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Innovative didactics and ICT in the Sports Science Degree: An integrated approach for university teacher education

Didattica innovativa e TIC nel corso di Laurea in Scienze Motorie: un approccio integrato per la formazione universitaria degli insegnanti.

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ABSTRACT In the field of university sports science education, the integration of Information and Communication Technologies (ICT) can provide added value to teacher training. This study explores compatibility of movement learning with innovative teaching methodologies. Utilizing the Synchrony methodology and through careful analysis, strategies have been proposed to merge theoretical learning with proprioceptive learning, via activities in eLearning, for the development of practical motor skills. The investigation emphasizes the importance of interdisciplinarity, highlighting the need for an educational approach that increasingly adapts to the contemporary needs of students. By activating ICT specifically designed for motor education, the authors aim to ensure that students acquire both a solid theoretical foundation and the ability to apply this knowledge in personal practice, thereby preparing them more effectively for professional contexts of the future. This approach could offer a richer and more up-to-date educational experience, as confirmed by the Delphi, supported by European Union guidelines.

KEYWORDS Education; Innovative Teaching; Information and Communication Technologies (ICT); Motor Sciences; Teaching.

SOMMARIO Nell'ambito dell'educazione alle scienze motorie universitaria, l'integrazione delle Tecnologie dell'Informazione e della Comunicazione (TIC) può rappresentare un valore aggiunto per la formazione degli insegnanti. Questo studio esplora la compatibilità dell'apprendimento nel movimento con le metodologie didattiche innovative. Attraverso l'utilizzo della metodologia Sincrony e di un’attenta analisi, sono state proposte strategie per unire l'apprendimento teorico a quello propriocettivo, attraverso attività di eLearning, per lo sviluppo di competenze pratiche motorie. L’indagine sottolinea l’importanza dell'interdisciplinarità, evidenziando la necessità di un approccio educativo che si adatti sempre di più alle esigenze contemporanee degli studenti. Attivando delle TIC specificatamente studiate per l'educazione motoria, gli autori vorrebbero garantire agli studenti sia l’acquisizione di solide basi teoriche sia la capacità di applicare queste conoscenze nella pratica personale, preparandoli in modo più efficace ai contesti professionali del futuro. Questo connubio potrebbe offrire un'esperienza formativa più ricca e aggiornata, come confermato dall'indagine Delphi, sostenuto dalle linee guida dell'Unione Europea

PAROLE CHIAVE Educazione; Didattica Innovativa; Tecnologie dell'Informazione e della Comunicazione (TIC); Scienze Motorie; Formazione.

1. Introduction

The use of Information and Communication Technologies (ICT) in education—commonly referred to as eLearning—reconfigures the educational experience by influencing some fundamental aspects of training, including space and time (Tardini & Cantoni, 2021). ICT has transformed educational activities, influencing both traditional face-to-face teaching and fully online and blended approaches (Bates & Poole, 2003).

Although distance learning has not been introduced by digital technologies—just think of the different forms of communication, such as writing, which over time have facilitated the exchange of ideas—ICTs have nevertheless brought about substantial improvements, especially regarding synchronous modes. These technologies have made flexible content delivery possible and have enhanced distance learning thanks to their multimedia and interactive capabilities. So, ICT has undoubtedly transformed educational content delivery, particularly through live video lectures and other synchronous activities, while also facilitating asynchronous learning methods.

When it comes to content and objectives related more to know-how (“skills”), in some cases—when it is mainly about verbalizing them and providing examples—ICT can be effectively used to convey them; for example, the vast spread of online (video) tutorials that explain through verbalization and examples how to cook a recipe, how to use the features of a new smartphone, how to draw a mandala, and so on.

In cases, however, where verbalization is not the primary form of teaching, but the practice of “modelling” (Cantoni, 2007) also plays an important role, ICT struggles more to "bridge the distance" between teachers and learners. This is the case, for example, in learning motor skills closely related to the learner's corporality, typical of studies in physical education and sports sciences. In this sense, the evolution of teaching and of new educational technologies could represent an interesting factor in the training of teachers in the field of sports sciences.

This area, traditionally anchored to physical interaction and in situ presence, now faces the challenge and opportunity to integrate innovative teaching methodologies that exploit the potential of digital learning.

The transition towards online and hybrid learning modes not only promises to overcome geographical and temporal barriers but also aims to provide accessible and inclusive education for a variety of students, including those in higher education environments (Potiuk, 2021).

