the Use of Digital Programs	Male	257	2.25	0.78	0.03	0.976
	Female	30	2.24	0.74		
Overall Perception Score	Male	257	2.27	0.52	1.833	0.068
	Female	30	2.08	0.63		

Note: * $p < 0.05$ ** $p < 0.01$.

As shown in Table 7, statistically significant differences were found among male teachers in the Effectiveness of Digital Programs in Motor Learning ($t = 2.167$, $p = 0.031$) and Suitability of Digital Programs for Students ($t = 3.600$, $p < 0.01$). However, no statistically significant differences were observed in Interaction and Motivation ($p = 0.349$), General Attitudes ($p = 0.976$), or the Overall Perception Score ($p = 0.068$).

Table 8. Independent samples t-test results for differences in physical education teachers' perceptions of digital training program effectiveness according to school sector (N = 287).

Subscale	School Sector	n	M	SD	t	p
Effectiveness of Digital Programs in Motor Learning	Public	197	2.25	0.64	0.527	0.599
	Private	90	2.29	0.75		
Interaction and Motivation	Public	197	2.23	0.61	1.291	0.198
	Private	90	2.34	0.79		
Suitability of Digital Programs for Students	Public	197	2.11	0.78	3.531	.000**
	Private	90	2.49	0.99		
General Attitudes toward the Use of Digital Programs	Public	197	2.12	0.6	4.127	.000**
	Private	90	2.52	1		
Overall Perception Score	Public	197	2.18	0.5	3.49	.000**
	Private	90	2.41	0.58		

Note: ** $p < 0.01$.

As presented in Table 8, no statistically significant differences were found between public and private school teachers in the Effectiveness of Digital Programs in Motor Learning or Interaction and Motivation. There are statistically significant differences; however, there were statistically significant differences in favor of teachers from private schools in the areas of (1) Suitability of Digital Programs for Students, (2) General Attitudes About Using Digital Programs, and (3) Overall Perception Score ($p < 0.01$).

5. Discussion

Teachers across all four subcategories have a very low mean, which suggests they view the Digital Training Programs to be only marginally useful. This observation has been replicated in global surveys of how technology is used in Physical Education (Korcz et al., 2021; Marttinen, Landi, Fredrick, & Silverman, 2020). Incredibly, a large body of experimental evidence suggests that mobile-based lessons and lessons delivered using an app can increase the amount of Moderate to Vigorous Intensity Physical Activity (MVPA), as well as self-efficacy and enjoyment from being active, when these types of technology are integrated into the curriculum, instead of being implemented as an add-on (Gilbert et al., 2023; Lee & Gao, 2020). The systematic reviews and meta-analyses show many positive impacts when using digital tools for student learning when incorporating digital tools that reflect educational goals and also require game-based instruction, rather than if they are just digitising current drills (Camacho-Sánchez et al., 2023; Manninen, Magrum, Campbell, & Belton, 2025).

The low scores on effectiveness, motivation, and suitability all indicate that the potential value of education technology is found to be conditional, context-specific, and also dependent on how well a teacher can design and present an education application (Moller, Sousa, Lee, Alon, & Lu, 2023; Saucedo-Araujo, Chillón, Pérez-López, & Barranco-Ruiz, 2020). The disparities seen in teacher gender and private school sectors reinforce research indicating that structural factors in access to resources (including physical infrastructure), experience with technology (including support), and expectations regarding creative solutions from leaders are correlated with a teacher's willingness to engage in digital innovation (Calderón & Tannehill, 2021; Marttinen et al., 2020). Although these barriers exist with regard to structures, they are ultimately working together under the Technology Acceptance Model (TAM) framework. The perceived usefulness and ease of use are important factors for creating behavioural intentions to accept new educational technologies (Davis, Bagozzi, & Warshaw, 1989).

