O R I G I N A L   A R T I C L E

Analyzing the Effective Components of Information and Communication Technology in the Process of Improving the Performance of Physical Education Teachers: A Qualitative Study

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A B S T R A C T

Background: The aim of the present research was to identify and analyze the effective components of information and communication technology in the process of improving the performance of physical education teachers.

Methods: The current qualitative research was carried out in two stages. In the first stage, in order to collect data from reliable national and international databases, a systematic review was used based on Silva method. After screening the articles, 25 scientific national and international articles were considered for research literature review. In the second stage, to achieve theoretical saturation, the phenomenological method was used to extract people's lived experiences, and 10 physical education specialists with master and PhD degrees were selected to conduct interviews. The results from both stages were coded in three open, axial and selective codes.

Results: Based on the findings, 16 components of the effectiveness of information and communication technology in improving the performance of physical education teachers, as well as 1 component related to the effective use of technology in the physical education curriculum were obtained. The results of the phenomenology of the interviewees' lived experiences were also presented in 3 codes: the advantages, obstacles and solutions of using information and communication technology in the physical education curriculum.

Conclusions: results showed that the use of information and communication technology by physical education teachers has improved their performance and teaching skills in many ways. Since new and innovative knowledge, skills and teaching methods are particularly important for the progress of physical education teachers and the use of them lead to the achievement of the educational purposes, it is necessary to consider comprehensive and practical programs to implement this issue.

Introduction

One of the educational institutions that is considered as one of the most important institutions in any society is the education organization, which is responsible for the education of people and the source of extensive social, political, economic and cultural changes [1]. In fact, education is the basic pillar of the development, and the education of people is considered as a kind of national investment, and any country that makes more efforts in this regard will undoubtedly benefit from comprehensive growth and development in the near future [2]. For this reason, addressing the issues of education and trying to identify and strengthen the key elements that are effective in its success or failure is one of the responsibilities of researchers and scholars [3]. In this regard, it should be mentioned that teachers play a main role in the education system of the society and influence different individuals with their speech and behavior as a role model for educators [4]. [5] In the book "Lasting experiences of successful teachers", mentions teachers as the most influential factor in the classroom and says that they should be aware of the important role they play in the lives of their students. Research has repeatedly shown that effective teachers are one of the most important factors that contribute to the success and academic progress of students in schools [5]. Therefore, teachers are considered a key component in the progress of students, and the basic focus of the educational system of any country should be based on their professional development, and it can be said that in today's era, one of the necessities of professional growth and development is teachers and their information and communication technology literacy [6]. Information and communication technology has been creating dynamic changes in society through increasing the amount of knowledge sharing and also increasing the flow of information and communication [2] and has affected all aspects of life, and these effects are felt more in schools [7]. For this reason, many countries have invested in the field of information and communication technology to achieve optimal education and are willing to use technology to achieve the best and latest teaching methods [8]. The fact is that the increasing use of information and communication technology in education has led to the use of innovative learning models [9] and has changed teachers' traditional methods to new methods as being facilitators and trainers. Therefore, information and communication technology has become a main method of education in many countries and is becoming a very important learning tool for the professional development of teachers [10]. The educational system and teachers of our country are not exempt from this rule. Countries of the world should make fundamental changes in their educational systems in order not to fall behind this fast pace and benefit from the advantages of the information and communication era [11]. One of the subjects whose teaching methods need to be updated in accordance with other subjects and information and communication technology should be taken into consideration in its teaching is physical education [12]. Physical education and sports are an integral part of education and a means to achieve the mental health of the young generation. It should not be assumed that physical education is a worthless and trivial matter and only provides entertainment for children and teenagers. On the contrary, it should be considered as an important part of life activities. Physical education, as one of the branches of education, plays an important role in the process of

physical and mental growth of students. Therefore, it is regarded as one of the main courses in different countries and its curricula are regularly reviewed and modified [13]. Physical education curriculum is the only curriculum subject that focuses on integrating physical skills with value-based learning and communication, therefore, it should never be neglected [14]. But nowadays, most of the people involved in physical education in schools believe that physical education has not found its original and real place in schools' program and is not implemented at an optimal level. Perhaps, it can be said that teachers' lack of innovation is one of the reasons for the uniformity of physical education lessons in schools, because having innovation is very important for the progress of education. One of the actions that improve the educational innovation of physical education teachers is the use of modern technologies. In other words, physical education teachers in inappropriate conditions in terms of facilities and technology will inevitably lean towards traditional educational systems, which can disrupt the education process [15]. Familiarity with information and communication technology in physical education includes the use of educational software needed in the field of sports and the use of modern technological tools in education. Research studies have also shown that familiarization of physical education teachers with information technology makes them more dynamic; therefore, the learning cycle will become more dynamic and active, and teachers will be able to acquire more competencies [16]. Examining the experiences of the educational system of developed countries also shows the importance they attach to the use of information and communication technology in physical education. For example, according to the standard of the American Health and Physical Education Association, physical education teachers must plan and implement learning experiences that require students to use technology appropriately to achieve their short or long-term goals. Also, in their opinion, including technology in the physical education curriculum is a way to increase its effectiveness (such as measuring activities using a pedometer) [17]. In the educational system of Singapore, it is also believed that the use of information and communication technology is in line with the needs of the 21st century learners and also enables teachers to go beyond the traditional teacher-centered approaches such as exercises and explanations in education. Therefore, in Singapore in recent years, there has been a significant increase in the number of technological tools available to teachers (such as heart rate monitors, pedometers, mobile phone apps, etc.) [18]. All these cases show the valuable and superior position of information and communication technology in the curriculum of physical education and highlight the necessity of examining this issue. The review of the literature of the current study shows that the issue of the effectiveness of information and communication technology in the performance of teachers and its importance in the physical education curriculum has been the focus of researchers in this field. In their research, [19] concluded that the use of information and communication technology by teachers is very important to keep them up-to-date and provide the best learning experiences to students. Also, they pointed out that information and communication technology had a positive effect on academic performance and students' participation in the teaching-learning process. [20] concluded in their study that the integration of multimedia technologies in physical education lessons has a positive impact on the development of creative thinking among physical education teachers. On the other hand, in their research study, [21] showed that advertising, media and information technology are considered as effective factors in the development of student sports in Khorasan Razavi. [16] Also stated in their study that educational tools and aids, including educational technology, had a special place in the education process. They considered the basic purpose of educational technology to facilitate, develop and strengthen the learning and teaching process. In their research, [22] identified and expressed system capability, individual empowerment, knowledge sharing, and

