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A Proposed Framework for Developing Physical Education Curricula in Light of Artificial Intelligence Concepts and Future Skills

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Abstract

The research attempts to develop a proposed framework for improving the physical education and sports curriculum in the light of artificial intelligence concepts and future skills. Also, it tried to spotlight the reality of the current curricula, what concepts should be present in it, what is needed for development, and what role developed curricula play in developing future skills of the student.

The study used the descriptive method with the survey approach to attain the data needed for the study. The sample of the research included 135 students of Al-Aqsa University, of them 15 students for the exploratory study and 120 students for the main study, and they were selected by the purposive method. A questionnaire of 40 statements was prepared in this research to collect data. This questionnaire was distributed over 4 axes; the reality of current curricula, what artificial intelligence concepts should be incorporated, what is required to develop the curricula, and what is the role of the developed curricula in developing future skills. The measurement instrument's psychometric characteristics were verified by means of validity and reliability coefficients, while the data were processed using SPSS.

The results indicated that the reality of current physical education curricula has a moderate agreement level tending toward low (M = 2.48 ± SD = 0.91), indicating limited compatibility with the requirements of the digital age. Moreover, the results showed a strong agreement about the inclusion of concepts related to artificial intelligence in the curricula at a mean of 4.43 ± 0.66, with artificial intelligence applications in sports performance analysis being the top-ranking. The requirements for the axis of curriculum development registered the highest mean, 4.49 ± 0.63, with faculty training and infrastructural development being among the most important. The study also discovered that the designed curricula could highly help enhance the future competencies of students, especially digital literacy, critical thinking, and data analysis. In this case, the mean value for this study was 4.45 ± 0.65. The mean score for the questionnaire across all domains was 3.96 ± 0.71.

The findings of the research confirmed that the current physical education curricula are far from meeting the requirements of digital transformation and the contemporary sports labor market. It also showed that the integration of artificial intelligence concepts, development of infrastructure, and qualifying faculty members are key requirements for curriculum development. As per the outcomes of the study, curricula developed based on artificial intelligence contribute to the development of future skills and to preparing better-capable graduates who are able to adapt to modern sports and educational environments.

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1- INTRODUCTION

The world has seen a rapid evolution over the past decades due to successive developments in Artificial Intelligence technologies. The impact of such technologies has gone beyond the scope of technical applications and become a major driver affecting the reform of educational, economic and social systems. Artificial Intelligence is now recognized as more than a digital tool; it is now more of a cognitive and applied framework that contributes to enhancing the decision-making process, personalized learning, data analysis, and the efficiency and performance of systems (Lee & Lee, 2022).

AI has transformed the methods of sports training and education by implementing intelligent analytical technologies, tracking performance, providing immediate feedback, digital simulation and prediction of sports performance in the field of sport. This has led to a redefinition of what sports preparation means, making it more reliant on information and technology and more able to meet the demands of modern sporting environments.

Physical education and sports are among the other areas of education that can benefit greatly from the applications of artificial intelligence. This is due to its nature, which encompasses cognitive, skill-based, motor and emotional aspects. Currently, the literature indicates that the addition of artificial intelligence technologies to the design of educational curricula helps in building interactive and flexible environments. It will assist educational institutions in providing education in accordance with the individual differences of learners and will increase levels of participation and achievement (Lazem et al., 2024).

Recent studies indicate that the use of artificial intelligence applications in sports education is not limited to the improvement of educational content only, but also includes teaching method development, assessment systems, performance measurement, and instant feedback. Virtual and augmented reality technologies are also involved for more realistic and efficacious training (Ghazi, 2024). Likewise, Gonzalez et al. (2020) state that the involvement of AI tools within the design of sports activities increases students' motivation and participation, thus improving the quality of learning.

Even with this progress on a global scale, the involvement of artificial intelligence in developing curricula for physical education and sports in various academic institutions remains lesser than the rapid developments taking place in the digital sports space, especially at the local level. As international universities increasingly reconfigure their academic programs in line with digital transformation requirements, some curricula remain committed to traditional models up to now, devoid of the necessary practical skills needed by students to deal with modern technologies in the sports sphere.

The curricula of the Faculty of Physical Education and Sports in Al-Aqsa University must be investigated. The investigation must focus on the readiness of the curricula for contemporary digital transformations. In light of the applications of artificial intelligence, a proposed framework must be built for the development of the curricula. Preparing graduates with superior digital and sports competencies has become a strategic necessity so that they can compete and contribute towards the future development of the sports sector.