Despite the undeniable advantages, the adaptation of teaching sports sciences to digital contexts has, however, raised relevant questions regarding the effectiveness of acquiring the necessary motor skills in more specialized subjects, typically linked to more bodily and "on the field" learning. In response to these challenges, the investigation focuses on the integration of ICT into motor education, aiming to enhance the learning of motor skills. The integration of ICT in motor education should be guided by pedagogical paradigms that recognize the importance of physical and sensory experiences in learning. For this reason, this study is inspired by the Sincrony methodology for movement education, which in turn is based on the theory of embodied cognition.

Embodied cognition posits that the learning processes do not occur solely at the cognitive level but require physical and bodily experiences. For instance, Thon et al. (2016) demonstrated an influence of sensory processes in learning during motor practice, and Allami et al. (2014) have studied neural reorganization in motor networks to support the concept of embodied cognition through. In accordance with this, the Sincrony model has sought also to improve cognitive aspects through targeted exercise protocols (Gabal, 2018).

From this perspective, the ability to integrate learning through physical and sensorial experiences becomes essential, even more so in physical education which by its nature should develop practical skills.

In this study, we want to understand whether using these paradigms to model the use of ICT can promote the development of motor skills. The motivations behind this study lie in the need to improve the effectiveness of teacher training in sports sciences, addressing the challenges of integrating ICT into practical teaching. In particular, the aim is to explore "how and if" these technologies can be used to facilitate the learning of motor skills, body awareness, and proprioception.

In fact, understanding the biomechanical causes of movements is a key aspect, allowing students to move beyond merely replicating visible gestures to develop a deeper awareness of the internal forces and dynamics that generate movement.

In this context, educational technologies can support teaching by providing tools that help to visualize and understand these internal dynamics, which are often not directly observable. Integrating this kind of knowledge into teaching can enhance learning effectiveness by shifting the focus from visible effects to the underlying causes that drive motor actions (Wang et al., 2022).

To address the challenges of integrating ICT into the body-based learning framework, the present study relies on two main methodological approaches: the Sincrony methodology and the principles of embodied cognition, which complement each other by addressing both theoretical and practical aspects of motor learning. In this context, the following research questions were formulated:

1) How effective are digital educational tools in enhancing motor skill learning?
2) How can ICT support practical teaching in sports science?
3) What are the guiding principles for using ICT to balance theory and practice in physical education?

2. Theoretical perspectives and potential applications of ICT in motor education

Motor Sciences programs are characterized by a strong interdisciplinarity: through a fusion of theory and practice, sports sciences explore different scientific fields that likely require different educational approaches to allow students to acquire even bodily skills aimed at teaching, especially for those ages considered critical for healthy growth (Mazahreh & Kilani, 2022).

Studying a theoretical subject in the field of sports sciences, such as biomechanics or exercise physiology, differs from teaching various sports or the basic skills of motricity and its observation principles. While the theoretical component benefits from lectures, critical reading of texts, and case study analysis to deepen concepts and principles, learning about movement requires a more dynamic and interactive approach, which in the past took place in practical environments like gyms, laboratories, or university sports fields.

Today, practice is often integrated with or replaced by internships, which offer targeted and direct experiences. These internships are designed to be efficient and generally allow students to apply theory in real professional contexts. However, their adequacy may be limited by the lack of resources or adequate support from the hosting institutions (Denison & Markula, 2023). Thus, a promising approach could involve integrating into eLearning activities ICT specifically developed to facilitate the development of practical skills in certain areas.

This strategy would aim to offer an educational experience that transcends the limitations imposed by physical distance or the scarcity of resources or available local facilities (Wang, 2022). This is in line with the objectives of the Italian National Recovery and Resilience Plan (PNRR), which emphasizes innovation, digitalisation and improving students' skills to provide better job opportunities, particularly for young people (European Commission, 2021).

As part of these efforts, several new training programs have been proposed to modernize the education system and improve the quality of physical education by integrating digital teaching methodologies into the curriculum.

These programs are designed to better prepare students for the evolving needs of the industry and better adhere them to “real practice”. The courses should in this perspective aim to guarantee operational skills for students in their reference sector.

In this context, the integration of ICT for learning could allow the full development of skills in both the theoretical and the most practical subjects (Mykytyuk et al., 2022; Jastrow et al., 2022).

For instance, a research like that of Couto et al. (2023) has highlighted how the use of videos, lecture recordings, and other multimedia resources can allow students not only adequate but also personalized theoretical-motor learning, for example, through the use of slow-motion or the ability to replay lectures.