While many thought that the disruptions from COVID-19 would lead to a long-lasting digital transformation of physical education, mean scores continue to be very low among the different dimensions measured, which points to a return to more traditional, technique-based methods of teaching after the pandemic (D'Agostino, Urtel, Webster, McMullen, & Culp, 2021; Jeong & So, 2020). This pattern of results runs counter to previously held concepts and expectations regarding how emergency remote teaching would have normalised online platforms, exergames, and hybrid formats into routine components of quality curricula. Thereby suggesting that for a large proportion of teachers, their experiences of digital solutions have been as a short-term fix rather than a long-term improvement (Calderón & Tannehill, 2021; Korcz et al., 2021). A second tension arises from the fairly neutral ratings for motivation and interaction. This contrasts greatly with meta-analytic research that demonstrates improvement in both affective responses as well as perceived competence when using game-based approaches within tactical or student-centred frameworks (Camacho-Sánchez et al., 2023; Manninen et al., 2025).

The explanation that is at first surprising to some people argues that the manner in which the students use available digital tools may lead to local digital programs being focused on demonstration, error-free copying, and (teacher) control over the use of program features. Therefore, local digital programs could potentially negate the motivationally-enhancing features of self-determination theory to provide students with more autonomy (Bureau, Howard, Chong, & Guay, 2022; Deci & Ryan, 2000). In the manner in which these types of digital media are used, they can tend to be another way to perpetuate a controlling instructional environment. Thus, the primary psychological needs of autonomy, competence, and relatedness are thwarted, even though these types of tools appear to be modern in nature (Bureau et al., 2022; Deci & Ryan, 2000). The existing results of this study suggest a need for further thought with respect to a new learning environment where digitalisation might not necessarily mean learner-centred learning, but will instead work dialectically with pre-existing teacher beliefs, curriculum requirements, and accountability mechanisms (Isgren, Alatalo, Nyberg, & Backman, 2023; Lander, Lewis, Nahavandi, Amsbury, & Barnett, 2022).

The focus of this research is on upper basic stage teachers from a non-Western governorate because the majority of previous research has sampled from European and North American countries. Therefore, it will provide a unique comparison to the growing research being produced in China and Korea about online and/or hybrid physical education (Jeong & So, 2020; Yan, Malkin, Smith, Morgan, & Eather, 2024). This spread-out geographic diversity is not just a descriptive characteristic of culture; it also demonstrates that different cultural norms associated with face-to-face teaching and evaluating students, as well as expectations by parents regarding their children's performance, create significant political and professional risks for implementing technology-based methods of teaching, regardless of the evidence for their effectiveness from other cultures (Song & Cheong, 2024; Yan et al., 2024). Using a multidimensional, psychometrically solid modified version of previous digital learning measurement scales permits an improved ability to differentiate used material to support perceived motor learning, motivational effect of material, suitability of material in context, and general attitudes toward material (Camacho-Sánchez et al., 2023; Lee & Gao, 2020).

High levels of internal consistency and adequate construct validity indices increase confidence that the low observed mean values are indicative of true attitude hesitancy rather than measurement artefacts, although cross-sectional designs still limit the ability to make strong causal inferences regarding the experiential drivers behind attitudes (Saucedo-Araujo et al., 2020). The integration of sex and sector as shaping variables goes further than earlier studies in that they combined teachers into one sample, even though it is evident that digital assets, workload and training options differ significantly from one group to another (Calderón & Tannehill, 2021; Marttinen et al., 2020). In conclusion, placing these results at the crossroads of theoretical research on acceptance of technology, need supportive pedagogies and policy-driven curricular changes, provides a more detailed explanation framework than those derived from a singular theory account, thus allowing for development of multi-level interventions that will be sensitive to local circumstances as well as theoretically or conceptually meaningful (Davis, 1989; Deci & Ryan, 2000).

Bringing together these similarities and differences, a new explanatory model is suggested that teachers' use of online training programs is limited by both their perception of pedagogical usefulness, as well as by the support provided for the teachers to work within the environment, and by satisfying their basic psychological needs. And not just by being technically proficient (Bureau et al., 2022; Davis, 1989). In practice, this means that professional development should focus on co-design workshops where teachers are transforming currently existing curricular units into either videogame or hybrid lessons through an iterative process and are also analysing the impact of current methods of assessment, time allocation, and size of classes on inhibiting innovative teaching practices (Calderón & Tannehill, 2021; Isgren et al., 2023). Providing scaffolding for autonomy, relatedness, and competence is established for both students and teachers. Despite limited resources, embedding digital tools within tactical, health-oriented, and inquiry-based units will progressively redefine these tools as facilitators of meaningful movement experiences (Manninen et al., 2025; Moller et al., 2023).