In this regard, the present study aims at presenting a proposed framework for developing physical education and sports curricula based on the application of artificial intelligence. This would help close the divide between current learning outputs and contemporary sports labor market requirements, as well as enhance students' competencies in the scientific and professional application of modern technologies.

The significance of this study is dictated by the many rapid changes occurring in sports education in the wake of the digital revolution and the increased uptake of Artificial Intelligence technologies. There is a growing demand on the part of academic institutions to rethink the philosophy of curriculum design and the procedures of its implementation so that graduates possess future skills.

1.2 The research is important as highlighted below

1. The proposed scientific framework for including AI applications in the curriculum aims to contribute to the development of physical education and sports curricula.
2. Keeping pace with global sports digital transformation by restructuring sports curricula as per recent trends in sports education and training.
3. Minimizing the technical and cognitive gap between traditional curricula and the demands of the technology-based sports labor market.
4. Improving the quality of education by supporting personalization, improving interaction, and developing assessment and follow-up tools.
5. Educating future sports personnel who will use artificial intelligence applications in training, analysis, and sports rehabilitation fields.
6. Providing a scientific reference for academic decision makers for developing study plans and building educational policies in faculties of physical education and sports..

2. Materials and Methods

2.1 Research Method

The researcher has employed the descriptive method with the use of the survey approach, which is appropriate for the nature of the current research to identify the opinions of the sample members regarding

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the reality and requirements for developing the curriculum (Creswell & Creswell, 2018; Cohen et al., 2018).

2.2 Research Sample

Al-Aqsa University's 135 students were selected as the research sample utilizing the purposive method. The allocation of students was done thus: 15 for the exploratory study, which was used to conduct the scientific procedures for the study tools under investigation, and 120 for the main study. The study's participant selection was based on the confirmation of the researcher that the members are students studying at the university and that they agreed to take part in the research as well (Fraenkel **et al., 2019; Adams & Lawrence, 2019).**.

Table (1) Percentage Distribution of the Research Sample from University Students

No.	Research Sample	Number	Percentage
1	Exploratory Study Sample	15	11.11%
2	Main Study Sample	120	88.89%
	Total	135	100%

Table (1) shows the percentage distribution of the research sample, where the exploratory study sample represented 11.11%, while the main study sample represented 88.89% of the total research sample.

3. Data Collection Tools

3.1 Questionnaire for Developing Physical Education Curricula in Light of Artificial Intelligence Concepts and Future Skills

The researcher prepared a questionnaire to measure students' attitudes toward developing physical education curricula in light of artificial intelligence concepts and future skills (DeVellis & Thorpe, 2021).

In its final form, the questionnaire consisted of four axes, including 40 statements distributed as follows:

The first axis: the reality of current physical education curricula in light of the requirements of the age.

The second axis: artificial intelligence concepts that should be included in physical education curricula.

The third axis: requirements for developing physical education curricula in light of artificial intelligence concepts

The fourth axis: the role of the developed curricula, in light of artificial intelligence, in developing students' future skills.

3.2 Scoring Method

The method of responding to the questionnaire statements was determined according to the three-point Likert scale: agree, neutral, and disagree, corresponding to the scores 3, 2, and 1, respectively, and representing the levels high, moderate, and low (Likert, 1932).

3.3 Scientific Coefficients of the Questionnaire

The psychometric properties of the questionnaire were verified by applying it to the exploratory sample, which consisted of 15 students. Through application to the exploratory study sample, validity and reliability were determined as follows (Nunnally & Bernstein, 1994).

3.4 Questionnaire Validity

The validity of the questionnaire was determined using construct validity, internal consistency, which shows the correlation of each statement with the score of the axis to which it belongs, and the correlation of each axis with the total score of the questionnaire for developing physical education curricula in light of artificial intelligence concepts and future skills among university students (Hair et al., 2019; Kline, 2015).

Table (2) Significance of Internal Consistency Validity for the Statements of the Questionnaire on Developing Physical Education Curricula in Light of Artificial Intelligence Concepts and Future Skills .