Other studies have shown how distance learning helped improve the acquisition of specific theoretical motor skills overcoming the practical limitations in direct interaction and practical demonstration (Cherevko et al., 2023).

The adoption of Augmented Reality (AR), Virtual Reality (VR) and Arificial Intelligence (AI) has been explored as well: for instance, Loia & Orciuoli (2019) explored the use of AR in exercise and sport science. Zakharov et al. (2021) examined proprioception within immersive VR, and Leight & Nichols (2012) discussed the application of AI in physical education. Again, Liu et al. (2022) studied the development of an intelligent physical education teaching tracking system based on multimedia data analysis.

Shang (2014) examined new sports teaching models based on VR techniques. Similarly, Pan (2015) analyzed the use of VR in university-level sports training. Park et al. (2020) focussed on the development of AR content for physical education in elementary schools.

All these studies contribute to the growing body of evidence that supports the integration of emerging technologies in the teaching of physical and motor skills.

So, when used ad hoc, ICT can serve as a tool to enrich the learning experience by offering alternative opportunities for an online physical education as complete as possible.

This technological approach, inserted within the academic context, could fit very well with the principle of interdisciplinarity that characterizes programs in motor sciences.

3. The theory of embodied cognition

On the other hand, however, other studies have raised some concerns, especially in the very specific and delicate field of teaching developmental motor skills (Xu, 2022).

Working in schools with children or in other educational contexts requires an in-depth knowledge of the body and its motor learning capabilities, which cannot stem from purely theoretical constructs or visual imitation.

As a matter of fact, the brain does not perceive reality directly as it is, but through a process of active interpretation based on internal models, expectations, and past experiences. This reflection aligns with constructivist approaches to learning, which highlight the fact that knowledge is actively constructed by the individual rather than passively absorbed (Piaget, 1971).

Furthermore, social constructionism suggests that our understanding of reality is shaped by social interactions and shared experiences, further supporting the idea that perception is influenced by expectations and past experiences (Vygotsky, 1978).

Helmholtz's theory of perception also supports this view, suggesting that perception is an active process based on unconscious inferences derived from sensory input (Helmholtz, 1867).

The classic experiment of the “invisible gorilla”, where participants, focused on counting the passes of a basketball, failed to notice a person dressed as a gorilla walking through the scene, demonstrates how our internal models and selective attention influence perception (Simons & Chabris, 1999).

These studies show how selective attention can narrow the visual field and cause us to overlook significant changes in our environment, even when changes occur slowly (Simons & Rensink, 2005). This further supports the need for an integrated approach that is not solely based on internal cognitive models but also includes physical and sensory experience, as proposed by the theory of embodied cognition (Shapiro, 2019), embodied cognition integrates both cognitive and physical processes, providing a more comprehensive understanding of how motor skills are acquired, particularly in dynamic and multisensory environments.

As two students can perceive the same lesson differently, depending on their past experiences, the educational approach must be flexible and adaptable, able to respond to the different interpretations and needs of the students.

When students become teachers, this understanding of the brain as an active interpreter of reality becomes even more important. Working with children, whose brains are in an intensely plastic and receptive phase, requires an educational approach that considers the variety of experiences and expectations that influence how children perceive and assimilate new information.

Teachers must therefore be prepared to present concepts in ways that can be easily integrated into children's existing models, while at the same time stimulating curiosity and openness to new experiences and interpretations.

Physical education and motor skills teachers are called to recognize and apply this principle in their daily practice, as well as to be aware of it. This means that, in addition to transmitting theoretical knowledge, it is essential that teachers are equipped with specific tools and skills that allow them to observe, assess, and guide the motor development of children in a sensitive and effective manner.

This requires a deep understanding of the different developmental stages and the underlying physical bases essential to every human movement, which can then be generalized and applied to each child or to each sport. By emphasizing the role of the body in learning, the theory of embodied cognition might provide interesting insights for the integration of its principles into a context of online teaching.

Research by Kopcha et al. (2021), for instance, highlights how the integration of emerging technologies could attempt to enrich the physical experience for education.

The C.O.P.S. framework proposal by Gubacs (2004), although extremely different from the context we studied, aims to modify and facilitate the training of physical education teachers, providing a guide for designing technology adoption plans that overcome existing barriers.

