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Identifying and Explaining the Factors Affecting Transformation in the School Physical Education System

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ABSTRACT

Objective: The objective of this study was to identify and explain the key components for enhancing the quality of physical education in Iranian schools, with an emphasis on contemporary educational conditions and environmental transformations.

Methods: This study adopted a qualitative approach using thematic analysis. In the first phase, semi-structured interviews were conducted with 10 experts in the field of education and physical education, including university faculty members, education administrators, physical education teachers, and educational policy specialists. Participants were selected through purposive sampling. Qualitative data were analyzed using thematic analysis, leading to the extraction of organizing and basic themes. In the second phase, the identified themes were validated and prioritized using the Fuzzy Delphi technique. Two Delphi rounds were conducted, crisp values were calculated for each theme, and differences between the mean values of the two rounds were analyzed.

Results: The qualitative analysis resulted in the identification of 14 organizing themes and numerous basic themes. Findings from the Fuzzy Delphi process indicated that themes such as development of physical education strategic programs, linkage between industry and schools in physical education, and physical education skill enhancement showed a relative decrease in priority in the second round. In contrast, themes including implementation of modern educational provisions, entrepreneurial physical education, and alignment of physical education with up-to-date standards demonstrated an increasing trend in prioritization.

Conclusions: The findings suggest that physical education in schools requires a fundamental transformation in educational content, teaching methods, and alignment with labor market needs and technological advancements. Based on the results, recommendations are proposed for revising educational policies, empowering physical education teachers, and designing future-oriented educational programs to improve the overall quality of physical education in schools.

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Introduction

The physical education system in schools, as one of the fundamental pillars of the educational system, plays a crucial role in the holistic development of students. This field not only contributes to the development of physical abilities but also significantly influences the enhancement of psychological, social, and cultural skills (Bailey et al., 2023). Given the numerous challenges confronting educational systems in the 21st century—such as increased physical inactivity among younger generations, the expansion of digital lifestyles, and rising mental health risks—the need to review and transform the structure and content of school physical education has become more pressing than ever (Hollis et al., 2017).

Transformative change in physical education requires fundamental shifts at multiple levels, including policymaking, curriculum planning, teaching methods, sports infrastructure, and society's cultural perspective on physical activity and health (Green et al., 2025). In this regard, identifying the factors that can facilitate such transformation is of great importance—factors that may range from macro-level influences such as Ministry of Education policies to micro-level elements such as teachers' attitudes and parental involvement.

An examination of successful global experiences reveals that transformation in school physical education is not possible without changing attitudes and reconstructing traditional structures. Countries that have managed to view physical education as a tool for achieving holistic education have succeeded in promoting students' physical and mental health alongside the development of their cognitive and social skills (Kirk et al., 2022). In such systems, physical education is no longer considered merely a recreational or marginal activity; rather, it has become an integral part of the formal education process.

In Iran, despite occasional emphasis in upstream policy documents such as the Fundamental Transformation Document of Education, physical education still faces major challenges, including a shortage of sports facilities, a lack of specialized teachers, and the absence of purposeful assessment. Moreover, a one-dimensional view of physical education as merely a means for releasing students' energy has prevented the true educational value of this subject from being fully recognized within the teaching–learning process (Nazari et al., 2017). Therefore, accurately identifying key transformative factors represents an important step toward redefining and modernizing current approaches.

Another essential component in transforming physical education is the use of modern educational technologies. Wearable technologies, sports applications, virtual reality, and physiological data analysis can all contribute to improving physical education instruction and assessment (Casey & Goodyear, 2015). However, effective implementation of these tools requires teacher training, appropriate digital infrastructure, and supportive policies from educational institutions.

Furthermore, the active participation of students in the design and implementation of physical education programs can enhance their sense of belonging, motivation, and responsibility. Research indicates that the more students are involved in selecting their physical activities and movement goals, the greater their satisfaction, sustained participation in sports, and educational impact (Blodgett et al., 2023). Therefore, transformation in physical education should not be solely top-down but must rely on the active participation of stakeholders—particularly students and teachers. Some studies indicate that the lack of comprehensive planning, shortages of specialized personnel, an instrumental view of physical education, and neglect of modern approaches such as integrated or technology-based physical education are among the main barriers to transformation in this field (Casey & Goodyear, 2015). Conversely, countries that have pursued targeted, research-based reforms in physical education structures have witnessed significant improvements in health indicators, sports participation, and the development of life skills among students (Borgen & Hallås, 2024; Tannehill et al., 2021).

This article aims to present a comprehensive model of transformative factors in school physical education by conducting an in-depth analysis of expert perspectives and examining field experiences. It is expected that the research findings will not only enrich the theoretical literature but also provide a practical foundation for policy reform, curriculum design, and human resource development. Given that the future of education and the health of future generations are directly linked to the quality of school physical education, this study can make a meaningful contribution to the sustainable development of the national education system.

One of the fundamental pillars of a country’s development is its education system. For this reason, this sector holds exceptional importance, as it serves both as a critical tool for development and as one of its primary objectives. In many countries, the establishment and operation of educational systems have become routine and well-documented processes, with substantial portions of public budgets and private expenditures allocated annually to this sector. With the growing recognition

of education as a strategic factor in enhancing national development, the analysis and evaluation of educational policies have gained considerable importance (Bell & Stevenson, 2006; Sarghini et al., 2023).