No.	First Axis Correlation Coefficient "r"	No.	Second Axis Correlation Coefficient "r"	No.	Third Axis Correlation Coefficient "r"	No.	Fourth Axis Correlation Coefficient "r"
1	0.614**	1	0.600**	1	0.621**	1	0.693**
2	0.647**	2	0.733**	2	0.664**	2	0.621**
3	0.639**	3	0.653**	3	0.638**	3	0.721**
4	0.668**	4	0.749**	4	0.695**	4	0.702**
5	0.739**	5	0.738**	5	0.729**	5	0.579**
6	0.743**	6	0.729**	6	0.665**	6	0.714**
7	0.687**	7	0.693**	7	0.681**	7	0.658**
8	0.658**	8	0.711**	8	0.642**	8	0.679**
9	0.726**	9	0.701**	9	0.673**	9	0.705**
10	0.698**	10	0.674**	10	0.712**	10	0.691**

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Statistical significance of tabulated "r" at the 0.05 level = 0.304

According to Table (2), the calculated "r" value between the score of each statement and the total score of the axis to which each statement belongs is statistically significant. The values were high, indicating the validity of the questionnaire for developing physical education curricula in light of artificial intelligence concepts and future skills (Hair et al., 2019).

Table (3) Significance of Internal Consistency Validity for the Axes of the Questionnaire on Developing Physical Education Curricula in Light of Artificial Intelligence Concepts and Future Skills among University Students

No.	Questionnaire Axes	Correlation Coefficient "r"
1	First Axis: The reality of current physical education curricula in light of the requirements of the age	0.936**
2	Second Axis: Artificial intelligence concepts that should be included in physical education curricula	0.905**
3	Third Axis: Requirements for developing physical education curricula in light of artificial intelligence concepts	0.928**
4	Fourth Axis: The role of the developed curricula, in light of artificial intelligence, in developing students' future skills	0.935**

Statistical significance of tabulated "r" at the 0.05 level = 0.304

According to Table (3), the calculated "r" value of the score of each axis with the total score of the questionnaire has a statistically significant correlation. The values of the correlation coefficient ranged from .905 to .936, which are quite high and imply that the questionnaire on developing physical education curricula in light of artificial intelligence concepts and future skills among university students is valid (Nunnally & Bernstein, 1994).

3.5 Scale Reliability

To ascertain the reliability of the questionnaire, Cronbach's alpha reliability coefficient and the split-half reliability coefficient were calculated for the axes of the questionnaire on developing physical education curricula in light of artificial intelligence concepts and future skills among university students (Taber, 2018; Tavakol & Dennick, 2011).

Table (4) Significance of the Reliability Coefficient for the Axes of the Questionnaire on Developing Physical Education Curricula in Light of Artificial Intelligence Concepts and Future Skills among University Students

No.	Questionnaire Axes	Cronbach's Alpha	Split-Half Reliability
1	First Axis: The reality of current physical education curricula in light of the requirements of the age	0.760	0.787
2	Second Axis: Artificial intelligence concepts that should be included in physical education curricula	0.793	0.880
3	Third Axis: Requirements for developing physical education curricula in light of artificial intelligence concepts	0.753	0.639
4	Fourth Axis: The role of the developed curricula, in light of artificial intelligence, in developing students' future skills	0.755	0.847
	Total Score	0.933	0.921

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As shown in Table (4), the reliability coefficient of Cronbach's alpha was 0.933, while the reliability coefficients of the axes were between 0.753 and 0.793. The split-half reliability coefficient was 0.931, while its values in the axes ranged from 0.639 to 0.880. These are high values greater than 0.6, which indicates the reliability of the questionnaire about developing Physical Education Curricula in light of the concepts of Artificial Intelligence and Future Skills among University Students (George & Mallery, 2020; Pallant, 2020).

3.6 Application of the Main Study: Executive Procedures

The research sample consisted of Al-Aqsa University students and the period of the main study was from 02 January 2025 to 27 January 2025, according to the following executive steps.

Using a group-based system, the research tool, the questionnaire, was applied to the main study sample, 120 students. The researcher was there to respond to questions, check that all questionnaire responses were filled, verify adherence to the stipulated time, and give the signal to start responding to the questionnaire (Cohen et al., 2018).

After ensuring that the responses from students for all questionnaire statements were taken, the researcher took back the forms. They were coded into tabulated data in preparation for the statistical treatments. Results were then extracted.

3.7 Statistical Analysis

The researcher processed and analyzed the data from the questionnaire using IBM SPSS Statistics 20 to achieve the following statistical treatments (Field, 2018; Pallant, 2020).