4. Methodology and practical applications

4.1 Sincrony methodology

Given the context, it is important to understand how the learning of some subjects in sports sciences could benefit from incorporating not only theoretical and imitative acquisition but also a bodily and proprioceptive one, which is based on the proprioceptive recognition of muscle execution (Ackerley et al., 2022; Huff et al., 2018; Whittier et al., 2023).

In this context, the Sincrony methodology for educating movement (De Bernardi, 2008) presents itself as a useful and innovative tool. Introduced in Italy in 1991, the Sincrony methodology focuses on motor programs based on the causes of movement rather than its visible effects. This approach emphasizes the understanding of the internal dynamics, such as muscle activations and neural coordination that generate motor actions.

By shifting the educational focus to the causes behind movements, the methodology aims to optimize motor learning by reducing the recruitment of antagonist muscles and improving movement efficiency. The ability to comprehend and apply these biomechanical principles can be enhanced when students are guided to focus on the internal processes driving their actions, rather than merely replicating observed movements (Dounskaia, 2023).

Therefore, this methodology offers a pedagogical approach that integrates motor abilities and the neurophysiological aspects of movement according to the theory of embodied cognition. The method focuses on improving also cognitive abilities through body training. By improving body awareness (Ambretti et al., 2024), this approach is particularly relevant in teacher training, where future educators must be aware of the gesture in its entirety.

The Sincrony methodology has already used ICT to support face-to-face teaching, albeit on a small scale, for the recognition of movement through the proprioceptive system. When teaching motor sciences at distance, however, the use of specific digital educational tools could represent a new opportunity to improve the effectiveness of teaching, making learning more embodied.

The Sincrony method, in this sense, could provide a theoretical basis for creating images or videos that encourage students to focus more on the cause—the driving muscle of the action or gesture—using proprioception and reflection on movement (Pezzulo et al., 2007). Although there are no large-scale, conclusive studies proving the effectiveness of this method, several smaller-scale studies and pilot projects have supported its potential.

For example, a study conducted by Fogliata et al. (2023) demonstrated significant improvements in visuospatial abilities and motor coordination in school-aged children following the integration of Sincrony into psychomotor programs. Similarly, Ambretti et al. (2023) highlighted how the integration improved physical balance in adolescents. These studies observed changes in motor learning in subjects who were guided toward greater use of proprioception and reflection.

Therefore, it is desirable that when motor learning must occur remotely, there may be utility in guiding students toward greater causal and reflective analysis that also involves the proprioceptive channel. For example, analyzing the simple act of running through traditional videos could be enriched with descriptive videos of the muscles in contraction and their timing, as well as feedback and exercises that the student must respond to after having attempted that movement remotely.

4.2 Practical applications in motor education

The actual causes of visible movement are not explicit in the gesture; for example, if we were to analyze the generating causes of a jump upwards, we should perceive the downward thrust expressed by the contraction of the leg muscles in synergy with those of the thighs: even if the visual effect is a body moving upwards, the cause is an invisible downward thrust.

So, to improve the learning of fundamental motor skills, it could be useful to adopt an educational approach that goes beyond the simple reproduction of movement. Integrating biomechanical modeling for muscle activation into educational technologies might be useful to provide detailed feedback for students, thus helping them develop a deeper understanding of the factors driving motor actions.

One example might be the offer of proprioceptive exercises, where students perform movements with varying levels of feedback based on questions.

This could involve activities such as performing specific motor tasks of complex sequences, with a focus on internal signals (Payne & Isaacs, 2016).

This approach could allow students to deeply understand movements through consciously experience the related sensations. Implementing ICT in motor education could start from the exploration of primary movements that are the basis of more complex actions and sports techniques, particularly in developmental motor education to support understanding. Among the fundamental movements that should be taught during the developmental age are walking, running, changing direction, jumping, throwing, and catching.

So, the students not only would learn to perform movements with greater precision but also gain the ability to critically analyze them, understanding the dynamics that regulate them.

This type of learning is particularly important in the training of future physical education teachers, as it prepares them to transmit not only theoretical but also practical skills.

5. Education in movement

Arnold (1988) identifies three fundamental dimensions in movement education: education “about” movement, education "through" movement, and education “in” movement. The first concerns theoretical knowledge about movement, the second involves skills acquired through bodily experiences (such as respecting rules), while the third dimension relates to knowledge developed directly through the act of moving (Brown & Penney, 2013).

The use of ICT in movement education requires balancing digital tools with direct physical experience, essential for developing motor skills. While ICT can facilitate theoretical instruction through videos, simulations, and gamification, integrating it for knowledge gained directly through movement is more complex but also more stimulating (Kestin & Miller, 2022).

