

Physical Education And Artificial Intelligence At School

Antonio Ascione¹

¹ University of Bari Aldo Moro, antonio.ascione@uniba.it

Abstract

Artificial intelligence is increasingly influencing every aspect of daily life, including education (Marchetti, Casonato, 2021). Although artificial intelligence research is still developing, it is already showing its potential in any field of application. In particular, by using artificial intelligence in physical education, it is possible to increase one's potential use in sports applications and initiate changes in the nature of Physical Education (Cioni, Isidori, Magnanini, Maulini, 2023).

This study aims to explore the principles and use of artificial intelligence in physical education through a targeted analysis of the areas of technology used in physical education where artificial intelligence could be applied to produce personalized physical education lessons.

Keywords

Artificial intelligence; Physical education; Technology; School.



Copyright: © 2024 by the authors.
Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

According to Housman, artificial intelligence has two capabilities (Housman, 2018):

1. the ability to produce repetitive tasks by predicting the results of data classified by humans;
2. Make decisions like humans, solving problems with human-developed algorithms.

The ability of artificial intelligence is to learn the commands given by repeatedly performing tasks and, at the same time, to be able to generate alternatives and creates decision-making paths for humans (Chen, Chen, Lin, 2020). The interaction between human beings and technologies based on artificial intelligence in the form of applications calibrated to these two aspects are part of the daily life of every human being. All this has been possible thanks to scientific and technological advances that over time, in the pedagogical-educational field, have managed to influence changes in both content and teaching methods, producing changes in both education and educational models and types of educational systems and organizations (Muradov, 2024). This highlights the need to continue research on educational technology, so as to enable education to prepare the student and, therefore, the future citizen of society regardless of age (von Gillern, Rose, Hutchison, 2024). This way of thinking shows how artificial intelligence in the school environment must be understood as an educational opportunity capable of developing new ways of learning (Rahiman, Kodikal, 2024).

Thanks to the inherent ability of technology to be useful in any context of life, it has also been possible to exploit this potential in schools, in particular, with regard to the technology used in physical education, which includes sports, education and computer science. In this context, artificial intelligence could represent a solution to practical problems in the development of physical education technology (Amina, Maati, Abdelhak, Youssef, Nadia, 2024).

Physical education is an important school discipline for the development of a person's identity (Wang, He, 2024). The use of technology and artificial intelligence in education is a way to enhance educational content by producing changes compared to classic educational models. Despite this, so far there is little scientific research concerning the application of artificial intelligence combined with physical education.

2. Analysis of the binomial physical education – artificial intelligence

This study aims to analyze in depth the relationship between artificial intelligence and physical education in order to be able to derive methods of use applicable in the school context.

The first phase of this work involves a review of the scientific literature on artificial intelligence and how it can "help" physical education in the teaching-learning process. This procedure was carried out through the most well-known search engines (e.g. Google Scholar) using a combination of artificial intelligence, education, physical education, sports education and personalized education as keywords. The results that emerged from this first phase made it possible to create a list of references and related documents, and highlighted that the use of artificial intelligence combined with physical education is, unfortunately, decidedly lacking.

Although technology and artificial intelligence have been present in education since their inception (Rivoltella, 2020), and despite the need for the world of education to update itself in order to be able to adapt to the needs of students (Carstens, Mallon, Bataineh, Al-Bataineh, 2021), there is still a strong lack inherent in the use of these tools in the teaching-learning pathway.

Artificial intelligence seems to represent a solution to be able to adapt educational proposals to a school audience that is certainly heterogeneous and changing over time (Kuru Gönen, 2019), even if, for correct use, it requires skills from both the learner and the teacher (Aeni, Hanifah, Sunaengsih, 2019).

The use of technology and artificial intelligence combined with physical education should not suggest a relational-emotional detachment due to the absence of a real environment, but rather the possibility that the student has to use a specific form of learning capable of producing positive implications in the experiences of daily life, both from a social, relational and emotional point of view (Andresen, Boud, Cohen, 2020).