interaction with the environment, learning sharing, financial resources and content production as components of learning technology in education. The research findings of [23] indicated that teachers should be encouraged to use new methods of teaching physical education in order to increase media literacy. [24] Also acknowledged that technology and communication have the greatest effect on the empowerment of physical education teachers in the study of the factors affecting the empowerment of physical education teachers. [25] In their research concluded that the existence of a positive attitude in teachers towards information and communication technology had a direct relationship with their use of technology in education. They also pointed out that teachers should be encouraged to develop an interest in the integration of information and communication technology in teaching and receive training to increase their efforts in this regard. In their research, [15] examined the effective factors in improving the educational innovation of physical education teachers and reached the conclusion that, along with other factors, the use of new technologies also improved the educational innovation of physical education teachers. [26, 27] found in their study that the use of educational tools such as pedometers as well as mobile phone applications had a significant effect in promoting a healthy lifestyle for students and the acquisition of knowledge and concepts was increased by them. [28] Also confirmed the theoretical importance of physical education teachers' understanding (that is, perceived ease, perceived usefulness, and perceived behavioral control) of technology and their attitude in predicting their future intention in using technology. It is also shown that environmental factors (management expectations and technical support) played an important role in influencing their use of technology. The research findings of [29] also showed that teaching the use of information and communication technology to physical education teachers was necessary to facilitate learning and educational innovation for disabled students. In their research, [30] reached the conclusion that the use of video recording and taking videos of students' performance increased their success in physical education. In another research, [16] considered one of the competence indicators of student physical education teachers to be familiar with information technology and it included the use of software required in the field of sports, the use of modern technology and the use of modern tools. The findings of [31] showed that teachers had a positive opinion of sharing their knowledge through information and communication technology. [32] Considered technological qualifications as one of the qualifications of physical education teachers and said that physical education teachers should be more media and technology literate and familiar with the different software and hardware. They should pay more attention to sports training and use educational media such as videos and pictures to teach the desired techniques. [33] Also pointed out in their research that the intelligent use of new technologies in the formal education system was one of the goals of the fundamental transformation document and filled the digital gap between educational areas and costs. The results of [34] showed that there was a significant relationship between information and communication technology with knowledge management and its components, as well as listening and feedback components of communication skills in physical education teachers. Therefore, to increase the knowledge of management and communication skills of physical education teachers, it seems necessary to pay more attention to information and communication technology. [15] Showed that the use of information and communication technology in the physical education lesson made students show more interest and attention to the relevant courses and a high level of interaction with their peers. In his research, [35] examined the mental ideas of physical education teachers regarding the integration of information and communication technology in sports and the 8 fields of student, teaching, teacher, equipment, computer literacy, classroom management, brought up social interactions and innovation and modern education under the influence of this action. In his

research, [36] emphasized the necessity of including technological facilities in educational activities and stated that to achieve this goal, compact discs related to the desired content should be presented to physical education teachers and in this process, educational projectors, CDs, etc. should be used. Also, he takes for granted the success of students in lessons that are supported by audio-visual tools. The review of the literature of the current research shows that there are a few research studies that investigate the effective components of information and communication technology from various aspects such as teaching methods, classroom management, educational innovation, etc. on the performance of physical education teachers. The present study intends to identify and introduce the effective components of information and communication technology to improve the performance of physical education teachers and to provide solutions for the effective use of new technologies in this regard. In other words, the current research seeks to answer whether the use of information and communication technology is effective in the process of improving the performance of physical education teachers or not?

Material and Methods

Considering that the number of subjects in phenomenological studies often varies from 5 to 25 [37],10 interviewees answered the interview questions, 4 of them were women and 6 of them were men. 7 of them had PhD degree, 1 was a PhD student, and 2 had a MA degree. Field of study of the first interviewee with 13 years of experience was physical education and sports sciences majoring in physiology. The field of study of the second interviewee with 21 years of experience was sport management. The field of study of the third interviewee with 24 years of experience was dynamic behavior. The field of study of the fourth interviewee with 23 years of experience was management of sports events. The field of study of the fifth interviewee with 13 years of experience was management of sports facilities. The field of study of the sixth interviewee with 18 years of experience was sport management. The field of study of the 7th interviewee with 5 years of experience was sport physiology. The field of study of the 8th interviewee with 12 years of experience was corrective movements and sports pathology. The field of study of the 9th interviewee with 21 years of experience was sport physiology. The field of study of the 10th interviewee with 16 years of experience was sport physiology. To collect data, a systematic review method was used according to Silva's method. Systematic review method is one of the qualitative research methods which is used to investigate phenomena and identify categories based on research literature, theoretical foundations and accessible scientific databases. Considering the rich literature and scientific articles which were obtained on this subject, the researchers tried to identify, classify and summarize the underlying categories of the studied phenomenon in four stages according to Silva's method: 1- Identifying and extracting articles from scientific databases and removing duplicate records, 2- Screening articles through studying the title and abstract of the extracted articles and selecting related articles and removing unrelated articles, 3- Re-screening and studying the introduction and conclusion of the screened articles in the previous stage and selecting the related articles and removing unrelated articles and 4- Final evaluation of the extracted articles. The findings were identified in the first stage, so that the search for research literature was done through reliable national and international databases, and for this purpose, scientific documents written from 2015 onwards were reviewed to check the theoretical and practical bases of the research and according to the determined criteria, 125 articles and books were extracted and after screening, 25 valid national and international articles were considered for research literature review. In the second step, the phenomenological method was used in order to obtain people's lived experiences and rich findings in the field of effective components of