Given that the ultimate goal of sports sciences is the holistic growth and development of individuals and societies across social, economic, psychological, and physical dimensions, emphasis is placed on the application of knowledge from various disciplines, including basic sciences, sociology, economics, management, psychology, and health-related sciences. Currently, departments and faculties of physical education operate in several main fields, such as sport management, motor development, pathology and corrective exercises—including disability studies—and more recently in areas such as sports biomechanics and sports psychology (Cheron, 2015; Zhao, 2024).

Educational (instructional) sport seeks to provide the necessary foundations, create appropriate environments, and offer equal learning opportunities so that all learners can be placed in healthy educational settings. By responding to their needs, it aims to develop programs that strengthen the body in accordance with growth principles and stages while remaining aligned with spiritual and moral development. In essence, physical education teaches students how to integrate movement and physical activity into their daily lives, adopt active and healthy lifestyles, and develop in ways that enable them to respond appropriately to social challenges.

Achieving the objectives of physical education courses at the secondary school level depends on several factors, including curriculum design, instruction, assessment, consideration of students' diverse interests and needs, equipment, facilities, resources, and the learning environment. The curriculum is a collection of topics that defines both what should be taught and the methods by which teaching should occur (how and when). The physical education curriculum derives from its educational objectives in schools. In Iran, curricula are centrally developed, and schools are required to implement them; however, this implementation has often fallen short of meeting the expectations of the primary stakeholders of these programs.

Physical education is one of the fundamental foundations for the growth and development of children and adolescents, as it provides the basis for lifelong participation in physical activities aimed at achieving physical and mental health (Moemeni Piri et al., 2015). On the other hand, the first step toward establishing a healthy society and institutionalizing a culture of sport and physical

activity begins in schools. Consequently, the attention of individuals, organizations, and international agencies to physical education in schools has increased to such an extent that Article 1 of the UNESCO Charter recognizes physical education and sport as a fundamental right of all children and adolescents, which must be supported through the provision of opportunities for practice within the education system. As a result, in response to the efforts of international agencies to reform physical education policies, responsible governmental organizations around the world have revised—or are in the process of revising—their educational policies in schools (Aghaei et al., 2021; Hashemi et al., 2021).

The primary innovation of this study lies in identifying and explaining the transformative factors of physical education in schools through the use of qualitative methods and the integration of theoretical perspectives with field-based insights—an approach that has thus far received limited comprehensive attention in both domestic and international literature. Unlike most previous studies that have focused solely on the physical or technical dimensions of physical education, this research adopts a systemic, participatory, and future-oriented approach, emphasizing the interconnections among components such as educational policymaking, emerging technologies, student participation, and teachers' professional development. The theoretical gap addressed by this study stems from the absence of a comprehensive and context-specific model for explaining transformative factors in Iranian school physical education. While strategic policy documents emphasize fundamental transformation, the existing literature has failed to establish a coherent link between macro-level educational objectives and the practical realities of physical education implementation—an issue this study seeks to address.

Material and Methods

In terms of purpose, this study is classified as applied research, and in terms of nature, it adopts an exploratory mixed-methods approach (qualitative–quantitative), implemented through qualitative thematic analysis and quantitative fuzzy Delphi techniques. In the first phase, thematic analysis was employed to identify the dimensions and components influencing transformation in the school physical education system. This analysis was conducted based on semi-structured interviews with experts in the field of physical education.

The statistical population in the qualitative phase consisted of senior administrators and expert educational specialists with substantial experience in school physical education. Sampling at this stage was non-probabilistic and purposive, aiming to ensure data richness and diversity. Based on theoretical saturation, it was anticipated that approximately 10 experts would participate in the interviews. The selection criteria included more than ten years of managerial experience in the education sector and a background in authorship or research related to physical education.

In the quantitative phase, the fuzzy Delphi method was applied. For this purpose, 10 experts—either additional experts or the same participants from the qualitative phase, subject to their willingness to continue cooperation—were included in the Delphi process. The fuzzy Delphi technique was used to screen and achieve consensus on the most important factors extracted from the thematic analysis. At this stage, expert judgments were assessed using triangular fuzzy scales (three-point scales: low, medium, high).

Data Collection Instruments

In the qualitative phase, the primary data collection instrument was a semi-structured interview guide, with questions designed based on theoretical foundations and a review of the research literature. The interviews were audio-recorded and subsequently transcribed verbatim. In the quantitative phase, a fuzzy Delphi questionnaire was used, consisting of a set of components identified during the qualitative phase. Responses to each item were measured using fuzzy linguistic scales (e.g., very low to very high). After data collection, fuzzy averaging techniques and alpha-cut calculations were employed to establish consensus on the final components.

Data Analysis

To identify the fundamental components and factors influencing transformation in the school physical education system, the qualitative phase of the study was conducted using thematic analysis. Thematic analysis is a well-established qualitative research method that enables researchers to extract and interpret meaningful conceptual patterns and themes through in-depth examination of textual data, primarily derived from interviews. In this study, the six-phase framework proposed by Braun and Clarke (2006) was employed.

The analysis process began with semi-structured interviews conducted with 10 school administrators, senior experts, and educational specialists. Participants were selected purposively based on criteria such as managerial experience, familiarity with educational concepts, and

experience in addressing environmental and organizational challenges. Interviews were conducted both in person and online, recorded with participants' consent, and transcribed verbatim.

