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Digital Competencies of Physical Education Teachers in Blended Learning: Current Status, Training Needs, and Adoption Obstacles in Algeria

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Abstract:
This study aimed to assess the current digital competencies, training needs, and implementation obstacles among Physical Education teachers in Algeria within blended learning environments, using the European Framework for the Digital Competence of Educators (DigCompEdu) as a theoretical foundation. A descriptive analytical approach was employed with a sample of 120 PE teachers from middle and secondary schools in Algiers, Oran, and Constantine. Data were collected via a 58-item questionnaire, with reliability confirmed using the Spearman-Brown coefficient (0.68). Results revealed critically low levels of current digital competencies (Grand Mean ≈ 1.95), particularly in digital content design (M = 1.48) and electronic assessment (M = 1.09). Conversely, training needs were high to very high (Grand Mean ≈ 3.46), especially in cybersecurity (M = 4.67) and sports applications (M = 4.09). The analysis of obstacles demonstrated that institutional barriers (M = 4.16), including restrictive policies (M = 4.64) and lack of financial support (M = 4.54), and technical barriers, such as infrastructure shortage (M = 4.55), were significantly more severe than personal obstacles (M = 3.36). The study concludes that the low level of digital integration in Algerian PE is a systemic issue, not one of teacher resistance. It recommends national adoption of the DigCompEdu framework, dedicated infrastructure funding, and discipline-specific training programs to enable effective technology integration.
Keywords: Digital competencies, Blended learning, Training needs.

Introduction:

The 21st-century digital transformation has redefined educational paradigms, mandating that teachers acquire new competencies to facilitate technology-enhanced learning. Blended learning, which synthesizes face-to-face instruction with digital media, has become a global standard, accelerated by the COVID-19 pandemic. This model requires educators to be digitally competent across six areas defined by the European Framework for the Digital Competence of Educators (DigCompEdu): professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence (Redecker & Punie, 2017).

Integrating technology into Physical Education (PE) presents a unique paradox. While PE is inherently physical and practical, international research confirms that digital tools such as video analysis, wearable sensors, gamified applications, and virtual simulations can significantly enhance motor learning, provide objective performance feedback, and support differentiated instruction (Casey et al., 2017; Koekoek & van Hilvoorde, 2018). These technologies enable teachers to address diverse learning styles, track psychomotor skill development quantitatively, and extend learning beyond the gymnasium.

Despite this potential, empirical evidence from multiple contexts indicates a persistent gap between technological affordances and actual practice among PE teachers (Baek et al., 2018). In Algeria, the Ministry of National Education has initiated several digitalization strategies. However, there is a paucity of empirical data on the specific digital competencies of PE teachers, their training needs, and the contextual obstacles they face. Anecdotal evidence suggests that PE instruction remains overwhelmingly traditional, with minimal use of digital tools for planning, delivery, or assessment.

This gap is critical because the absence of digital integration in PE not only contradicts national educational policy but also deprives students of opportunities to develop 21st-century skills and digital literacy through physical activity contexts. Therefore, this study addresses three research questions:

1. What is the current level of digital competencies among Physical Education teachers in Algeria?
2. What are their specific training needs for implementing digital competencies in blended learning environments?
3. What personal, technical, and institutional obstacles hinder the acquisition and application of these competencies?

Answering these questions will provide an evidence base for policymakers and training institutions to design targeted, effective interventions.

1-Study Terms:

1-1-Training Needs:

Conceptual Definition:

The gap between an individual's current performance level and the desired or planned performance level, which can be bridged or reduced through planned and directed training programs (Noe, 2017).

Operational Definition:

The requirements that Physical Education teachers lack and need in order to acquire the knowledge and skills necessary to utilize digital competencies in blended learning environments. It is measured by the score a teacher obtains on the Training Needs axis of the questionnaire used in this study, which consists of 19 items on a 5-point Likert scale.

1-2-Digital Competencies:

Conceptual Definition:

According to the European Framework (DigCompEdu), digital competencies are defined as "the set of abilities that allow teachers to use digital technologies effectively, creatively, and with critical awareness to enhance teaching, learning, and assessment processes" (Redecker, 2017).

Operational Definition:

The set of technical and pedagogical skills that a Physical Education teacher needs to integrate technology into the teaching of the subject matter, such as: using fitness applications, learning management systems, video analysis software, creating digital sports content, and digital assessment. It is measured by the score a teacher obtains on the Current Digital Competencies axis of the questionnaire, which consists of 19 items distributed across 5 dimensions.