The combination of physical education and artificial intelligence helps in the teaching-learning process, as it is possible to process and transmit any volume of information in an immediate, efficient and simple way (Bahroun, Anane, Ahmed, Zacca, 2023). Artificial intelligence and physical education represent a pedagogical practice characterized by the propensity to make the teaching-learning process more motivating and to improve the classroom climate, beyond the irreplaceable importance of physical presence (North, et al., 2023). Thanks to it, it is possible to create educational experiences that can be defined as unique and personalized, as the student can acquire new knowledge according to their own learning rhythms. Obviously, the role of the teacher must be to guide the learning process characterized by the relationship with technological tools (Corrias, 2021). The usefulness of AI applications in physical education is becoming increasingly clear, as they combine new concepts and theories established by developments in technology in related fields.

Through this combination, it is possible to personalize physical education lessons, so that the teacher can offer each student a personalized and differentiated physical education learning experience (Cesaretti, 2021). By doing so, the teacher

will be able to take into account both the physical conditions of individual students and the level of performance of physical activity and psychological characteristics (Cesarano, Valentino, 2022). It is possible, therefore, to speak of personalized physical education, that is, a discipline that considers the different physical, emotional and socio-relational characteristics of students. In this way it will be possible to propose group work in order to promote the speed of learning of the students, in which the initial level of knowledge and the needs of each one will be taken into consideration.

These changes are therefore aimed at the teaching-learning process, in the sense that it is necessary for the school system to be flexible, capable of adapting to the level of performance and speed of learning of each student, and during the process, to the different levels of cognitive, relational and socio-emotional growth of students (Benvenuto, Livi, 2024).

3. Job description

The aim of this work is to investigate whether artificial intelligence combined with physical education can be used as a learning tool to improve pupils' knowledge and motivation. This study was carried out in the 2022/2023 school year in three lower secondary schools.

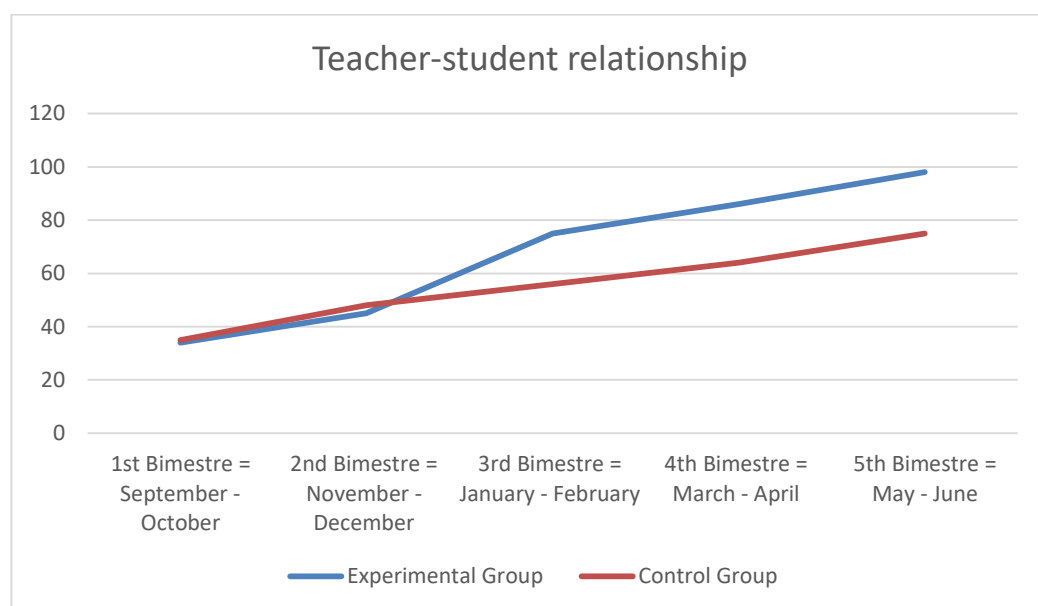
Three first classes, three second classes and three third classes were randomly selected. Subsequently, a control group and an experimental group were created for each class. The substantial difference between the control group of the experimental group is that the former carries out traditional teaching activities, while the experimental group benefits from teaching proposals based on the combination of physical education and artificial intelligence.

The purpose of this distinction is to assess whether physical education classes that use artificial intelligence are of help to both teachers and students. In addition, we want to evaluate whether learning related to the use of artificial intelligence generates a form of personalized learning and so that all students can achieve their learning goals.