Following transcription, the analysis phase commenced. Initially, the researcher familiarized themselves with the data through repeated and careful reading of the texts, and initial codes were generated based on key concepts and significant expressions. Subsequently, similar and related codes were merged, and preliminary themes were identified. These themes were reviewed and refined across multiple stages to ultimately develop a coherent, valid, and conceptually robust structure for explaining the factors influencing transformation in the school physical education system.

The thematic analysis in this study was conducted using an inductive (data-driven) approach, meaning that themes were derived directly from the interview data without reliance on predefined theoretical frameworks or assumptions. However, in the final interpretation stage, the findings were compared with the existing theoretical literature and previous studies to ensure theoretical coherence and credibility.

The final themes were coded and visualized using qualitative analysis software and organized into an initial conceptual model, which was then prepared for entry into the quantitative phase (fuzzy Delphi). The output of this qualitative phase consisted of a set of key components and indicators that served as the basis for designing the questionnaire used in the fuzzy Delphi stage.

Results

Thematic analysis, as one of the most widely used methods in qualitative research, begins with an in-depth familiarization with the data. This stage forms the foundation of the entire analytical process and plays a critical role in guiding subsequent phases. In the present study, the first stage of thematic analysis involved a careful and repeated review of the interview transcripts conducted with 10 administrators and experts in physical education. These participants were selected purposively based on criteria such as professional expertise, experience, and familiarity with financial and environmental issues related to the field.

At this stage, all interviews were audio-recorded and meticulously transcribed verbatim, and the raw interview texts were prepared for analysis. The purpose of this phase was to gain a deep understanding of participants' perspectives, experiences, and perceptions regarding the concept of

transformative development in school physical education when responding to environmental and contextual challenges. Through repeated readings of the texts, the researcher searched for significant words, sentences, key phrases, and meaningful patterns, striving to grasp the overall tone and underlying meanings present in the data.

Throughout this process, the researcher documented analytical notes reflecting initial impressions, salient points, and recurring patterns, which later facilitated the initial coding stage. These notes contributed to the development of an analytical mindset and played an important role in identifying both shared perspectives and divergent viewpoints among participants. This phase enabled the researcher to access not only the explicit concepts expressed by participants but also the implicit and latent layers of meaning embedded in their statements—an essential step for extracting valid and applicable themes in subsequent stages.

Furthermore, this phase laid the groundwork for identifying preliminary relationships among key concepts and issues raised by the experts, which later informed the development of the study's initial theoretical framework. Following careful and repeated examination of the transcribed interview texts, a set of preliminary concepts and understandings emerged that were frequently observed across participants' statements. These concepts reflected the experts' shared understanding of the fundamental components of transformative change and were identified in the form of initial meaning patterns.

Table 1. Selected Interview Excerpts by Participant

No.	Interviewee Code	Interview Excerpts
1	Interviewee 1	One of our main challenges is the lack of a transformation-oriented framework in policymaking. Physical education programs in schools are often repetitive and traditional and are not designed in line with the needs of today's students. We need to move away from top-down policymaking and adopt a participatory approach that involves teachers, students, and even parents in program design. Transformation occurs when programs are flexible, localized, and evidence-based.
2	Interviewee 2	We face shortages of sports facilities, proper equipment, suitable clothing, educational space, and even moral support. Many times, we cannot maintain students' motivation because we lack tools and space. Transformation becomes meaningful only when physical education is viewed as a core subject, not merely a break or a way to fill time.
3	Interviewee 3	The problem with our school physical education system is the absence of a research-based approach to content design. Our programs are still based on approaches from the 1990s. If transformation is to occur, it must be grounded in field data, accurate needs assessments, and analyses of students' movement behaviors within local contexts.
4	Interviewee 4	I like sports, but physical education classes are always repetitive—just football or volleyball. We don't learn anything new. If our PE teachers received better training and introduced more diverse activities, we would be more motivated to participate. Once an external coach came and taught us new stretching exercises; that was the best PE class we ever had.

5	Interviewee 5	I always ask my son what he learned in PE class today, and most of the time he says, "We just played with a ball." I believe transformation in physical education must start with teacher training and continue through purposeful planning. In addition, schools should actively involve parents in the physical education process, such as through sports counseling sessions or family-based physical activity programs.
6	Interviewee 6	We are still not using the potential of technology in physical education. Movement-monitoring applications, performance assessment systems, or even augmented reality could transform PE classes. If we want transformation, technology must be integrated into PE lessons as a learning tool, not limited to theoretical classrooms.
7	Interviewee 7	Parental participation in physical education is almost nonexistent. Schools usually contact us only during festivals or competitions. However, if health and physical activity education sessions were held for families, we could also contribute to our children's learning. Real transformation happens when collaboration between families and schools is strengthened.
8	Interviewee 8	Over the years, I have seen teachers become exhausted because professional development opportunities are weak. We need retraining. In-service courses are often outdated and impractical. If transformation is to occur, teachers must first be empowered—both scientifically and psychologically.
9	Interviewee 9	Our schools are required to implement a national program that applies the same model to everyone. However, differences in climate, culture, and human resources must be considered in planning. Transformation should be based on educational equity and reduced centralization. Physical education in northern regions differs greatly from that in southern or eastern regions of the country.
10	Interviewee 10	One major weakness of school physical education is the disconnect between formal education and professional sports pathways. Talented students do not know how to progress. If schools could collaborate with clubs and federations, transformation in talent identification and development would occur. Currently, there is a significant gap between schools and professional sports.