2-Previous Studies:

-Redecker and Punie (2017) conducted a comprehensive study on the European Framework for the Digital Competence of Educators (DigCompEdu), presenting an integrated framework comprising six main areas of digital competence: Professional Engagement, Digital Resources, Teaching and Learning, Assessment, Empowering Learners, and Facilitating Learners' Digital Competence. This framework has become a fundamental reference for many countries in developing teacher training programs.

-In a study conducted by Guillén-Gámez et al. (2020) on a sample of 634 teachers in Spain, the results revealed that the majority of teachers possessed basic technical skills but lacked advanced competencies in digital content design and electronic assessment. The study also showed statistically significant differences in competency levels attributable to gender in favor of males, and to teaching experience in favor of newer teachers.

-Casey et al. (2017) conducted a systematic review of 26 studies on the use of technology in Physical Education and concluded that digital technologies can enhance motor learning and student motivation when used appropriately. However, they noted that many Physical Education teachers face difficulties in integrating technology due to lack of training and resources.

-In an experimental study conducted by Koekoek and van Hilvoorde (2018) in the Netherlands, a blended learning program in Physical Education was implemented using video and interactive applications to teach motor skills. The results showed a significant improvement in students' motor performance and cognitive understanding, but the program's success depended heavily on the teachers' competence in using technology.

-In a large-scale survey conducted by Albion et al. (2015) in Australia involving 1,200 teachers from various disciplines, the results indicated that the most important training needs were related to integrating technology into teaching and learning, managing virtual classrooms, and electronic assessment. The study recommended providing continuous and tiered training programs that consider teachers' different levels.

-Baek et al. (2018) conducted a comparative study between Physical Education teachers and other disciplines in South Korea. The results showed that Physical Education teachers had a

lower level of digital competencies compared to their colleagues in other disciplines, and their training needs were focused on using sports applications, video motion analysis, and digital measurements.

-Gao et al. (2020) conducted a qualitative study in China involving interviews with 30 Physical Education teachers and identified six main obstacles: lack of specialized training, limited technical resources, resistance to change, time constraints, lack of administrative support, and fear of technical failure during lessons.

-In a quantitative study conducted by Backman et al. (2021) in Sweden on 340 teachers, the Technology Acceptance Model (TAM) was used to understand the factors influencing technology use. They found that perceived ease of use and perceived usefulness were among the strongest influences, in addition to school culture and institutional support.

3- Methodology:

3-1- Research Design:

A descriptive analytical design was employed to describe the current status of the phenomenon and analyze its components and relationships.

3-2- Research population and sample:

The population comprised all PE teachers in public middle and secondary schools in Algeria. A purposive sample of 120 teachers was selected from three major provinces: Algiers (n=50), Oran (n=40), and Constantine (n=30), to ensure geographical representation.

3-3- Search Tool:

A questionnaire was developed based on DigCompEdu and validated instruments from Guillén-Gámez et al. (2020). It contained 58 items across three axes: (1) Current digital competencies (19 items), (2) Training needs (19 items), (3) Implementation obstacles (15 items). A 5-point Likert scale was used: Axis 1 (1=Never to 5=Always), Axis 2 (1=Not Needed to 5=Very Highly Needed), Axis 3 (1=Strongly Disagree to 5=Strongly Agree).

3-4-Validity and Reliability:

-Cronbach's Alpha:

Cronbach's Alpha was calculated for each factor of the questionnaire, ranging from 0.70 to 0.81, indicating that the questionnaire exhibits a high degree of reliability**.**

-Content validity

Content validity was established by 8 experts in educational technology and PE curriculum. The Spearman-Brown split-half reliability coefficient was calculated.

Table 1:

Spearman-Brown Split-Half Reliability Coefficients for Questionnaire Axes

Spearman-Brown	Axis One & Two	Basic Technical Skills	Digital Content Design and Production	Management of Virtual Learning Environments	Electronic Assessment and Measurement	Cybersecurity and Ethical Practices
		0.846	0.801	0.901	0.678	0.721

	Axis Three	Personal Obstacles	Technical Obstacles	Institutional Obstacles
		0.631	0.901	0.557

Note: The overall reliability coefficient was 0.68, indicating adequate reliability for research purposes according to DeVellis (2016). The high coefficients for Virtual Learning Environment Management (0.901) and Technical Obstacles (0.901) indicate excellent internal consistency for these critical dimensions.