information and communication technology from the views of physical education specialists. Phenomenology in general is the study of the lived experience with the world of life and is concerned with the world as lived by a person, not the world with a reality that is separate from humans[38]. In other words, phenomenology is a research-oriented approach through which the researcher searches for the structure or the revealed essence of people's lived experiences of a phenomenon and finds integrated meanings that reveal the essence of the phenomenon.

Protocol

Before conducting the interview, the necessary coordination had been done with all the interviewees and the time of the interview was based on the schedule of the interviewees and the aims of the current research had been determined for them. For this purpose, a complete research process was designed to ensure that the research process is free of bias and the experiences of physical education specialists are not contaminated with the researchers' preconceptions and prior knowledge. the specifications (including gender, field of study, degree, and work history) of physical education specialists who participated in the interview of this research were presented. To obtain accurate and valid data, experts in the field of physical education with master and a PhD degrees (preferably a specialized doctorate) who have teaching experience in schools and universities and had sufficient scientific and practical qualifications, were invited to answer the research questions.

Training Intervention

In the present study, the participants were assured about protecting their identity, giving them sufficient information about the research and keeping the information confidential. In addition, according to the recommendation of researchers in this field, all participants were fully assured to erase all databases such as tape recordings, all manuscripts, and other related items after the analysis was completed. In explaining the findings, it can be stated that using information and communication technology in education is inevitable and necessary in today's era. Because it provides information expansion and easy and low-cost access to new information for individuals who are involved in education, including teachers and students. Therefore, this issue requires special attention and like developed countries, there should be comprehensive and practical programs in our country for the application of new technologies in education. Unfortunately, very little attention has been paid to this important issue in physical education lessons, which can be due to various reasons, including the fact that physical education lessons are not taken seriously in schools and the lack of attention of teachers, students, parents and etc. The lack of use of technology by physical education teachers will ultimately lead to a decrease in their knowledge of modern training and educational methods and their effectiveness will clearly decrease. On the other hand, as stated above, the use of information and communication technology has improved the performance and skills of physical education teachers in many ways and facilitated the achievement of the goals of this lesson to a great extent. Also, it can be said that the classroom will be attractive place for students when teachers have new ideas to implement, and information and communication technology plays a very important role in learning these ideas, as well as implementing a part of these ideas in the physical education lesson depends on technological facilities and equipment, including software, tools and educational aids. In this way, all these points show the importance of information and communication technology in education and training and it is a powerful tool for improving the quality and efficiency of education and through transforming the traditional methods and views about education and training. Furthermore, in the dynamic environment of physical education lessons, new skills, knowledge and learning methods are necessary to progress, and a large part of these things can be achieved through information and communication technology. Among the limitations of this research, the following can be

mentioned: lack of cooperation of the interviewees, limitation of space and time. In this regard and for the effective use of information and communication technology in the curriculum of physical education, the following suggestions are presented:

1. Courses and practical workshops related to information and communication technology should be held for physical education teachers with the use of professors who are scientifically expert and have sufficient practical experience.

2. Necessary space and facilities such as classrooms and sports halls equipped with technological equipment should be provided by the government for physical education teachers in schools, and if the necessary facilities are not available, the capacities of virtual space and various messengers should be used to compensate this deficiency.

3. Necessary support, enough interest and motivation to use information and communication technology should be provided for physical education teachers to improve their teaching skills and classroom management.

4. By holding various sports competitions and festivals for physical education courses, teachers' motivation to use new technologies will increase.

5. The school staff, including its management and assistants, should gain knowledge about the objectives of the physical education lessons and cooperate with the physical education teachers in order to provide technological facilities.

6. The traditional view of teachers and other school staff regarding the teaching methods of physical education should be modified and global experiences should be used in order to use educational software and hardware in this lesson. Therefore, since in today's era, information and communication technology takes the first place in all fields, and the field of education is not an exception, it is recommended that researchers focus on investigating the effective components of information and communication technology in improving the performance of teachers of other subjects and provide solutions for teachers to use this type of technology as much as possible.

Research Procedure

In the first step, in order to collect data, a systematic review was used according to Silva's method. Systematic review method is one of the qualitative research methods which is used to investigate phenomena and identify categories based on research literature, theoretical foundations and accessible scientific databases. This study used a systematic method to identify, classify and summarize the underlying categories of the studied phenomenon in four stages according to Silva's method which are as follows: 1. Identifying and extracting articles from scientific databases and removing duplicate records, 2. Screening articles by studying the title and abstract of the extracted articles and selecting related articles and removing unrelated articles, 3. Re-screening and studying the introduction and conclusion of the screened articles in the previous stage and selecting related articles and removing unrelated articles and 4. Final evaluation of the extracted articles. To do this, reliable national and international databases and scientific documents written from 2015 onwards were reviewed to check the theoretical and practical bases of the research. According to the determined criteria, 125 articles and books were extracted and after screening, 25 valid national and international articles were selected for research literature review. In the second step, the phenomenological method was used in order to obtain people's lived experiences and rich findings in the field of effective components of information and communication technology from the views of physical education specialists, which by using the phenomenological method, in-depth knowledge of the experts' experiences in the field of physical education with master and PhD degrees were investigated. Phenomenology in general is the study of the lived experience with the

world of life and is concerned with the world as lived by a person, not the world with a reality that is separate from humans [38].