Stage Two: Coding and Theme Identification

At this stage, the interview data collected in the first phase were broken down into smaller units of information, referred to as *codes*. These codes consist of words, phrases, or sentences that convey specific meanings relevant to the research objectives. Initial coding was conducted to enable deeper analysis of the data and to facilitate the extraction of key concepts and themes. Through this process, similar and related codes were grouped together, forming basic themes. These basic themes were then organized into higher-order organizing themes, which ultimately led to the identification of overarching (global) themes. This hierarchical thematic structure provided a systematic framework for explaining the transformative factors in school physical education.

Thematic Categorization

Global Theme: Enhancement of Physical Education Training Policies and Programs

Organizing Theme: Development of Modern Physical Education Training Frameworks

Basic Themes:

- Creating the necessary foundations for modern physical education training

- Adequate education and practical preparation of students with physical education concepts for appropriate participation in the labor market
- Transfer of essential physical education knowledge
- Greater emphasis on physical education through the use of modern instructional methods
- Development of long-term learning skills
- Teaching advanced thinking and higher-level approaches
- Utilization of modern educational models and teaching methods

Organizing Theme: Development of Innovative Physical Education Training Tools

Basic Themes:

- Appropriate educational tools for physical education
- Training in relevant educational software at undergraduate levels
- Inadequacy of school equipment during the course of study (e.g., number of classes, computers, projectors, etc.)

Organizing Theme: Alignment of Physical Education Training with Updated Standards

Basic Themes:

- Alignment of educational content with current physical education standards
- Harmonization of national curricula with international physical education programs
- Development of educational programs aligned with societal needs
- Alignment of selected educational content with physical education standards

Organizing Theme: Linking Schools with the Sports Industry

Basic Themes:

- Consideration of the needs of the sports industry
- Internship programs to enhance students' skills
- Skill-based internships within the sports industry

Organizing Theme: Development of Strategic Physical Education Plans

Basic Themes:

- Formulation of strategic and long-term plans in physical education
- Development of strategic plans by educational departments
- Appropriate goal setting for physical education training
- Strong commitment to implementing physical education strategies

Organizing Theme: Skill Development in Physical Education

Basic Themes:

- Necessity of training communication and ethical skills
- Emphasis on specialized physical education skills
- Development of strategic programs to reduce gaps between students' current skills and labor market requirements
- Basic administrative and cost-related physical education skills
- Analytical skills, system design, and consulting abilities

Global Theme: Enhancement of Teaching Quality and Educational Standards in Physical Education

Organizing Theme: Instruction Aligned with Contemporary Developments in Physical Education

Basic Themes:

- Adequate education and preparation of students
- Emphasis on instruction aligned with required regulations
- Recruitment of young and elite instructors in physical education
- Training and development of specialized and competent human resources to meet the needs of industries and organizations
- Educating individuals knowledgeable about laws, regulations, and physical education standards
- Participatory learning methods
- Teaching through modern technologies
- Providing domestic and international research opportunities for faculty to update knowledge

Organizing Theme: Identification of Physical Education Standards

Basic Themes:

- Identification of standards related to physical education courses
- Review and analysis of modern physical education standards

Organizing Theme: Quantity and Quality of Instructors

Basic Themes:

- Sufficient number of instructors for teaching physical education courses

- Alignment of physical education content with global developments
- Use of modern teaching methods instead of traditional approaches in physical education instruction

Global Theme: Enhancement of Educational and Research Content in Physical Education

Organizing Theme: Specialization of Educational Content

Basic Themes:

- Identification of prerequisites for responding to identified demands in physical education within curricula
- Creation of a demand-driven educational system based on societal needs
- Definition of specialized disciplines and development of their syllabi
- Incorporation of modern physical education concepts into curricula
- Inclusion of digitally oriented physical education in curricula
- Integration of artificial intelligence–based physical education in curricula
- Consideration of environmentally oriented physical education in curricula

Organizing Theme: Attention to Students' Future Employment

Basic Themes:

- Identification of labor market needs in physical education
- Identification of industry and business market demands in physical education

Organizing Theme: Focus on Outcomes

Basic Themes:

- Identification of required outputs of physical education
- Improvement of physical education course content and student selection mechanisms

Organizing Theme: Students' Career and Employment Prospects

Basic Themes:

- Acquisition of competencies required to assume physical education responsibilities
- Lack of sufficient qualifications for employment in public and private physical education sectors
- Preparation of students for practical work environments
- Preparation for entry into complex labor markets

Organizing Theme: Entrepreneurial Physical Education

Basic Themes:

- Promotion of entrepreneurial thinking and creativity in specialized physical education courses
- Research-oriented approaches in physical education training
- Emphasis on the active and transformative role of physical education in society
- Attention to perceptual gaps between students and teachers
- Strong school participation in fostering entrepreneurial growth in physical education
- Transition from traditional physical education to entrepreneurial physical education
- Provision of value-added physical education services in the market
- Organizational roles and individual and group interactions
- Problem solving and implementation of research projects
- Personal responsibility, social skills, and group process development

Stage Three: Elaboration of Dimensions and Components

The enhancement of physical education training policies and programs, as one of the key themes, emphasizes the necessity of transforming educational structures and instructional tools. Measures such as the adoption of modern teaching methods, equipping schools with technological tools and applied software, and aligning instruction with international standards indicate that the physical education system requires fundamental revision in order to adapt to contemporary developments. This theme is also manifested in the need to establish connections between education and the sports industry and to formulate long-term strategies, highlighting the importance of strategic planning and precise goal setting.