4-Results and Discussion:

4-1-Axis One: Current Digital Competencies of Physical Education Teachers:

Table 2:

Dimension	Item	Never	Rarely	Sometimes	Often	Always	Mean	SD	Sample Tendency
Basic Technical Skills	I use a computer	0	33	67	15	5	2.94	0.748	Moderate
	I use email	10	45	60	5	0	2.5	0.685	Rarely
	I use basic computer programs	5	23	72	14	6	2.94	0.822	Moderate
	I manage electronic files	12	38	62	7	1	2.56	0.796	Rarely
Digital Content Design	I create presentations	80	25	12	3	0	1.48	0.777	Never
	I record and edit video	94	11	10	5	0	1.38	0.811	Never
	I use sports applications	40	67	8	5	0	1.81	0.733	Rarely
	I design interactive e-games	115	5	0	0	0	1.04	0.2	Never
Virtual Learning Environment	I manage time using digital technology	82	35	3	0	0	1.34	0.526	Never
	I communicate with students	95	20	5	0	0	1.24	0.518	Never

	using digital technology								
	I organize instructional lessons using digital technology	65	40	12	3	0	1.6	0.771	**Never**
Electronic Assessment and Measurement	I design electronic tests	110	9	1	0	0	1.09	0.317	**Never**
	I use electronic assessment tools	98	14	8	0	0	1.25	0.568	**Never**
	I analyze student results electronically	103	10	7	0	0	1.2	0.528	**Never**
	I provide feedback using technology	112	6	2	0	0	1.08	0.332	**Never**
Cybersecurity and Ethical Practices	I protect my personal data	7	88	17	8	0	2.21	0.65	**Rarely**
	I use secure passwords	7	51	49	11	2	2.58	0.805	**Rarely**
	I update programs and applications regularly	10	75	25	10	0	2.3	0.753	**Rarely**
	I follow ethical practices in using technology	0	10	20	67	23	3.85	0.822	**Often**

Analysis and Interpretation:

The data reveal a critical deficiency in the digital competencies of Algerian PE teachers, with a grand mean of approximately 1.95, falling between "Rarely" and "Never".

-Basic Technical Skills:

The moderate level of computer use (M = 2.94) and rare use of email (M = 2.50) indicate that teachers are not engaging with technology as a routine professional tool. This contradicts the expectation that basic ICT skills are ubiquitous and supports Baek et al.'s (2018) finding that

PE teachers often exhibit lower foundational digital literacy than teachers of theoretical subjects. The moderate dispersion (SD ≈ 0.75) suggests this is a systemic, not individual, issue.

-Digital Content Design:

This dimension shows near-total absence of practice. The means for creating presentations (1.48) and video editing (1.38) are alarming because PE is a visual-motor discipline where modeling and video feedback are pedagogically essential (Casey et al., 2017). The mean of 1.04 for designing e-games, with 95.8% of the sample selecting "Never", indicates a complete disconnect from gamification strategies proven to increase student motivation. The extremely low standard deviations confirm strong consensus on this deficiency.

-Virtual Learning Environment Management:

All items scored below 1.60, "Never". This means teachers cannot leverage digital tools for time management, a critical skill in PE where lesson segments must be precisely timed. It also means no asynchronous communication or learning extension occurs, directly contravening blended learning principles

-Electronic Assessment:

This is the weakest dimension (Mean range 1.08-1.25). The data show that assessment in Algerian PE is entirely traditional and subjective. The inability to design electronic tests or analyze results digitally prevents data-driven instruction and objective evaluation of psychomotor skills, a key requirement of modern competency-based assessment (Redecker & Punie, 2017).

-Cybersecurity:

The paradox here is instructive. Teachers rarely protect data (M = 2.21) or use secure passwords (M = 2.58) but often follow ethical practices (M = 3.85). This indicates strong professional ethics coupled with a dangerous lack of technical cybersecurity knowledge. Teachers understand _what_ is right but not _how_ to implement it technically, creating significant vulnerability.