Instruments

To collect data in two stages, systematic review and phenomenological methods were used. Also, the important instrument used in the current research was the interview and coding of the three-stages. The interview was conducted by experts in this field. The reliability was measured by analyzing and coding the data by an experienced and independent researcher and comparing it with the researchers' own analysis. For this purpose, a complete research process was designed to ensure that the research process was free of bias and the obvious experiences of physical education specialists were not contaminated with the researchers' preconceptions and prior knowledge. In the present study, the subjects were assured about protecting their identity, giving them sufficient information about the research and keeping the information confidential.

Data Analysis

The findings were identified in the first stage, so that the search for research literature was done through reliable national and international databases, and for this purpose, scientific documents written from 2015 onwards were reviewed to check the theoretical and practical bases of the research and according to the determined criteria, 125 articles and books were extracted and after screening, 25 valid national and international articles were selected for research literature review. In the second step, the phenomenological method was used in order to obtain people's lived experiences and rich findings in the field of effective components of information and communication technology from the point of view of physical education specialists, which by using the phenomenological method, in-depth knowledge of the experts' experiences in the field of physical education with master and PhD degrees were investigated. Phenomenology in general is the study of the lived experience with the world of life and is concerned with the world as lived by a person, not the world with a reality that is separate from humans [10]. According to the theoretical saturation of the components, a total of 10 participants from the field of physical education were selected to conduct the interview and were interviewed until the saturation of the findings. Data collection was done through a semi-structured interview. At first, as the researchers emphasized, an effort was made to establish a mutual trust between the interviewees and the researchers. The interviews were conducted face-to-face, at participants' workplaces and in educational centers, and in a relatively quiet atmosphere. A tape recorder was used to record the interviews, and after the end of each interview, all the content of the interview was noted verbatim. The interviews continued until the classifications and themes were revealed and the information reached saturation. Despite the fact that there is a possibility of subjectivity and researcher's views in qualitative studies including phenomenology, it was tried to be neutral towards the subject with some kind of the problem of researcher bias should be tackled. Considering that the process of data analysis in phenomenology requires a strong interaction between the reader and the text, for the data analysis in the present study, Colazzi analysis method, which includes 9 steps (description of the phenomenon of interest by the researcher, reading all the descriptions of the participants of the phenomenon, extracting the main sentences from the original manuscripts, recounting the main meanings of each sentence, organizing the total meanings formed in a cluster of classes, writing a comprehensive description by the researcher, returning it to the participants to compare with their descriptions of the phenomenon and the modification and changes of the findings in case of new data in the stage of change) was used [33]. Then, the codes and categories were organized. In the next stage, by combining all the inferred main and sub-categories, a complete and comprehensive description of the details of the studied phenomenon was obtained. Consequently, the results of

the systematic review included 16 components of the effectiveness of information and communication technology in improving the performance of physical education teachers, as well as 1 component related to the effective use of technology in the physical education curriculum. The results of the phenomenology of the interviewees' lived experiences were also obtained in 3 themes: advantages, obstacles and solutions of using information and communication technology in the physical education curriculum [26]. It was also tried to achieve the scientific accuracy and strength of the research findings through the three capabilities of verification, validity and trust. The ability to verify was obtained by comparing with the research literature, staying faithful to the phenomenological research method throughout the study and continuously monitoring the research from the beginning to the end, using a sufficient and appropriate sample and continuing the interviews until the saturation of the resulting data is reached. The reliability was measured by analyzing and coding the data by an experienced and independent researcher and comparing it with the researchers' own analysis, as well as giving the results of the analysis to the participants and getting their opinions [39]. In addition, according to the recommendation of researchers in this field, all subjects were fully assured to erase all databases such as tape recordings, all manuscripts, and other related items after the analysis was completed became.

Results

In table 1, the titles of the selected studies, the year of publication and authors regarding the effective components of information and communication technology were mentioned, after summarizing and classifying these studies in table 3, the results were classified and coded.

Table 1. Studies conducted regarding the effective components of information and communication technology in the process of improving the performance of physical education teachers

Name of authors and year of publication	The title of the research
[40]	Investigating the effective role of various elements in information technology on education teachers
[41]	Identifying effective factors on the development of physical education and student sports (Study case: Khorasan Razavi)
[42]	Analyzing the effective factors of successful online teaching in the classroom: a phenomenological analysis
[16]	Identifying the competence indicators of student teachers of physical education and the relevant factors affecting it
[24]	Identifying contextual factors affecting the empowerment of physical education teachers
[15]	Investigating effective factors on improving the educational innovation of physical education teachers
[23]	Identifying the mental patterns of experts regarding the effective factors on increasing the level of media literacy of physical education teachers in virtual education due to the corona epidemic
[43]	The role of educational technology in teaching and learning of students in school and social environments
[22]	Identifying the components of learning technology in education
[28]	The decision of physical education teachers to use technology in education: application of the theory of planned behavior model
[30]	The points of teachers and students regarding the use of educational technology in physical education
[31]	Identifying and validating factors affecting teachers' knowledge sharing through information and communication technology (ICT).
[44]	The effect of the effectiveness of the use of sagacious boards on the curriculum elements based on the technology acceptance model