Lower Secondary School					
Experimental Group			Control Group		
Students' Number	Class	Age	Students' Number	Class	Age
38	1°	10 - 11	35	1°	10 - 11
42	2°	11 - 12	40	2°	11 - 12
34	3°	12 - 13	39	3°	12 - 13
TOT. = 114	-	-	TOT. = 114	-	-

Table 1. Experimental Group and Control Group data.

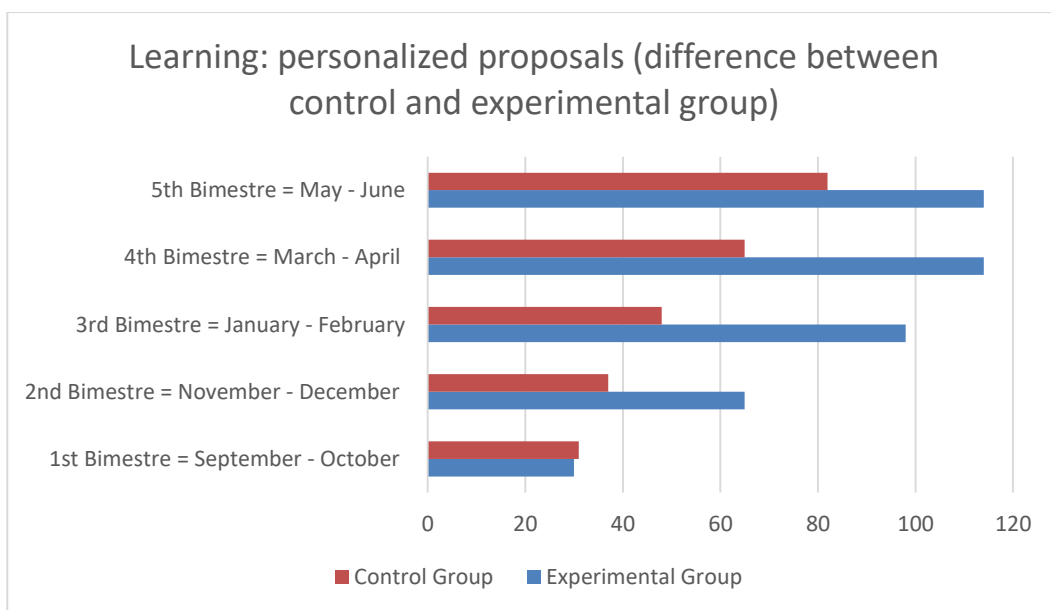
The intervention lasted one year and each group had a similar number of pupils, in order to avoid an over-representation of a specific class and consequently disorders from the point of view of the results of the study. It should be noted that the data collection took place every two months (1st Bimestre = September - October / 2nd Bimestre = November - December / 3rd Bimestre = January - February / 4th Bimestre = March - April / 5th Bimestre = May - June) and was carried out by the teachers through direct observation and structured tests. The didactic proposals, although different between the control and experimental groups, were conducted by the same teachers, therefore, the only difference between the two groups consists in the modality, means and tools used.