4-2- Axis Two: Training Needs of Physical Education Teachers*

Table 3:

Descriptive Statistics for Training Needs in Digital Competencies:

Dimension	Item	Not Needed	Slightly Needed	Needed	Highly Needed	Very Highly Needed	Mean	SD	Sample Tendency
Basic Technical Skills	I use a computer	0	35	64	20	1	2.89	0.695	**Needed**
	I use email	0	10	45	56	9	3.53	0.755	**Highly Needed**
	I use basic computer programs	0	5	40	70	5	3.62	0.635	**Highly Needed**

	I manage electronic files	0	3	57	55	5	3.51	0.621	**Highly Needed**
Digital Content Design	I create presentations	0	5	67	43	5	3.4	0.64	**Highly Needed**
	I record and edit video	0	21	75	18	6	3.07	0.723	**Needed**
	I use sports applications	0	0	10	90	20	4.09	0.502	**Highly Needed**
	I design interactive e-games	0	5	70	35	10	3.41	0.705	**Highly Needed**
Virtual Learning Environment Management	I manage time using digital technology	0	1	50	65	4	3.6	0.571	**Highly Needed**
	I communicate with students using digital technology	5	35	65	10	5	2.79	0.818	**Needed**
	I organize instructional lessons using digital technology	0	17	66	30	7	3.22	0.761	**Needed**
Electronic Assessment and Measurement	I design electronic tests	1	26	59	30	4	3.08	0.794	**Needed**
	I use electronic assessment tools	0	10	63	40	7	3.36	0.721	**Needed**
	I analyze student results electronically	0	5	80	30	5	3.29	0.613	**Needed**
	I provide feedback using technology	0	19	70	25	6	3.15	0.74	**Needed**
Cybersecurity and	I protect my personal data	0	0	4	31	85	4.67	0.537	**Very Highly Needed**

	I use secure passwords	0	0	6	30	84	4.65	0.574	**Very Highly Needed**
	I update programs and applications regularly	0	0	15	75	30	4.12	0.601	**Highly Needed**
	I follow ethical practices in using technology	3	57	60	0	0	2.47	0.549	**Slightly Needed**

Analysis and Interpretation:

The grand mean for training needs is 3.46, approaching "Highly Needed". This directly contradicts any assumption of teacher resistance to technology. Instead, it reveals high motivation for professional development.

-Cybersecurity:

emerges as the most urgent need (M = 4.67, 4.65), with extremely low SDs (<0.58) indicating overwhelming consensus. This aligns with the Axis 1 finding of high ethical awareness but low technical competence. Teachers recognize that without security, all other digital integration is untenable. This should be the first priority of any training program.

-Sports applications:

(M = 4.09) is the second-highest need. This is discipline-specific and pedagogically significant. The gap between current use (M = 1.81) and need (M = 4.09) is 2.28 points—the largest in the study. It proves teachers understand that apps for performance analysis, heart rate monitoring, and skill tracking are essential for modern PE, as advocated by Koekoek & van Hilvoorde (2018).

-Basic Technical Skills:

are "Highly Needed" (M = 3.51-3.62), confirming that teachers are aware their foundational skills are inadequate for 21st-century demands. The consistency of high needs across all dimensions, with means above 2.79, demonstrates a comprehensive and systemic skill gap, not an isolated deficiency.

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4-3- Axis Three: Obstacles to Acquiring and Applying Digital Competencies:

Table 4

Descriptive Statistics for Obstacles to Acquiring and Applying Digital Competencies:

Dimension	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD	Sample Tendency
Personal Obstacles	I face difficulty adapting to technology	4	30	12	59	15	3.42	1.097	**Agree**
	I feel a lack of knowledge and skills in using technology	7	33	14	53	13	3.26	1.15	**Neutral**
	I fear failure when using technology	19	57	9	33	2	2.51	1.107	**Disagree**
	I lack confidence in technology	2	22	6	69	21	3.7	1.015	**Agree**
	I fear the negative impact of technology on my health	1	16	5	71	27	3.89	0.933	**Agree**
Technical Obstacles	I face a shortage of necessary technological infrastructure	0	1	2	47	70	4.55	0.577	**Strongly Agree**
	I face connectivity problems or network outages	1	7	3	77	32	4.1	0.771	**Agree**
	I feel risks regarding data security and privacy	0	8	4	74	34	4.11	0.757	**Agree**

	face compatibility issues between technology and some programs	4	14	4	70	28	3.84	1.045	**Agree**
	I face difficulty adapting to technology updates	13	67	11	20	9	2.54	1.121	**Disagree**
Institutional Obstacles	I face a lack of administrative support	1	9	1	65	44	4.18	0.849	**Agree**
	I face a lack of financial support	0	1	2	46	71	4.54	0.62	**Strongly Agree**
	Procedures and policies hinder the application of technology	0	0	1	43	76	4.64	0.498	**Strongly Agree**
	I face a lack of training and development	7	29	7	68	9	3.35	1.106	**Neutral**
	The high cost of technology makes its application difficult	0	5	6	80	29	4.1	0.671	**Agree**

Analysis and Interpretation:

The obstacle hierarchy is unequivocal: Institutional (Grand Mean = 4.16) > Technical (Grand Mean = 3.83) > Personal (Grand Mean = 3.36).