The second theme, enhancement of teaching quality and educational standards in physical education, focuses on the quality of human resources and the structural organization of educational content. The recruitment of young instructors, continuous scientific updating through domestic and international study opportunities, and the use of modern educational technologies are among the prominent components of this dimension. Furthermore, emphasis is placed on aligning educational content with international standards and upgrading teaching methods from traditional

to modern approaches, in line with strengthening participatory and demand-driven learning models.

The third theme addresses the enhancement of educational and research content in physical education, adopting a specialization-oriented perspective toward physical education courses. In this regard, the development of need-based curricula is identified as one of the key innovations highlighted in this study. Additionally, identifying labor market needs and defining specialized disciplines are considered effective mechanisms for bridging the gap between academic education and the real needs of society.

The fourth axis focuses on students' future career prospects and entrepreneurial physical education. This theme emphasizes the development of practical skills, industry-based internships, and empowering students to play effective roles in the labor market. Physical education is no longer viewed solely as skill-oriented; rather, it must also move toward value creation and entrepreneurship. Accordingly, fostering creativity, personal responsibility, social skills, and participation in group activities has gained particular importance.

The theme of skill enhancement in physical education highlights the teaching of soft skills such as communication and ethical competencies, while also emphasizing the gap between existing skills and labor market requirements. Training in complementary skills such as basic administrative competencies, system analysis, and consulting further underscores the need for physical education to move beyond a single-dimensional perspective toward a multi-skilled and interdisciplinary approach.

Quantitative Phase of the Study

Definition of Linguistic Variables

At this stage, following the interviews with sample members and the identification of dimensions and components, a questionnaire was designed to obtain experts' opinions regarding their level of agreement with the identified components. Experts expressed their level of agreement using linguistic variables including *very low*, *low*, *moderate*, *high*, and *very high*.

Given that individuals' diverse characteristics influence their mental interpretations of qualitative variables, defining clear ranges for these qualitative variables ensures that experts respond to the questions with a shared conceptual understanding. Accordingly, these linguistic variables were

defined in the form of triangular fuzzy numbers, as illustrated in the corresponding figure and table.

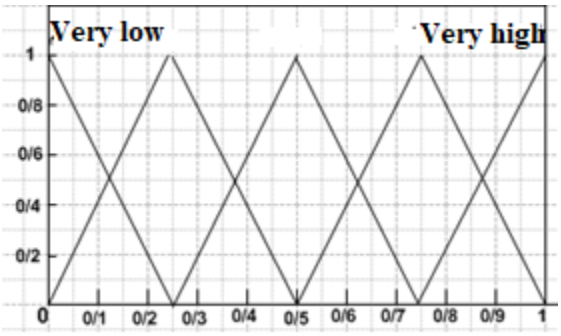

Figure 1. Definition of Linguistic Variables

Table 2 presents the method for converting linguistic variables into triangular fuzzy numbers and their corresponding defuzzied (crisp) values.

Table 2. Triangular Fuzzy Numbers

Linguistic Variables	Triangular Fuzzy Number	Defuzzied (Crisp) Value
Very High	(0.75, 1, 1)	0.75
High	(0.50, 0.75, 1)	0.5625
Moderate	(0.25, 0.50, 0.75)	0.3125
Low	(0, 0.25, 0.50)	0.0625
Very Low	(0, 0, 0.25)	0.0625

It should be noted that after matching each indicator with fuzzy values and assigning a linguistic level, fuzzy numbers must be converted into definite quantitative (crisp) values through a process known as *defuzzification*. In the fuzzy literature, several methods have been proposed for this purpose, including the centroid (center of gravity), mean of maxima, and minimum–maximum methods.

One of the commonly used approaches in this context is the Minkowski formula, through which fuzzy numbers are transformed into crisp values. The Minkowski relation is expressed as follows, where β represents the upper bound of the triangular fuzzy number, **α** denotes the modal (middle) value, and m indicates the lower bound of the triangular fuzzy number.

(b) Validation of Organizing Themes

At this stage, after identifying the themes, a decision-making group consisting of experts related to the research topic was formed. Questionnaires were then distributed to determine the relevance

of the identified indicators to the main research subject and to screen them accordingly. The linguistic variables presented in Table 5 were used to express the importance of each indicator.

Following the identification of influential criteria, the validation and screening of indicators were conducted by comparing the acquired value of each indicator with the threshold value S~\tilde{S}S~. The threshold value is determined based on the subjective judgment of the decision maker and directly affects the number of factors retained after screening. There is no simple or fixed rule for determining the threshold value.

First-Round Survey

At this stage, the researchers presented the identified themes to experts in the form of a questionnaire. The degree of experts' agreement with each component was collected, and their proposed and corrective comments were summarized. Accordingly, based on the proposed weighting scheme and the defined linguistic variables, the results obtained from analyzing the constrained responses in the questionnaire were examined to calculate the fuzzy mean of the components.