[33]		Designing the model of empowerment of physical education teachers with the approach of vision document 1404 of the Islamic Republic of Iran
[32]		Designing a model of professional qualifications and characteristics of physical education and sports teachers
[34]		The relationship between information technology and knowledge management and communication skills of physical education teachers
[19]		Impact of classroom environment, teacher competency, information and communication technology resources, and university facilities on student engagement and academic performance
[20]		Development of creativity in physical education teachers using interactive technologies: involvement and collaboration. Education and Information Technologies
[25]		Integration of information and communication technology in teaching: Initial perspectives of senior high school teachers in Ghana
[26]		The efficacy of using mobile applications in changing adolescent girls physical activity behaviour during weekends
[27]		Academic Effects of the use of Flipped learning in physical education
[29]		Physical Education Teachers and their ICT Training Applied to Students with Disabilities
[35]		Physical education teachers' subjective theories about integrating information and communication technology (ICT) into Physical education
[15]		Integration of Information and Communication Technology and Pupils Motivation in a Physical Education setting
[36]		The abilities of physical education teachers in educational technologies and multimedia

Table 2. Coding the theoretical bases of the effective components of information and communication technology in the process of improving the performance of physical education teachers

Selective coding	Axial coding	Open coding
Effective components of information and communication technology in improving the performance of physical education teachers	teaching methods	Demonstrating more competencies in education, innovation by using modern technologies in teaching, the possibility of presenting and understanding the content better, the possibility of using new teaching methods, deepening learning, more understandable teaching, and theology alone, absence of teachers in the classroom, better preparation of the content of physical education courses, providing the best learning experiences to students.
	Student performance	More mastery of students on sports skills by increasing their motivation, improving critical thinking in students, improving problem solving in students, activating students in the learning cycle, providing the possibility of learning through different senses, improving the ability of students to work as a team, better participation of students in teaching and learning, the positive impact of ICT on the academic performance of students, improving the intelligence of students through technology.
	Interaction and communication skills	Improving teachers' listening components, improving teachers' feedback, increasing internal and external interactions, the possibility of interacting and exchanging information with colleagues in the field of physical education, the possibility of using the experiences of national and international researchers, showing a high level of student interaction, with peers, the possibility of global connection, exchange of information between teacher and student at a distance.
	Access to resources	The possibility of communication and access to the findings of student sports in advanced countries, the ease of access for teachers to the

	global Internet network, easy access to information sources, easy access to facilities for better learning, creating a suitable mechanism for optimal and intelligent use, using the capabilities of virtual space such as forming a group and using the new educational resources of the world.
Professional development of teachers	The growth and improvement of teacher education, increasing the effectiveness of teacher education, more dynamism of teachers, increasing the knowledge of teachers in all areas of physical education, originality-part of lifelong education, information elites of physical education teachers, knowledge enhancement and promotion teacher training program, retraining of physical education teachers and increasing their job skills, increasing critical thinking skills and critical understanding of physical education teachers from the media, turning knowledge into ability with intelligence, familiarizing teachers with educational software and hardware.
Knowledge sharing	The willingness of teachers to share knowledge through ICT for the success of themselves and their colleagues, the interest of teachers in learning new knowledge and updating information, the possibility of collaborative decision-making with the help of other teachers, paying attention to the past experiences of teachers in using ICT, benefit ¬Taking teachers' knowledge and experience of each other, bridging the digital gap between educational areas, effective communication with higher authorities and other schools, facilitating cooperation and teamwork among teachers.
The quality of the teaching-learning process	Applying the use of ICT to add quality to students' sports activities, high quality ICT-based educational content, using high-quality multimedia content for education, increasing the success of students by filming their performance, improving Visual learning of skills through technology, making the learning cycle more dynamic and active, increasing educational efficiency in terms of quantity and quality, facilitating and accelerating learning.
Environmental factors	Enrichment of learning environments, diversity of space, bringing the spirit of vitality and vitality to the classroom.
Emotional and motivational factors	Strengthening the motivation and effort and innovation of teachers in the curriculum of physical education, increasing the motivation and interest of students, increasing the internal motivation of students by looking at pictures and videos, increasing the motivation to acquire new skills, the perception of students from the use of technology in physical education as fun and entertainment, more students are interested in ICT-based training courses.
Using educational software (technological facilities)	It is possible for students to have access to new educational equipment, to make physical education lessons more intelligent, to create special applications for student sports to be used during vacations, to use virtual space in student sports, to perform sports activities with software. Education such as a heart rate monitor, the existence of new and efficient software for teaching physical education courses, preparation of appropriate scientific audio and video content, use of useful Power Points, use of messengers with the ability to transmit educational issues, use of animation pictures and photos appropriate to the subject, use of simulated films and software, use of educational media, use of films and images for teaching sports techniques, use of modern tools in education, use of More educational aids in teaching physical education, more realism through the presentation of photos, audio, etc., the use of educational tablets and projectors in the teaching process, the possibility of using audio-visual materials in education.