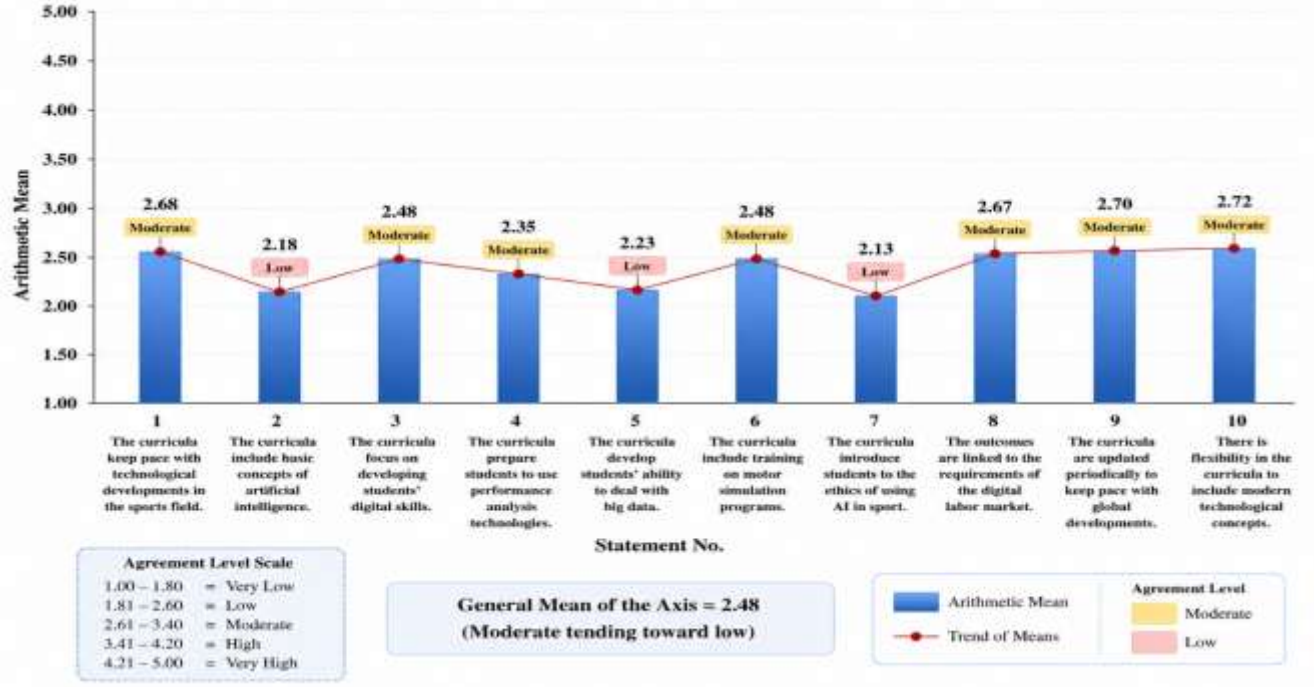
- Percentage.
- Arithmetic mean.
- Pearson's correlation coefficient "r".
- Cronbach's alpha reliability coefficient.
- Split-half reliability coefficient.
- Chi-square test "χ^2".

3. Results

4.1 Current Physical Education Curricula in the Digital Age Context

In order to answer this axis, arithmetic means, standard deviations, statement rankings, and levels of agreement were extracted, as shown in figer (1).

Figure (1). Arithmetic Means and Agreement Levels for the Statements of the First Axis (n = 120)



As seen from figure (1), the total mean of the axis reached 2.48, which is considered to be within the moderate level of agreement tending towards low. It is evident that the physical education curricula at present do not adequately equip students for the changes in the current educational and sports environment in terms of the digital age.

The highest mean score of 2.72 was obtained from the statement pertaining to the availability of flexibility to

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incorporate modern technological concepts. This means there is initial organizational readiness to revise curricula. Nonetheless, this degree of flexibility did not achieve a high level, which indicates that the flexibility has not yet been applied within the course content.

Conversely, the statement referring to introducing students to the ethics of using artificial intelligence in sport obtained the lowest mean of 2.13. This indicates limited focus on the ethical and regulatory dimensions of artificial intelligence applications in physical education programs, despite being one of the main global axes in modern education development.