To calculate the fuzzy mean, the following relationships were used. In this study, **0.7** was considered as the threshold value. First, the triangular fuzzy values of experts' opinions were calculated. Then, to compute the mean of the opinions of 15 respondents, the fuzzy average was determined. The calculation of the fuzzy number τ~\tilde{\tau}τ~ for each indicator was performed using the following equations:

(1)τ~ij=(aij,bij,cij),i=1,2,…,nj=1,2,…,m(1)\quad \tilde{\tau}_{ij} = (a_{ij}, b_{ij}, c_{ij}), \quad i = 1,2,\ldots,n \quad j = 1,2,\ldots,m(1)τ~ij=(aij,bij,cij),i=1,2,…,nj=1,2,…,m (2)aj=∑aijn(2)\quad a_j = \frac{\sum a_{ij}}{n}(2)aj=n∑aij (3)bj=∑bijn(3)\quad b_j = \frac{\sum b_{ij}}{n}(3)bj =n∑bij (4)cj=∑cijn(4)\quad c_j = \frac{\sum c_{ij}}{n}(4)cj=n∑cij (5)Crisp=a+b+c3(5)\quad \text{Crisp} = \frac{a + b + c}{3}(5)Crisp=3a+b+c

In the above equations, index **i** refers to the expert, and index **j** refers to the decision indicator. The defuzzified value of the mean fuzzy number was then calculated using the above relationship.

Finally, in the consensus stage and completion of the fuzzy Delphi process, if the difference between the mean values of two consecutive fuzzy Delphi rounds is less than 0.1, the fuzzy Delphi procedure is considered complete.

Table 3. First-Round Survey Results

Variables	Very High	High	Moderate	Low	Very Low
Development of modern physical education instructional provisions	2	3	3	5	2
Development of modern physical education instructional tools	4	7	2	1	1
Alignment of physical education with up-to-date standards	2	7	5	0	1
Industry–school linkage in physical education instruction	1	11	2	1	0
Development of physical education strategic programs	4	8	2	1	0
Skill enhancement in physical education	4	8	2	1	0
Instruction aligned with environmental and contextual changes in physical education	4	5	3	3	0
Specialization of instructional content	7	2	3	2	1
Identification of physical education standards	5	4	3	3	0
Quality and quantity of coaches	1	10	3	1	0
Attention to students' future employment	2	6	3	2	2
Attention to outcomes and achievements	9	2	2	0	2
Students' future career and employment prospects	4	8	2	1	0
Entrepreneurial physical education	4	8	2	1	0

When the number of responses for each indicator was determined, and after applying the Minkowski formula to calculate the triangular fuzzy mean of each factor, the defuzzied (crisp) values for each factor were calculated. The results of the fuzzy averaging and defuzzification of the components are presented in Table 4.

Table 4. Mean Expert Opinions from the First-Round Survey

Organizing Themes	β	α	m	Crisp Value
Development of modern physical education instructional provisions	0.771	0.500	0.313	0.528
Development of modern physical education instructional tools	1.000	0.854	0.563	0.806
Alignment of physical education with up-to-date standards	1.000	0.813	0.521	0.778
Industry–school linkage in physical education instruction	1.146	0.854	0.542	0.847
Development of physical education strategic programs	1.208	0.958	0.625	0.931
Skill enhancement in physical education	1.125	0.958	0.625	0.903
Instruction aligned with environmental changes in physical education	0.938	0.688	0.417	0.681
Specialization of instructional content	0.917	0.813	0.583	0.771
Identification of physical education standards	0.896	0.771	0.542	0.736
Quality and quantity of coaches	1.229	0.896	0.542	0.889
Attention to students' future employment	1.021	0.729	0.438	0.729
Attention to outcomes and achievements	1.083	0.958	0.688	0.910
Students' future career and employment prospects	1.042	0.729	0.417	0.729
Entrepreneurial physical education	1.125	0.958	0.625	0.903

After completing the first-round survey, it is necessary to conduct the second round so that the results obtained from both rounds can be compared and a final conclusion can be reached.

Second-Round Survey

Table 5 presents the results of the responses given to each factor in the second-round survey.

Table 5. Organizing Themes | Second-Round Survey Results

Organizing Themes	Very High	High	Moderate	Low	Very Low
Development of modern physical education instructional provisions	2	4	7	1	1
Development of modern physical education instructional tools	9	2	2	1	1
Alignment of physical education with up-to-date standards	5	5	2	1	2
Industry–school linkage in physical education instruction	7	2	4	1	1
Development of physical education strategic programs	4	3	4	1	3
Skill enhancement in physical education	1	7	4	2	1
Instruction aligned with environmental changes in physical education	4	5	3	2	1
Specialization of instructional content	4	2	3	3	3
Identification of physical education standards	6	2	3	2	2
Quality and quantity of coaches	2	7	0	3	3
Attention to students' future employment	6	1	4	4	0
Attention to outcomes and achievements	9	1	3	1	1
Students' future career and employment prospects	2	8	5	0	0
Entrepreneurial physical education	6	6	1	2	0

After determining the number of responses given to each factor in the second round and calculating the triangular fuzzy mean for each factor, the Minkowski formula was applied to compute the defuzzied (crisp) values for each component. The results of the fuzzy averaging and defuzzification of the factors in the second round are presented in Table 6.