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knowledge management	Acquiring up-to-date knowledge and information, overcoming educational problems, speeding up the transfer of knowledge, increasing the ability of teachers to access knowledge, the ability to record information and follow up and read it again, students' thinking more about the skills they have learned. Implementation of education based on more scientific methods and criteria, increasing the acquisition of knowledge and acquiring concepts using educational software.
Economic factors	Reducing educational costs in the long term, reducing the cost of accessing rare information by the teacher.
Time dimension	Reducing the amount of time used by learners to reach the desired goals, optimal use of time and preventing time wastage.
Educational innovation	Updating the educational system, the creativity and artistic taste of teachers in the production of physical education lesson content, the use of visual literacy, art and aesthetics of physical education teachers in the production of content, synchronizing students with current developments, introducing new initiatives educational, providing creative suggestions, developing creative thinking in physical education teachers through the integration of multimedia technologies.
Physical factors	Increasing physical fitness through a virtual teacher, promoting a healthy lifestyle in students using educational software.
Class management	Institutionalizing student-centeredness in the classroom, changing the role of teachers as students' guides, flexibility in classroom management.
Solutions to encourage physical education teachers to use information and communication technology	Holding practical workshops to learn about modern technology and practical and simple sports software, increasing the perception of physical education teachers about the usefulness of using technology in education, increasing the ease perceived by physical education teachers to use technology, improving The attitude of physical education teachers towards the use of technology in education, the support of school management (technical support), increasing the behavioral intention of physical education teachers regarding the use of technology in education, paying attention to the individual characteristics of teachers such as skills, capabilities and individual ability, improving the mental norms of physical education teachers regarding the use of technology in education, access to computers and the ability to connect to Internet network by physical education teachers.
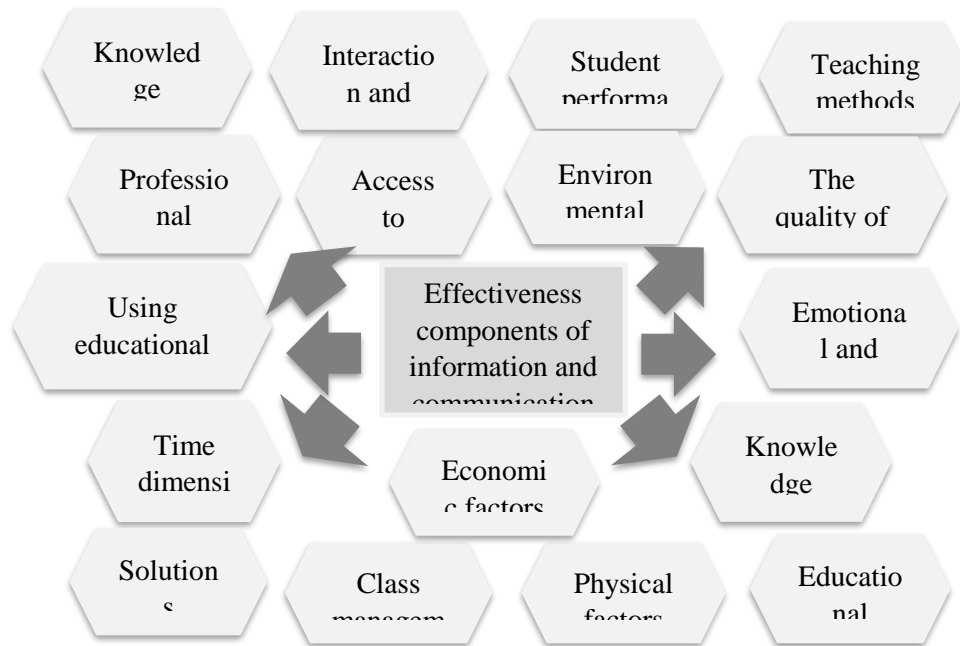
Figure 1. The conceptual model of identifying and analyzing the effective components of information and communication technology in the process of improving the performance of physical education teachers

In the second step of the research, in order to enrich the findings and achieve theoretical saturation, a semi-structured interview was conducted with 10 experts in the field of physical education, in which 3 main questions were asked in line with the goals of the research. The first research question: What are the advantages and opportunities of using information and communication technology in physical education curriculum from various aspects? Based on the results, the benefits of using information and communication technology in physical education lessons have been classified in three factors: "enhancement of teachers' knowledge", "access to information" and "benefits related to students". Table 4 shows the open codes of each of these factors. The second research question: What obstacles and challenges are there in the realm of realizing and using information and communication technology by physical education teachers? Based on the results, the obstacles of the use of information and communication technology in the physical education courses include six factors: "less attention of physical education teachers", "obstacles related to the courses and workshops", "lack of facilities", "economic dimension", "incompetent manpower" and "lack of support". Table 4 shows the open codes of each of these factors. The third question of the research: What solutions do you suggest for the promotion and maximum use of information and communication technology by physical education teachers? Based on the results, the solutions for maximum use of information and communication technology in physical education lessons include five factors: "providing facilities", "increasing the knowledge and skills of physical education teachers", "benefits of technological facilities", "educational courses and workshops" and "financial support for teachers". Table 3 shows the open codes of each of these factors.

Table 3. Open, axial and selective coding of the benefits, barriers and solutions of using ICT in physical education

Selective coding	Axial coding	Open coding
Advantages of using ICT in physical education	Enhancing the knowledge of teachers	Updating teachers' information, learning new teaching methods, exchanging information between physical education teachers, the possibility of physical education teachers benefiting from the creativity of other teachers, developing physical education teaching methods, familiarizing physical education teachers with appropriate sports movements, familiarization of physical education teachers with sports movements suitable for each gender, providing the possibility of correcting the teacher's mistakes.
	access to information	Introducing technological equipment, the possibility of obtaining various statistics through ICT, getting familiar with equipment suitable for every age through ICT, providing the possibility of observational learning.
	Benefits related to students	Ensuring the physical safety of students, learning sports issues by watching sports videos, more preparation and coordination among students by sending different sports exercises in messenger.
Obstacles to use ICT in physical education in schools	Less attention of physical education teachers	Less use of educational software and technological facilities by physical education teachers, teachers' lack of familiarity with information and communication technology such as educational software and content creation methods, less use of educational media by physical education teachers, less use of blackboards educational practices by physical education teachers, physical education teachers' misconceptions about their role in the classroom, physical education teachers' lack of attention to students' talent development, the traditional attitude of managers and physical education teachers towards teaching.
	Obstacles related to courses and workshops	Holding fewer workshops in the field of ICT training for physical education teachers.
	deficiency of facilities	Lack of equipping schools and sports halls with technological systems, lack of appropriate electronic devices (both audio and video) in schools, lack of suitable places in schools to advance the goals of physical education courses.
	Economic dimension	The high cost of equipping schools and sports halls with technological systems, the lack of impact of ICT use on the difference in salaries and benefits of physical education teachers, the high cost of repairing technological equipment in case of damage.
	Incompetent manpower	The selection of educational and physical education vice-chancellors of schools from unrelated fields, the lack of enthusiasm and motivation in school employees to advance the goals of physical education lessons, preventing school officials from the effective activities of physical education teachers, school officials' opposition to broadcasting Sports songs in morning exercise.
	Lack of protection	Lack of appreciation for active physical education teachers in the field of technology, not considering material and spiritual benefits for capable physical education teachers, lack of motivation due to lack of sufficient support for physical education teachers, lack of support from the school

		management in order to provide technological facilities for physical education lessons.