-Personal Obstacles:

While teachers agree they lack confidence (M = 3.70) and fear health impacts (M = 3.89), they disagree with fearing failure (M = 2.51). The higher SDs (>1.0) show more individual variation here. This indicates that psychological barriers like technophobia exist but are secondary. The primary issue is structural. Addressing personal obstacles through training without first providing infrastructure and supportive policies would be ineffective, a key principle of change management in education.

-Technical Obstacles:

Infrastructure shortage (M = 4.55) is the second-highest mean in the study. This means teachers cannot practice digital skills even if they wanted to. The finding that teachers disagree with having difficulty with updates (M = 2.54) is telling—it suggests the problem is not that technology changes too fast, but that there is no technology to update in the first place.

-Institutional Obstacles:

The item "Procedures and policies hinder the application of technology" (M = 4.64, SD = 0.498) recorded the highest mean and lowest SD in the entire study. With 119/120 teachers agreeing or strongly agreeing, this represents near-unanimous consensus that the system itself is the primary barrier. Lack of financial support (M = 4.54) and administrative support (M = 4.18) confirm this. This finding is critical: it shifts the locus of responsibility from individual teachers to the educational administration. As Guillén-Gámez et al. (2020) argue, without institutional enablers, individual competence is irrelevant.

5- General Discussion:

The triangulation of the three axes reveals a coherent and troubling picture. Axis 1 demonstrates a severe deficit in digital competencies. Axis 2 proves this deficit is not due to lack of motivation, as training needs are high. Axis 3 explains the deficit: overwhelming institutional and technical barriers prevent acquisition and application of competencies.

The most significant finding is the disconnect between ethical awareness and technical capability in cybersecurity. Teachers know they should protect data (Axis 1, M = 3.85 for ethics) and desperately want to learn how (Axis 2, M = 4.67 for protection), but cannot because they lack both skills and infrastructure (Axis 3, M = 4.55 for infrastructure shortage). This creates a professional and ethical dilemma.

The data strongly support the conclusion of Baek et al. (2018) that PE teachers are marginalized in digital transformation initiatives. The gap between the need for sports applications (M = 4.09) and their actual use (M = 1.81) exemplifies how the specific pedagogical needs of PE are not being met by generic ICT policies.

6-Conclusion:

Physical Education teachers in Algeria operate in a context of "enforced digital illiteracy." They possess the willingness and recognize the need for digital competencies but are constrained by a system that fails to provide basic infrastructure, financial resources, or enabling policies. The low level of current digital competencies is a symptom, not a cause. The root cause is systemic failure. Therefore, interventions targeting only teachers through training will fail without parallel systemic reforms.

7-Recommendations:

1. For the Ministry of National Education:

a. Legally adopt the DigCompEdu framework as the national standard for all teacher evaluation and training.

b. Establish a "PE Digital Transformation Fund" to equip all middle and secondary schools with: class sets of tablets, portable projectors, high-speed internet, and site licenses for PE-specific software (e.g., Dartfish, Coach's Eye).

c. Amend administrative regulations to explicitly permit and encourage the use of personal devices and applications for pedagogical purposes, removing the current policy barriers (M = 4.64).

2. For Teacher Training Institutions:

a. Redesign pre-service PE curriculum, hands-on training in: video analysis, sports app integration, electronic assessment design, and cybersecurity fundamentals, as per Casey et al. (2017).

b. Create in-service professional development modules that are: discipline-specific, practice-based, and delivered in blended format. Priority must be given to cybersecurity and sports applications.

3. For School Administration:

a. Designate and train a "Digital PE Coordinator" in each school to provide peer support and troubleshoot technical issues.

b. Allocate 10% of the school's pedagogical budget to PE technology maintenance and consumables.

4. For Teachers:

a. Form Professional Learning Communities (PLCs) to share free resources and peer-teach basic skills, mitigating the personal confidence obstacle (M = 3.70).

b. Document and report infrastructure needs to create data-driven advocacy for resources.

5. For Future Research:

a. Conduct a longitudinal, quasi-experimental study to measure the impact of a DigCompEdu-based intervention on both teacher competence and student psychomotor achievement, addressing the research gap identified by Koekoek & van Hilvoorde (2018).

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