Table 6. Mean Expert Opinions from the Second-Round Survey

Organizing Themes	β	α	m	Crisp Value
Development of modern physical education instructional provisions	0.625	0.729	0.438	0.597
Development of modern physical education instructional tools	0.958	0.917	0.688	0.854
Alignment of physical education with up-to-date standards	1.063	0.854	0.563	0.826
Industry–school linkage in physical education instruction	0.833	0.708	0.417	0.653
Development of physical education strategic programs	0.938	0.771	0.458	0.722
Skill enhancement in physical education	1.063	0.708	0.438	0.736
Instruction aligned with environmental changes in physical education	1.021	0.833	0.521	0.792
Specialization of instructional content	0.896	0.625	0.333	0.618
Identification of physical education standards	0.979	0.646	0.396	0.674
Quality and quantity of coaches	1.021	0.667	0.417	0.701
Attention to students' future employment	1.063	0.729	0.438	0.743
Attention to outcomes and achievements	1.083	0.958	0.667	0.903
Students' future career and employment prospects	1.042	0.875	0.563	0.764
Entrepreneurial physical education	1.104	0.958	0.646	0.917

Table 7. Difference Between Defuzzied Mean Values (Crisp Values) in the First and Second Rounds

Organizing Themes	Crisp Value (Round 1)	Crisp Value (Round 2)	Difference (Round 2 − Round 1)
Development of modern physical education instructional provisions	0.528	0.597	0.069
Development of modern physical education instructional tools	0.806	0.854	0.048
Alignment of physical education with up-to-date standards	0.778	0.826	0.048
Industry–school linkage in physical education instruction	0.847	0.653	−0.194
Development of physical education strategic programs	0.931	0.722	−0.209
Skill enhancement in physical education	0.903	0.736	−0.167
Instruction aligned with environmental changes in physical education	0.806	0.792	−0.014
Specialization of instructional content	0.771	0.618	−0.153
Identification of physical education standards	0.736	0.674	−0.062
Quality and quantity of coaches	0.889	0.701	−0.188
Attention to students' future employment	0.729	0.743	0.014
Attention to outcomes and achievements	0.910	0.903	−0.007
Students' future career and employment prospects	0.729	0.764	0.035
Entrepreneurial physical education	0.861	0.917	0.056

The results presented in Table 7 indicate that during the fuzzy Delphi analysis process, experts' perceptions regarding various themes of physical education in schools underwent noticeable changes. Some components exhibited an increase in crisp values in the second round, reflecting their growing importance and enhanced expert consensus. Notable examples include the development of modern physical education instructional provisions (increase of 0.069), entrepreneurial physical education (0.056), students' future career and employment prospects (0.035), and attention to students' future employment (0.014). These changes suggest that experts' perspectives increasingly emphasize innovation, entrepreneurship, and preparing students for labor market entry.

Conversely, several components experienced a decrease in crisp values, which may reflect reassessment, uncertainty, or shifts in expert prioritization. The largest declines were observed in the development of physical education strategic programs (−0.209), industry–school linkage in physical education instruction (−0.194), and the quality and quantity of coaches (−0.188). These reductions may indicate implementation challenges or structural constraints associated with these components.

Some components remained relatively stable, suggesting a high initial level of consensus and sustained recognition of their importance, such as attention to outcomes and achievements (−0.007) and instruction aligned with environmental changes in physical education (−0.014).

Overall, the analysis reveals that from the experts' perspective, the priorities of physical education have shifted toward components that emphasize educational innovation, adaptability to contemporary changes, entrepreneurship, and future-oriented student employment. Accordingly, educational policymakers should prioritize strengthening components such as modern instructional tools, entrepreneurial approaches, contemporary educational provisions, and alignment with students' future career pathways, while simultaneously addressing the operational and infrastructural limitations associated with components that showed declining consensus.

Discussion

In the present study, an attempt was made to identify, explain, and prioritize the various dimensions associated with enhancing physical education in schools using thematic analysis and the fuzzy Delphi technique. In-depth interviews with experts in physical education and educational administration revealed multifaceted themes, each representing a fundamental need in the transformation of physical education. These themes, ranging from the development of modern instructional provisions to entrepreneurial physical education, and from content specialization to attention to students' future careers, all stem from current realities and forward-looking necessities of the educational system. To validate and prioritize these components, a two-stage fuzzy Delphi approach was employed. The results indicated that some components showed an increase in crisp values in the second round, particularly elements such as "development of modern physical education instructional provisions," "entrepreneurial physical education," and "attention to students' future careers." This increase reflects that the expert community, after further reflection and interaction, recognized the importance of these components more strongly. This suggests that physical education should move beyond traditional frameworks toward innovative designs emphasizing skill acquisition, employability, and practical application. The growing importance of physical education as a platform for personal development, social intelligence, and even entrepreneurship has established a unique place for it in the long-term vision of the educational system.

On the other hand, some themes experienced a decrease in crisp values in the second round, such as “development of physical education strategic programs,” “industry–school linkage,” “quality and quantity of coaches,” and “content specialization.” This decline may be due to implementation challenges, policy ambiguity, or insufficient infrastructure to achieve these goals. Realizing these objectives likely requires long-term planning, allocation of financial and human resources, and alignment of existing structures with transformative goals. Meanwhile, some components, such as “attention to outcomes” and “instruction aligned with environmental changes,” remained largely unchanged. This stability indicates a relatively consistent consensus among experts regarding their importance. In other words, these components, as fundamental elements, have the potential to play a central role in the design and implementation of transformative strategies. Overall, it can be concluded that school-based physical education requires a fundamental redefinition—one that simultaneously addresses students’ physical, mental, social, and psychological needs while situating physical education within economic and employment contexts of the future. Educational programs should be designed to strengthen physical health, creativity, competitive spirit, and collaborative skills, preparing students for effective participation in society and potential entry into specialized professional and entrepreneurial fields within sports. Achieving these objectives necessitates a revision of curricular content, enhancement of teachers’ capabilities, strengthening connections with the sports industry, utilization of modern technologies, and institutional and policy support at the macro level. Only through these measures can physical education serve as a cornerstone for sustainable development, human growth, and educational equity.