	Providing facilities	Providing software and hardware infrastructures in schools, creating remote training and conference for teachers and learners, access to high-speed internet network, providing electronic devices among physical education teachers.
	Increasing the knowledge and skills of physical education teachers	Teaching physical education teachers how to use ICT, making physical education teachers feel the need to use ICT, using the experiences of physical education teachers from other schools regarding various sports plans.
Strategies for using ICT in physical education at schools	Utilization of technological facilities	Showing all kinds of slides and clips and sports images to students, using facilities such as VR (Virtual Reality) box in schools and sports halls, using Shad network when teaching in special conditions, using virtual space features such as Shad to compensate for the lack of school facilities, broadcast videos of sports competitions to increase students' excitement, broadcast morning exercises on the projector, use clips related to the benefits of exercising to attract students' attention.
	Educational courses and workshops	Holding practical courses for teaching ICT to physical education teachers according to the existing conditions, holding brainstorming sessions among physical education teachers, holding competitions and festivals of the best teaching models in physical education lessons, using professional and expert professors in the field of ICT in different courses.
	Teachers Financial support	Holding free ICT training courses for physical education teachers, increasing the salaries and benefits of physical education teachers to increase their motivation, considering material and spiritual benefits for capable teachers, reforming the salary and living conditions of teachers.

Table 5: Axial coding and samples of interviews (number of interviewees) effective components of information and communication technology

Axial coding	Interview sample with interviewee number
Enhancing the knowledge of teachers	Since we teach boys and girls at different grades or even levels in each academic year, it is very important to be familiar with the sports movements of each age and gender so as not to get into trouble. Thus, the use of information and communication technology in this department is of great help to physical education teachers (8).
Benefits related to students	There are some sports movements and techniques that are dangerous, in order to ensure the physical safety and health of the students, I first show the pictures and videos of those techniques so that they can gain relative mastery over them, and then show them in practical form, after that we tend to do them (3).
Incompetent manpower	Unfortunately, one of the obstacles to the use of information and communication technology in physical education is that the educational and physical education assistants of schools are selected from unrelated fields such as education, and as a result, there is insufficient enthusiasm and knowledge in the field of education (4).
Increasing the knowledge and skills of physical education teachers	If physical education teachers realize that the use of this type of technology improves their performance, they need that feeling and in teaching, they will use new technologies (3).

|	
Educational courses and workshops	Simply holding courses and workshops may not be fruitful for teachers, but holding practical courses in the field of information and communication technology that teachers consider useful and helpful for them can make physical education teachers use technology in teaching (1).
Teacher's Financial support	If educational courses and workshops that are held in the field of using information and communication technology in physical education are held for free, teachers will be motivated to apply what is presented in the courses (2).
Utilization of technological facilities	If there are no technological facilities in the school where you teach, you can use the capabilities of various messengers such as Shad and upload videos, images and necessary materials and exchange with your students (6).
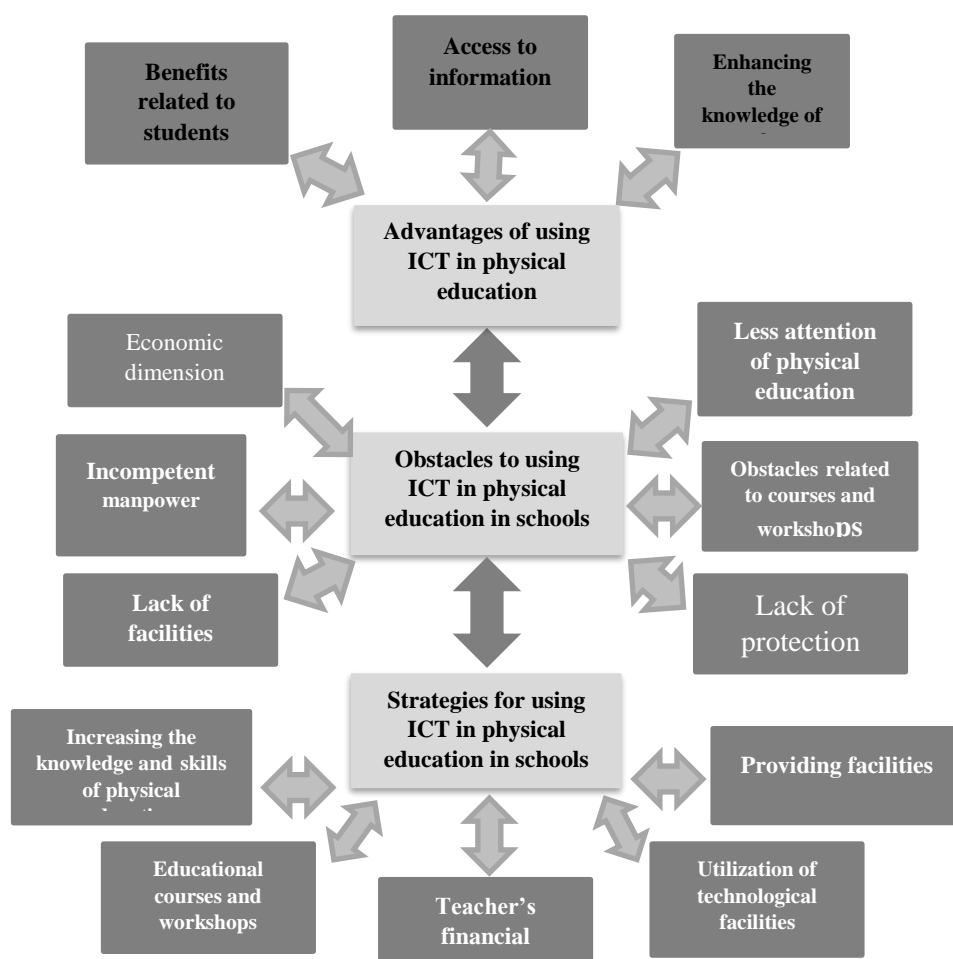
Figure 2: Conceptual model of advantages, obstacles and solutions of using information and communication technology in physical education