Graph 1. Teacher-student relationship

The first difference that emerged from the data obtained between the experi-

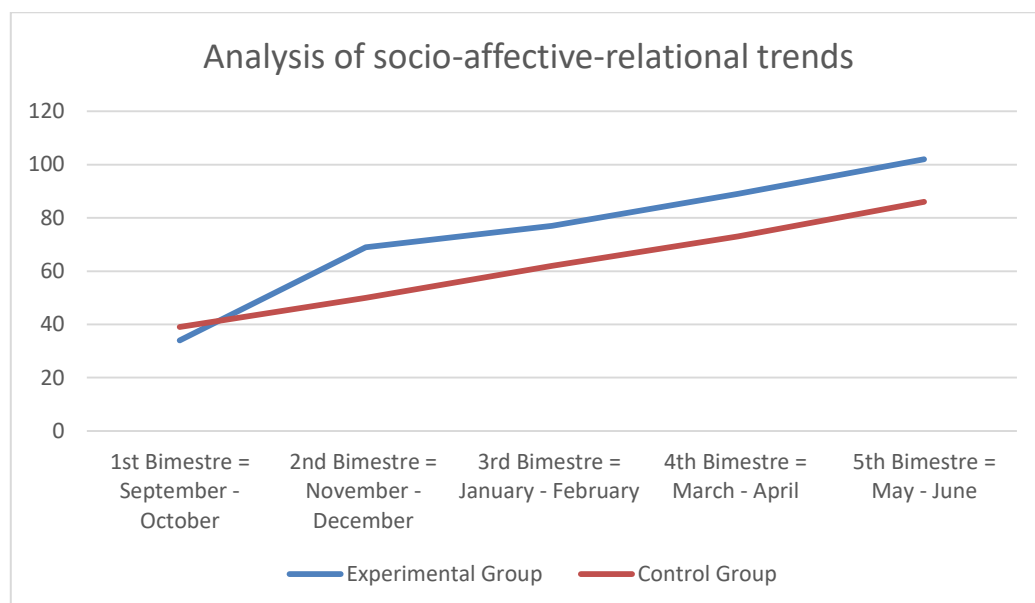
mental and control groups concerns the teacher-student relationship, which during the bimonthly observations has grown significantly in the experimental group. In particular, in the first two months for the experimental group there was a good teacher-learner relationship for 34 out of 114 students, while for the control group 35 out of 114. This substantial parity becomes unequal with the progress of time until a good teacher-learner relationship is obtained in the fifth two months for the experimental group for 98 out of 114 pupils, while for the control group 75 out of 114. The motivation for this positive trend for the experimental group lies in the improvement, both of teachers and learners, in the use of technology and in the possibility of a continuous and constant comparison beyond the time limit dictated by the classic lesson in a single hour. In addition, in view of the absence of time limits, it has been observed that, thanks to the use of artificial intelligence, it is possible to reserve a fair treatment for each student, which allows an incentive from the point of view of fun among students, and as regards the role of teachers, a reduction in fatigue in the dissemination of knowledge (Park, Shin, 2017). Therefore, the use of artificial intelligence allows physical education teachers to focus on communication and facilitate students' self-managed growth, managing to create a collaborative relationship in which the teacher does not have to have direct control of any action (Koedinger et al., 2013).



Graph 2. Learning: personalized proposals (difference between control and experimental group)

Analyzing the role of the teacher in the control group and in the experimental group, it is observed that in the latter it is possible to find forms of personalized learning, formalized discussion, diversification of learning and formalized evaluation, whose data are quite simple to collect and analyze. On the other hand, in the control group it was not possible to propose a complete form of personalized in-

struction and a diversification of learning, despite the presence of physical education. Specifically, it is observed that in the first two months the personalized proposals in the experimental group involved 30 out of 114 pupils, while in the control group 31 out of 114. At the beginning of the fourth two months, 114 out of 114 pupils in the experimental group were all involved, while at the end of the fifth two months the control group recorded personalisation in 82 out of 114 pupils.



Graph 3. Analysis of socio-affective-relational trends

As far as the learning environment is concerned, artificial intelligence fosters a place where students manifest greater interest and active participation (Almansoori, 2024). In addition, it has been observed that the experimental group needs a teacher with great emotional potential, in the sense that they will have to demonstrate their competence in terms of emotional interaction with students, value judgments on educational activities, design and functioning of learning performed through artificial intelligence. Therefore, teachers and pupils, through artificial intelligence, will have to be in constant relationship, thus improving social skills both in the interaction between peers and between teacher and learner. In particular, it has been observed that in the experimental group the socio-affective-relational components have increased dramatically since the second two months, while in the control group this increase occurs more gradually but involves fewer pupils. In the control group, it was observed that, despite a well-structured learning environment, physical education teachers are not always able to identify individual differences in students and present appropriate goals accordingly. Unfortunately, there are many limitations in this regard that generate a learning experience that is not adapted to the individual differences of the students. The main problem

that has been found is that while some pupils enjoy PE classes and actively participate, others avoid or passively participate in classes for different reasons. It has been observed that the main motivation is that students do not judge their physical abilities and activity level on their own, but through the perspective and language of teachers and, more importantly, other pupils (Lee, Lee, 2020). This limitation is overcome by the experimental group thanks to the presence of artificial intelligence that allows learners to live different and personalized experiences, capable of exploiting the different sensory information and the possibility that students have to live, through technology, direct experiences and receive objective information and feedback from artificial intelligence.