To enhance the quality of physical education, it is recommended that schools implement necessary provisions for the use of modern instructional methods, including virtual reality, gamification, and interactive teaching within the curriculum. Simultaneously, innovative and technological tools for physical education, such as activity monitoring applications, exercise design software, and performance analysis systems for students, should be developed and integrated into schools. The curriculum content for physical education should be reviewed and updated in line with international standards to meet the physical, psychological, and social needs of the new generation. Communication channels between schools and the sports industry—including clubs, federations, and sports enterprises—should be strengthened to establish skill- and employment-oriented pathways for students during their academic years. Strategic programs and macro-level policies

for school-based physical education should be designed collaboratively with experts, teachers, and policymakers to ensure coordination and coherence in implementation. Specialized skill development courses for physical education teachers are recommended to enhance their competencies in modern teaching methods, sports psychology, and individual training. Furthermore, the physical education curriculum should be designed to respond to environmental, social, and technological changes, preparing students for future life and work conditions. The process of content specialization should also be tailored to students' age groups, physical abilities, and psychological needs to promote more effective and targeted learning. Additionally, the recruitment, training, and evaluation of physical education teachers should be redesigned and institutionalized based on scientific and ethical standards to elevate teaching quality. Finally, school-based physical education should adopt an entrepreneurial approach, equipping students with knowledge of sports business, club management, content creation, and relevant vocational skills.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the ethics committee of Islamic Azad University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection, and analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

Aghaei, N., Elahi, A., & Dehghan, A. (2021). Designing Physical Education Extracurricular Activity Management in Iran. *Research on Educational Sport*, *9*(23), 17–44.

Bailey, C. P., Lowry, M., Napolitano, M. A., Hoban, M. T., Kukich, C., & Perna, F. M. (2023). Associations between college/university physical activity requirements and student physical activity. *Research quarterly for exercise and sport*, *94*(2), 485–492.

Bell, L., & Stevenson, H. (2006). *Education policy: Process, themes and impact*. Routledge.

Blodgett, J., Mitchell, J., Stamatakis, E., Chastin, S., & Hamer, M. (2023). Associations between the composition of daily time spent in physical activity, sedentary behaviour and sleep and risk of depression: compositional data analyses of the 1970 British cohort Study. *Journal of affective disorders*, *320*, 616–620.

Borgen, J. S., & Hallås, B. O. (2024). Global Problems and/or Local Solutions: Teaching and Learning Physical Education in the Wake of OECD Education 2030. *Nordic Studies in Education*, *44*(3), 193–209–193–209.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, *3*(2), 77–101.

Casey, A., & Goodyear, V. A. (2015). Can cooperative learning achieve the four learning outcomes of physical education? A review of literature. *Quest, 67*(1), 56–72.

Cheron, G. (2015). From biomechanics to sport psychology: the current oscillatory approach. In (Vol. 6, pp. 1642): Frontiers Media SA.

Green, K., O'Hare, D., Twist, S., & Vecchione, H. (2025). Challenges related to pupil participation in physical activity and sport outside lessons: What can be done in physical education that might increase young people's participation in physical activity and sport beyond school. In *Maximising Learning in Physical Education* (pp. 164–178). Routledge.

Hashemi, S. H., Khatibi, A., Hojabrnia, Z., & Alam, S. (2021). A comparative study of physical education curriculum in Iranian high schools with selected countries (USA, Germany, Australia, Japan). *JETT*, *12*(3), 10–20.

Hollis, J. L., Sutherland, R., Williams, A. J., Campbell, E., Nathan, N., Wolfenden, L., Morgan, P. J., Lubans, D. R., Gillham, K., & Wiggers, J. (2017). A systematic review and meta-analysis of moderate-to-vigorous physical activity levels in secondary school physical education lessons. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 52.

Kirk, H. E., Richmond, S., Cornish, K., & Spencer-Smith, M. (2022). The role of age, cognitive ability, and ADHD symptoms on outcomes of attention training in primary school children. *Journal of Cognitive Enhancement*, *6*(2), 170–182.

Moemeni Piri, S., Hashemi Afosi, M., Rezaeinasab, A., Noroozi, S., Maghboli, S., & Babai Mazreno, A. (2015). The effects of physical education course on mental health of students in Bu-Ali Sina University, Hamedan-Iran. *Journal of Pediatric Perspectives*, *3*(2.1), 67–73.

Nazari, H., Jafari, S. E. M., Isfahani, A. R. N., & Marandi, S. M. (2017). Evaluation of Current Condition of Physical Education Curriculum of Iranian High Schools and the Prescribed Strategies to Improve Its Overall Situation Based on Expertise Ideas and Viewpoints. *Higher Education Studies*, *7*(3), 80–92.

Sarghini, A., Talebi, B., & Hoseinzade, O. (2023). Elements of the educational policy model in schools (a systematic review). *Journal of Education and Health Promotion*, *12*(1), 42.

Tannehill, D., Demirhan, G., Čaplová, P., & Avsar, Z. (2021). Continuing professional development for physical education teachers in Europe. *European Physical Education Review*, *27*(1), 150–167.

Zhao, F. (2024). The Application of Sports Biomechanics in Sports Injury Prevention and Rehabilitation. *Frontiers in Sport Research*, *6*(3), 142–147.