For example, videos can illustrate the reasons behind movement activation, with questions interrupting the theoretical content to encourage physical experience, thus reinforcing learning (Brame, 2016; Sherer & Shea, 2011).

Additionally, using videos to record correct movement executions, assessable by both students and teachers, is an effective use of ICT in motor sciences. For instance, videos focusing on proprioceptive cues, like body alignment, enhance students' awareness of correct physical adjustments.

Advanced technologies such as haptic devices and biofeedback systems enable students to refine movements with real-time feedback (Araki & Sakuma, 1982).

Motion capture systems also track movements in detail, allowing for precise analysis and improvement of motor techniques (Inagaki et al., 2019; Gonzalez-Mendoza et al., 2022).

6. Delphi and future perspectives

A Delphi survey was conducted to evaluate experts' interest in integrating ICT and Sincrony methodology into movement education, focusing on learning based on the causes of movement, thus shifting from teaching processes based on effects (theory-vision-imitation) to a paradigm based on causes (theory of effects-observation-theory of causes-proprioception).

The Delphi survey is a structured method that aims to obtain a response among experts through a series of rounds of questionnaires, with anonymous feedback.

The Delphi survey was conducted involving a sample of 30 voluntary experts, which were asked, through three rounds of questionnaires, to express their opinions on the potential of a curriculum integrating ICT to improve both the theoretical understanding and the practical execution of fundamental motor movements. The authors were directly involved in designing the survey and conducting all rounds, ensuring consistency throughout the process.

This Delphi survey is to be considered as the initial step of a larger project: the iterations and responses obtained from this study will help guide future explorations aimed at a more complete evaluation of both technologies and their practical applications in motor learning.

The current approach therefore aims to establish a preliminary framework guided by the described teaching principles, providing a basis for more extensive technology integration and testing.

6.1 Delphi survey methodology

The sample consisted of 30 experts in the fields of physical education and motor sciences, from the Lombardy region, particularly from the provinces of Milan, Bergamo, and Brescia, as well as local sports associations. The experts were recruited through direct contacts and digital tools, with an average age of 45 years (SD = +/- 0.8). Of the participants, 60% were male and 40% female.

The experts came from diverse educational contexts, including primary, secondary, and university settings, and had an average of 15 years of experience in the field. The investigation was conducted in three phases, following the Delphi method, and involved questionnaires with 20 items.

Each phase was designed to build upon the results of the previous one: the first round explored general interest in the use of ICT in motor education, the second focused on specific applications, such as a teaching module dedicated to the causes of movement, while the third assessed students' demand for curriculum enhancement and the integration of new technologies.

The results from these phases indicated the need to develop a more comprehensive educational approach that not only embraces new technologies but also combines them with traditional teaching practices to optimize motor skill learning. For this reason, the focus has now shifted to designing a method that integrates proprioceptive feedback with biomechanical principles, with the aim of making the learning process more interactive and engaging.

The choice of specific technological tools will therefore be based on their ability to support this integrated approach, which seeks to combine physical experience with the use of ICT.

6.2 Delphi questionnaire

The questionnaire was developed through a four-stage process aimed at ensuring the relevance of the questions and the reliability of the data collected.

Stage 1: identification of key themes

Focused interviews were conducted with 10 representatives (5 teachers and 5 students) from the target group, selected on the basis of their experience and expertise in motor sciences and physical education. The participants (average age 35 years, SD = 3.2) were chosen to represent a variety of educational backgrounds.

The interviews, which lasted an average of 30 minutes, provided detailed insights into educational perceptions and specific needs related to the integration of ICT and proprioception teaching. The data were analyzed thematically, identifying recurring themes such as the importance of perceptual-motor learning and challenges associated with using technology. None of the interviewees participated in the subsequent stages of the study.

Stage 2: question development

Based on the identified themes, a preliminary set of 25 questions was developed: 15 for teachers and 10 for students. The questions for teachers focused on teaching methodologies, assessment of learning, and the use of ICT, while those for students addressed perceptions of teaching quality and the integration of technology in education.

Stage 3: content validation

A draft of the questionnaire was reviewed by a panel of experts (3 statisticians and 3 experts in educational methodologies), who provided feedback to enhance the validity and clarity of the questions. Following the review, some questions were modified or eliminated, resulting in a final set of 20 questions.