The outcomes also indicated a low level of inclusion of the basic concepts of artificial intelligence, 2.18, weak focus on big data, 2.23, and insufficient preparation of students to use sports performance analysis technologies, 2.35. This shows that there is a gap between the current content and the requirements of digital transformation in the sports field.

The aforementioned results can be explained by the fact that a number of physical education curricula in various educational environments are still produced on the basis of the traditional model, with learning basic physical and cognitive skills, while there is not sufficient transition to the model of smart sports education, which depends on data analysis, digital systems, simulation and performance prediction.

This outcome supports the research conducted by Lee and Lee (2022), which found that the development of education in the age of artificial intelligence requires a reformulation of educational objectives and their linking to modern digital infrastructure. The analysis also confirms the study of Ghazi (2024), that incorporating artificial intelligence in physical education entails basic methodological changes that require updating content and methods of teaching.

The findings are also aligned with UNESCO (2023), which indicates that integrating artificial intelligence into education is not only facilitated by providing the technology. It can also take place through the redesigning of curricula and the development of advanced digital and professional skills among students.

The investigator conceives that the low level is due to some reasons, the most important of which are:

Artificial intelligence concepts in Arab sports specializations are novel.

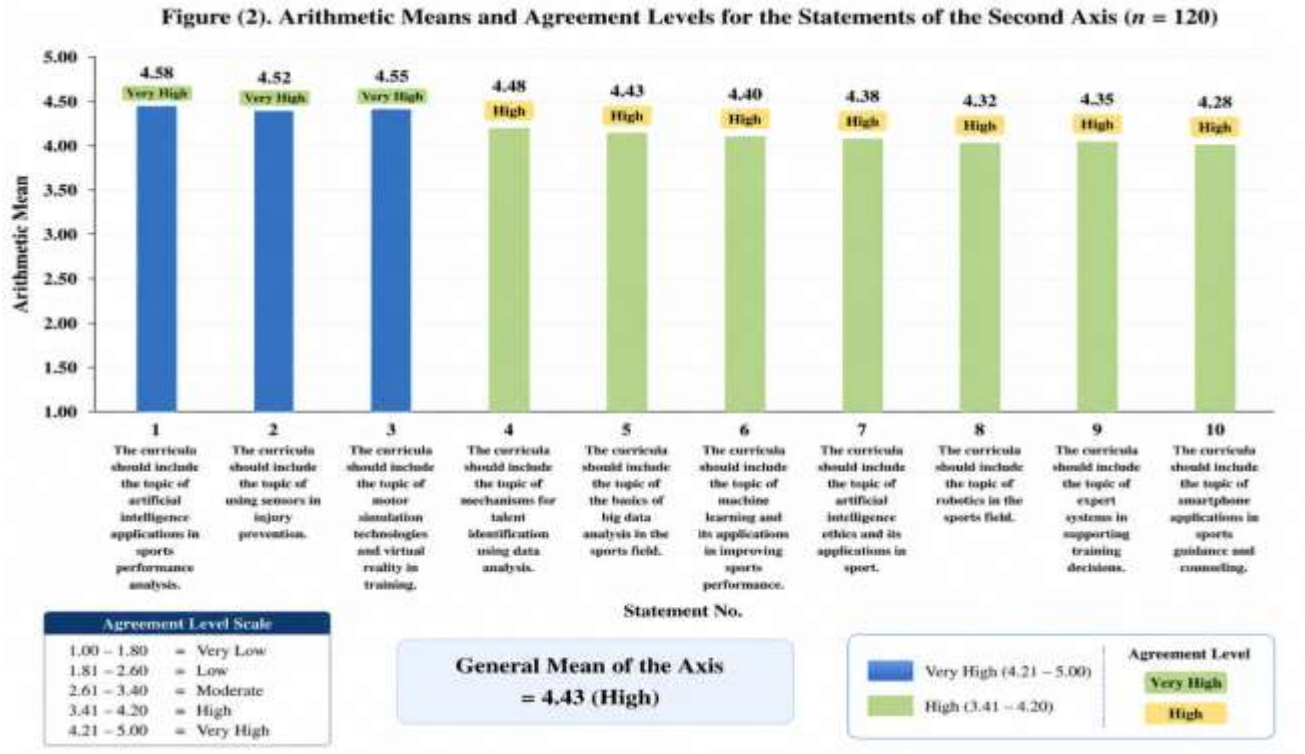
The constant dependency on conventional skill-based curricula.