4. Conclusion

Physical education can be considered as an important part of the overall development of the pupil (You, 2010). Thanks to technology, this discipline, like all others, can enrich educational content, promoting changes in traditional educational models in favor of a teaching-learning process centered on the needs and requirements of the student (Altomari, Miceli, 2023).

This work aims to highlight the importance of the relationship between physical education and artificial intelligence in schools, analyzing what can be the link between the use of technologies and educational physical education. This combination can generate a strong motivation in learners' learning as it positively affects the emotional-socio-relational axis, contributing to a personalization of teaching proposals (Zhao, Kong, Zheng, Ahmad, 2024). It was observed that the experimental group benefited from the combination of physical education and artificial intelligence, showing a greater propensity in the production of personalized teaching proposals than the control group. These results show how the emerging relationship between artificial intelligence and physical education in schools can contribute to creating positive effects on learning, motivation and interest, but also the reduction of distractions and therefore a potential lowering of pupils' perceptual abilities.

The challenges that technology in association with physical education mean that artificial intelligence cannot be understood only as a product of modern innovation, but must also be a complex of skills and competencies of both the teacher and the learner. Through the combination of artificial intelligence and physical education, it is possible to promote the creative thinking and individual abilities of each pupil and reflect their value in a more evident way (Bahroun, Anane, Ahmed, Zacca, 2023). Therefore, artificial intelligence and physical education can represent an innovative teaching proposal capable of producing an effective and personalized form of learning, as it is based on living learning experiences that also stimulate and involve the emotional, social and relational axis (Ledger, Fischetti, 2020).

Three aspects could be identified according to which artificial intelligence is

necessary for physical education, first of all it does not take place exclusively in the gym but it is possible to attend physical education lessons without restrictions of time and space. In addition, personalized learning can be carried out more easily as artificial intelligence can provide various learning tools capable of arousing students' interest and keeping learning motivation high.

AI-based physical education can be summed up in terms of student, educator, and educational work. AI helps students collect data, analyze basics, and visualize, allowing them to spend more time on high-level physical activities, hands-on and virtual experiences, and interactions between educators and students. AI supports teachers' decision-making by reporting to them the status of the class in real-time and presenting various alternatives to students' problems. In addition, it effectively assists educators in assessing and managing learning. Finally, AI helps teachers by assisting them efficiently and reducing the time spent on administrative work, helping them invest more time in improving the quality of teaching and learning (Sun, et al., 2024).

This work focused on the analysis of areas where AI can be applied in terms of sports educational technology, personalised physical education lessons, knowledge delivery via AI, student assessment, student counselling methods, and the skills and roles of future physical education teachers. However, the analysis of these areas only provided an idea of the direction that the overall use of AI should take in each area, and the specific method of use has not been fully explained.