Stage 4: questionnaire pre-testing

The final questionnaire was pre-tested on a sample of 30 individuals (15 teachers and 15 students), different from the main study participants selected online. 95% of participants confirmed the clarity of the questions, while 5% suggested further modifications to improve comprehension.

The results of the quantitative analyzes were described using descriptive statistics (means and standard deviations), to assess the level of consensus among participants. (Table 1) The data showed an increase in consensus and average scores across the different aspects assessed, indicating a positive alignment of expert opinions between the first and second rounds.

Table 1. Quantitative Analysis Results.

Evaluated Aspects	Round 1 - Consensus (%)	Round 1 - Mean Score (SD)	Round 2 - Consensus (%)	Round 2 - Mean Score (SD)
General interest in the use of ICT	89%	4.3 (0.7)	93%	4.5 (0.5)
Integration of the module on movement causes	78%	4.0 (0.9)	85%	4.2 (0.7)
Use of proprioception as a key element	73%	3.7 (1.1)	80%	4.0 (0.8)

The qualitative data, collected from open-ended questions, were analyzed to identify recurring themes and specific concerns that emerged in the different rounds.

Thematic analysis highlighted several key themes and expert concerns regarding the implementation of the proposed method, such as the need for a stronger emphasis on sensory-motor integration and challenges related to the practical application of ICT in diverse educational contexts.

To illustrate the qualitative findings, provides a summary of the main themes identified in the first and second rounds, along with their frequency of occurrence and corresponding expert comments. (Table 2)

This table helps to contextualize the quantitative findings by showing how expert perceptions evolved throughout the survey.

Table 2. Qualitative Analysis Results.

Theme	Round 1 -Frequency (%)	Round 2 – Frequency (%)	Representative Expert Comments
Importance of sensory-motor integration	82%	88%	Proprioception is important for understanding
Challenges of implementing ICT in practical settings	65%	72%	There are barriers to adopting ICT tools
Need for a more interactive learning approach	78%	84%	Using ICT to promote active engagement

In the first round, 93% of the experts recognized the importance that ICT could have in developmental motor education, highlighting how it could enrich student learning not only by providing visual feedback but also by guiding them on sensory stimuli related to the main bodily motor patterns. By the second round, 87% of the experts positively evaluated the proposal of a pilot teaching module based on teaching the causes of fundamental movements (Nurjaman et al., 2022).

This growing consensus has led to the development of a pilot experiment called eCRONY, currently in progress, which aims at integrating the principles of the Sincrony method into a structured curriculum. The research team is actively working on designing and implementing this online learning module to evaluate its effectiveness in enhancing motor education through ICT.

Finally, the opinions of 76 students and/or recent graduates in sports sciences from different universities across Italy were assessed: 92% of the students expressed strong interest and a positive view about the possibility of integrating the understanding of biomechanical causes of movement into the university curriculum.

7. Research limitations

The results supporting the interest in the possible construction of ad hoc teaching online resources come on a theoretical basis from small-scale studies and pilot projects, thus limiting the generalizability of the results.

Furthermore, the effects of integrating proprioceptive learning and ICT into cause-based teacher training have not yet been fully explored. Finally, the use of digital technologies brings challenges related to access and the digital divide, which may influence the implementation of these methods in some educational contexts.

Further research is therefore needed to address and fully understand these aspects; however, data collected so far encourages us towards more extensive future studies.

8. Conclusions

The study highlighted a strong interest and consensus among experts regarding the use of ICT to enhance motor skills learning (93% of experts recognized the potential of ICT), although further investigation is required.

The eCRONY pilot project, currently under development, moves in this dicrection, aiming at evaluating how the integration of ICT into teaching activities can support them by shifting their focus from traditional effect-based approaches (theory-vision-imitation) to a cause-based paradigm (theory of effects-observation-theory of causes-proprioception).

The use of ICT in practical teaching of sports sciences has also received positive feedback (87% of experts favorably evaluated the proposed integration), suggesting that the paradigms of embodied cognition and the Sincrony methodology could provide a solid theoretical foundation for innovating educational approaches.

The shift to a cause-based paradigm in movement education, which integrates proprioceptive and theoretical learning, has shown potential for providing a more engaging and comprehensive educational experience.

However, the data collected indicate that further research is still needed to optimize the use of ICT in different educational contexts, find guiding principles that help adopt ICT to balance theory and practice in physical education, and confirm the long-term benefits (80% of experts emphasized the need for a balanced integration of theory and practice).

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