The poor technological and digital infrastructure capabilities.

The insufficiency of specialized training for faculty members.

4.2 Artificial Intelligence Concepts That Should Be Included in Physical Education Curricula

Table (6) Arithmetic Means, Standard Deviations, Rankings, and Agreement Levels for the Statements of the Second Axis (n = 120)



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As shown by the results in figure (2), the sample members agreed on the high importance of including artificial intelligence concepts in physical education curricula, as the general mean stood at 4.43. This shows a clear awareness of the global changes happening in the sports field towards intelligent data-based systems.

The statement on the use of artificial intelligence applications in sports performance analysis is at 1st rank with a mean score of 4.58. The growing importance of artificial intelligence and intelligent analytical technologies in sports training and the improvement of efficiency in technical decision-making is known to participants.

A mean score value of 4.55 was also assigned to motor simulation technologies and virtual reality, which shows that participants are becoming more aware of the importance of interactive environments in motor learning.

Results show evident enthusiasm towards sensors and injury prevention. This is a confirmation of the fact that the contemporary outlook of physical education has witnessed a gradual shift. It is being regarded as an integrated system for technology, health and scientific analysis and not merely limited to performance.

The study of Gonzalez et al. (2020) confirms that utilizing artificial intelligence in sports activities helped to enhance participation, motivation, and quality of learning. Thus, these findings corroborate each other. They also concur with the findings of Inventado and Baker (2014), which claimed that machine learning has become an efficient tool for analyzing sports performance and extracting educational patterns.

The results are also consistent with recent trends which indicate that future sports education must incorporate intelligent analysis, virtual reality, and big data technologies in order to equip the graduates for interaction with the digital sports labour market.

The researcher believes that this low level has occurred due to a number of factors, the most important of which are:

1. The novelty of artificial intelligence concepts in Arab sports specializations.
2. The persistence of traditional skill-based curricula.
3. The available equipment and digital frameworks may not be adequate to suit the needs.
4. The weakness of specialized training for faculty members.

4.3 Requirements for Developing Curricula for Physical Education Based on the Concepts of Artificial Intelligence

Table (5) Arithmetic Means, Standard Deviations, Rankings, and Agreement Levels for the Statements of the Third Axis (n = 120)

No.	Statement	Arithmetic Mean	Standard Deviation	Rank	Agreement Level
1	Developing technological infrastructure	4.62	0.54	2	Very High
2	Training faculty members	4.68	0.51	1	Very High
3	Developing a national strategic plan	4.55	0.58	3	Very High
4	Preparing specialized human cadres	4.52	0.60	4	Very High
5	Providing sufficient budgets	4.48	0.63	5	High
6	Providing digital learning resources	4.45	0.65	6	High
7	Establishing research and technical partnerships	4.40	0.68	8	High
8	Amending academic regulations	4.42	0.66	7	High
9	Encouraging scientific research	4.38	0.70	9	High
10	Holding conferences and workshops	4.35	0.72	10	High
	General Mean of the Axis	4.49	0.63		High

The findings indicated that the axis with the highest mean of 4.49 was the Requirements axis for Curriculum Development. This shows that respondents are convinced that curriculum development is a total institutional process that goes beyond content alteration.

The highest ranked mean was for training faculty members at 4.68, confirming the participants' awareness that digital transformation is driven by the teacher.

The second area for improvement was with score 4.62 on developing the technological infrastructure, which shows the need for a conducive learning environment for applications of artificial intelligence.

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According to Lazem et al. (2024), the success of artificial intelligence-supported education requires the readiness of the institution as well as the continuous qualification of the academic staff.

Recent literature confirms that investments in human capital precede technical investments when it comes to the implementation of digital transformation in education.

The researcher believes that the students' opinions reflect advanced awareness, as real development begins with:

1. Human resource development.
2. Updating systems and regulations.
3. A flexible and sustainable technological environment.