References

- Aeni, A. N., Hanifah, N., & Sunaengsih, C. (2019). The impact of the internet technology on teacher competence and student morality. In *Journal of Physics: Conference Series* (Vol. 1318, No. 1, p. 012046). IOP Publishing.
- Amina, G., Maati, S., Abdelhak, C., Youssef, S., & Nadia, C. (2024). Rapid Learning in the Teaching of Physical Education and Sport. In *Navigating Virtual Worlds and the Metaverse for Enhanced E-Learning* (pp. 225-233). IGI Global.
- Andresen, L., Boud, D., & Cohen, R. (2020). *Experience-based learning*. In *Understanding adult education and training* (pp. 225-239). Routledge.
- Bahroun, Z., Anane, C., Ahmed, V., & Zacca, A. (2023). Transforming education: A comprehensive review of generative artificial intelligence in educational settings through bibliometric and content analysis. *Sustainability*, 15(17), 12983.
- Carstens, K. J., Mallon, J. M., Bataineh, M., & Al-Bataineh, A. (2021). *Effects of Technology on Student Learning*. *Turkish Online Journal of Educational Technology-TOJET*, 20(1), 105-113.
- Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *Ieee Access*, 8, 75264-75278.
- Cioni, L., Isidori, E., Magnanini, A., & Maulini, C. (2023). Il corpo sportivo come contenuto critico-riflessivo per la formazione degli insegnanti di educazione fisica. *Annali online della Didattica e della Formazione Docente*, 15(26), 102-117.
- Corrias, G. (2021). *Progettazione, realizzazione e testing di un ambiente di realtà virtuale immersiva per l'apprendimento*. Dottorato di Ricerca Filosofia, Epistemologia e Storia della Cultura Ciclo XXXIII, Università degli Studi di Cagliari.
- Housman, M. Why 'Augmented Intelligence' Is a Better Way to Describe AI. *AINews*, 2018. Available online: <https://www.artificialintelligence-news.com/2018/05/24/why-augmented-intelligence-is-a-better-way-to-describe-ai/> (accessed on 22 December 2020).
- Koedinger, K.R.; Brunskill, E.; Baker, R.S.; McLaughlin, E.A.; Stamper, J. New Potentials for Data-Driven Intelligent Tutoring System Development and Optimization. *AI Mag.* 2013, 34, 27.
- Kuru Gönen, S. İ. (2019). *A qualitative study on a situated experience of technology integration: Reflections from pre-service teachers and students*. *Computer Assisted Language Learning*, 32(3), 163-189.
- Ledger, S., & Fischetti, J. (2020). *Micro-teaching 2.0: Technology as the classroom*. *Australasian Journal of Educational Technology*, 36(1), 37-54.
- Lee, H.-S.; Lee, J.-H. The Effect of T-Ball Class on Physical Self-Efficacy of Elementary School Students Using Virtual Reality Technology (VR). *Korean J. Sports Sci.* 2020, 29, 613-624.
- Marchetti, B., & Casonato, C. (2021). Prime osservazioni sulla proposta di Regolamento dell'Unione europea in materia di intelligenza artificiale. *BioLaw Journal*, 2021(3), 415-437.
- Muradov, O. (2024). BASIC PRINCIPLES AND RULES OF INNOVATIVE PEDAGOGICAL TECHNOLOGIES IN THE EDUCATIONAL PROCESS. *Models and methods in modern science*, 3(1), 84-93.
- North, C., Hills, D., Maher, P., Farkić, J., Zeilmann, V., Waite, S., ... & French, G. (2023). The impact of artificial

-
- intelligence on adventure education and outdoor learning: international perspectives. *Journal of Adventure Education and Outdoor Learning*, 1-18.
- Park, J.H.; Shin, N.M. Students' perceptions of artificial intelligence technology and artificial intelligence teachers. *J. Korean Teach. Educ.* 2017, 34, 169–192.
- Rahiman, H. U., & Kodikal, R. (2024). Revolutionizing education: Artificial intelligence empowered learning in higher education. *Cogent Education*, 11(1), 2293431.
- Rivoltella, P. C. (2020). Scuola. Tecnologia più condivisione: Così si può fare buon e-learning. *Avvenire. it*.
- Sun, Z., Yuan, Y., Xiong, X., Meng, S., Shi, Y., & Chen, A. (2024). Predicting academic achievement from the collaborative influences of executive function, physical fitness, and demographic factors among primary school students in China: ensemble learning methods. *BMC Public Health*, 24(1), 274.
- von Gillern, S., Rose, C., & Hutchison, A. (2024). How students can be effective citizens in the digital age: Establishing the Teachers' Perceptions on Digital Citizenship Scale. *British Journal of Educational Technology*.
- Wang, H., & He, X. (2024). Unveiling the links between physical activity, self-identity, social anxiety, and emotional eating among overweight and obese young adults. *Frontiers in Psychology*, 14, 1255548.
- You, J.A. Why Physical Education Teacher as Curriculum Maker? *Korean J. Sport Pedagog.* 2010, 17, 1–18.
- Zhao, Y., Kong, X., Zheng, W., & Ahmad, S. (2024). Emotion generation method in online physical education teaching based on data mining of teacher-student interactions. *PeerJ Computer Science*, 10, e1814.