Future work needs to focus on research using multiple time points and incorporate different methods to connect changes in attitude with instructional practices, student motor skills, cognition, and psychosocial outcomes (D'Agostino et al., 2021; Yan et al., 2024). Studies utilizing mixed methodologies, such as ecological observations from the classroom, digital traces, and in-depth interviews, are ideally suited to capture the implicit influences on the lived experience of teaching with technology in physical education due to institutional culture, regulations related to accountability, and community expectations (Saucedo-Araujo et al., 2020; Song & Cheong, 2024). Eventually, this type of evidence may help produce context-specific implementation frameworks for digitalisation that take the form of negotiated and iterative processes embedded in larger agendas for equitable, health-promoting education (Jeong & So, 2020; Korcz et al., 2021).

6. Conclusion

The results of the study indicate that teachers who provide physical education at the upper level perceive the impact of digital training programmes to be generally low across all dimensions assessed, including support for motor learning, interaction and motivation, developmentally appropriate for students and overall level of use. A consistently low average score supports the view that digital training is currently on the outside edge of daily pedagogical practice rather than being a central mechanism for creating instructional innovation in physical education. Gender and school type differences among teachers serve to indicate that access to resources and structural issues associated with institutional expectations and professional socialization patterns have a significant impact on how effectively teachers utilise digital resources in their teaching.

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Appendix 1. Physical education teachers' responses on digital training programs (means, standard deviations, and levels).

Item No.	Item	M	SD	Level
Overall Score — General Attitudes toward the Use of Digital Programs		2.25	0.77	Low
1	Digital training programs help to demonstrate motor skills more effectively than traditional instruction	2.36	0.92	Moderate
2	Digital programs assist me in conveying and sequencing the steps of motor performance to students	2.34	0.87	Moderate
4	Digital training programs contribute to improving the quality of learning in physical education classes	2.2	0.94	Low
3	I find that using digital programs facilitates the learning of various sports skills for students	2.14	0.88	Low
Overall Score — Effectiveness of Digital Programs in Motor Learning		2.26	0.68	Low
4	Digital programs help increase my interaction with students and the surrounding environment during class	2.47	0.86	Moderate
1	Digital training programs increase students' motivation to participate in physical education classes	2.23	0.82	Low
3	Digital training programs make physical education classes more enjoyable and engaging	2.2	0.8	Low
2	I feel that learners show enthusiasm when using digital programs while learning sports skills	2.17	0.87	Low
Overall Score — Interaction and Motivation		2.27	0.67	Low
1	Digital training programs are appropriate for students' age and academic and motor level	2.43	1	Moderate

Item No.	Item	M	SD	Level
2	Students can use digital training programs with ease and without difficulty	2.2	0.96	Low
4	I believe digital programs are suitable for teaching physical education in schools	2.17	1.07	Low
3	I feel that digital programs accommodate individual differences among students in the skill learning process	2.12	1.11	Low
Overall Score — Suitability of Digital Programs for Students		2.23	0.87	Low
2	I believe that digital programs contribute to developing physical education teaching methods	2.38	0.9	Moderate
1	I prefer using digital training programs alongside traditional methods in physical education	2.28	0.98	Low
3	I wish to continue using digital training programs in physical education classes	2.21	0.96	Low
4	I recommend the widespread adoption of digital training programs in schools	2.12	0.99	Low

Appendix 1 presents physical education teachers' responses to the digital training programs questionnaire, including the means, standard deviations, and corresponding levels for each item and dimension. Overall, the results indicate predominantly low perceptions regarding digital training programs. The overall scores for the dimensions of effectiveness of digital programs in motor learning (M = 2.26), interaction and motivation (M = 2.27), suitability of digital programs for students (M = 2.23), and general attitudes toward the use of digital programs (M = 2.25) were all classified as low. Only a limited number of individual items reached a moderate level, suggesting that teachers generally perceive digital training programs as having limited effectiveness in supporting physical education instruction.