4.4 The Future Skills Development of Students and the Role of Developed Curricula

Table (6) Arithmetic Means, Standard Deviations, Rankings, and Agreement Levels (n = 120)

No.	Statement	Arithmetic Mean	Standard Deviation	Rank	Agreement Level
1	Developing critical thinking	4.52	0.61	2	Very High
2	Enhancing creativity and innovation	4.48	0.63	4	High
3	Improving digital literacy	4.55	0.58	1	Very High
4	Developing self-learning	4.45	0.65	6	High
5	Developing data analysis	4.50	0.62	3	Very High
6	Enhancing teamwork	4.42	0.67	7	High
7	Developing flexibility and adaptability	4.47	0.64	5	High
8	Increasing self-efficacy	4.40	0.68	8	High
9	Qualification for the labor market	4.38	0.70	9	High
10	Future thinking	4.35	0.72	10	High
	General Mean	4.45	0.65		High

Those curricula that are developed according to artificial intelligence concepts are expected to contribute to future skills development significantly, according to the results, as the general mean value reached 4.45.

The topmost item was boosting digital literacy, as the respondents are aware that success in today's sports world requires advanced digital competencies.

Skills related to critical thinking and data analysis also ranked among the highest indicators, which signifies students' shift in perception from rote-based learning to learning based on exploration and decision-making.

The results corroborate those of the OECD (2021), which classified digital skills and critical thinking as essential skills for the future. They also agree with the study of Al-Mohammadi (2020), which proved the effectiveness of smart learning environments in developing future learning competencies.

4.5 Overall Results of the Questionnaire Axes

Table (7) Arithmetic Means and Standard Deviations for the Questionnaire Axes

Axis	Mean	Standard Deviation	Rank	Agreement Level
Reality of Current Curricula	2.48	0.91	4	Moderate
Artificial Intelligence Concepts	4.43	0.66	3	High
Development Requirements	4.49	0.63	1	High
Developing Future Skills	4.45	0.65	2	High
General Mean	3.96	0.71		High

The findings uncover a gap between the existing curriculum reality and the required future orientations. Despite the low ratings of the existing curricula, the high levels of agreement on the concepts and development requirements of artificial intelligence certainly confirm the existence of a real will to reconstruct the physical education curricula in a way that is more compatible with the requirements of digital education.

Results indicate that the success of this transformation requires integration among content development, staff qualification and the provision of a technological environment, in order to ensure the graduation of sports cadres capable of competing in the knowledge economy.

5. Conclusions

1. The research that was done proved that the reality of the current physical education curricula does not keep pace with the requirements of the digital age on a relative level, as this axis was evaluated at a moderate level tending low.
2. The findings indicated a weak embedding of artificial intelligence concepts and modern digital technologies in the current curriculum, particularly in the fields of sports performance analysis and data analysis.
3. According to the study conducted, there was a high level of agreeability among the sample members on the

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importance of including concepts of artificial intelligence in physical education curricula as a future educational and professional imperative.

4. The findings reveal that training faculty members and developing the technological infrastructure system represent two major essentials for successful implementation of the curriculum development process.

5. The study confirmed that the development of curricula with regard to artificial intelligence will contribute to developing students' future skills, especially digital literacy, critical thinking, data analysis and decision-making.

6. The results indicate that there is an existing gap between the reality of the curricula and the requirements of the digital sports labor market. This calls for the adoption of a comprehensive developmental framework.

6. Recommendations

1. Physical education curricula should be redeveloped in accordance with the requirements of digital transformation and the use of artificial intelligence tools.

2. Incorporating content related to artificial intelligence systematically within subjects such as sports performance analysis, machine learning, and sports data analysis.

3. Continuously train and qualify faculty members to improve their competence in using intelligent technologies in the educational process.

4. Developing digital infrastructure and providing software and educational laboratories supporting the application of artificial intelligence.

5. Relating physical education curricula outcomes to the demands of the future labor market, therefore contributing to the acquisition of students' future skills.

6. Encouraging scientific research and academic and technical partnerships in the field of artificial intelligence and physical education.

Study Limitations

The study was limited to first-year students from the Department of Physical Education and Sports Sciences at the University of Mosul.

The sample size was relatively small (n = 45), which may limit the generalizability of the findings.

Only four basic football skills were examined.

The intervention lasted six weeks, and long-term retention was not evaluated.

Researchers' Contributions

Ahmed Yousef Hamdan solely conceived and designed the study, reviewed the relevant literature, developed the research instrument, collected and analyzed the data, interpreted the findings, prepared the proposed framework, and wrote and approved the final manuscript for publication.

Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of this research.

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Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical Considerations

The study was conducted in accordance with accepted ethical standards for educational research. Participation was voluntary, and all participants were informed about the objectives of the study before completing the questionnaire. Confidentiality and anonymity of responses were ensured, and the collected data were used solely for scientific research purposes.

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