Discussion

The current research was conducted with the aim of identifying and analyzing the effective components of information and communication technology in the process of improving the

performance of physical education teachers. To do that and to answer the research questions, in the first stage, relying on the systematic review method, the effective components of information and communication technology in improving the performance of physical education teachers in the form of 17 integrational components were presented. Components of teachers' teaching methods, students' performance, interaction and communication skills, access to resources, teachers' professional development, knowledge sharing, quality of the teaching-learning process, environmental factors, emotional and motivational factors, selection of educational software (technological possibilities), knowledge management, economic factors, time dimension, educational innovation, physical factors and classroom management were proposed as components in the physical education curriculum, which the use of information technology and communication is affected. Also, a central code was assigned to the solutions of using information and communication technology in the curriculum of physical education. In the second stage, relying on the phenomenological method, a semi-structured interview was conducted with 10 physical education specialists and questions were asked in line with the research topic. By coding the findings through interviews, 3 selective codes related to the advantages, obstacles and solutions of using information and communication technology in physical education lessons were extracted, and each of these selective codes included a number of central codes. The results of the present research show that the use of information and communication technology provides knowledge sharing among physical education teachers, but the results of the research of [45] show the insignificant effect of information and communication technology on the knowledge sharing. Therefore, there is no agreement between this research and the current research study. They admit that in order to strengthen the quality of knowledge sharing among teachers, it is better to use management styles that lead to the development of knowledge sharing among people and to strengthen their job affiliation and commitment in order to increase their motivation. However, the results of [31] are in line with the results of the current research and its findings show that teachers have a positive view of sharing their knowledge through information and communication technology and that teachers are familiar with the corresponding technologies. With their needs, it strengthens the ability and skill of teachers to share their knowledge. Another component obtained through the interviews was about the importance of holding courses and workshops in the field of information and communication technology for teachers, which is in line with the results of [23], because they also suggested that it is necessary to hold tests and training courses for teachers in order to increase their information and communication literacy. Another component of the effectiveness of information and communication technology in improving the performance of physical education teachers is related to the knowledge enhancement of teachers and their professional development. [24, 15] are consistent with this finding, because they believe that the main axis in professional development is the existence of the necessary conditions and space for growth and learning, and new technologies and communication are one of these conditions.

Conclusion
In explaining the findings, it can be stated that integrating information and communication technology in education is inevitable and necessary in today's era. Because it provides information expansion and easy and low-cost access to new information for people involved in education, including teachers and students. Therefore, this issue requires a special attention. Like developed countries, there should be comprehensive and practical programs in our country for the application of new technologies in education. Unfortunately, very little attention has been paid to this issue in physical education lessons, which can be due to various reasons, including the fact that physical

education lessons are not taken seriously in schools and the lack of attention of teachers, students, parents and so on. The lack of use of technology by physical education teachers will ultimately lead to a decrease in their knowledge of modern training and educational methods and their effectiveness will clearly decrease. On the other hand, as stated in the research findings, the use of information and communication technology has improved the performance and skills of physical education teachers in many ways and facilitated the achievement of the goals of this lesson to a great extent. Also, it can be said that the classroom will be attractive for students when the teachers have new ideas to implement, and information and communication technology plays a very important role in learning these ideas, as well as implementing a part of these ideas in the physical education lesson depends on technological facilities and equipment, including software, tools and educational aids. In this realm, all these findings show the importance of information and communication technology in education and training and it is a powerful tool for improving the quality and efficiency of education and through transforming the traditional methods and views about education and training. Also, in the dynamic environment of physical education lessons, new skills, knowledge and learning methods are necessary to progress, and a large part of these things can be achieved through information and communication technology. Among the limitations of this research, the following can be mentioned: lack of cooperation of the interviewees, limitation of space and time. In this regard and for the effective use of information and communication technology in the curriculum of physical education, the following suggestions are presented:

1. Courses and practical workshops related to information and communication technology should be held for physical education teachers with the use of professors who are scientifically expert and have sufficient practical experience.

2. Necessary space and facilities such as classrooms and sports halls equipped with technological equipment should be provided by the government for physical education lessons in schools, and if the necessary facilities are not available, the capacities of virtual space and various messengers should be used to compensate this deficiency.

3. Necessary support, enough interest and motivation to use information and communication technology should be provided for physical education teachers to improve their teaching skills and classroom management.

4. By holding various sports competitions and festivals for physical education lessons, teachers' motivation to use new technologies will increase.

5. The school staff, including its management and assistants, should gain knowledge about the objectives of the physical education lesson and cooperate with the physical education teacher in order to provide technological facilities.

6. The traditional view of teachers and other school staff regarding the teaching methods of physical education should be modified and global experiences should be used in order to use educational software and hardware in this lesson. Therefore, since in today's era, information and communication technology takes the first place in all fields, and the field of education is not an exception, it is recommended that researchers focus on investigate the effective components of information and communication technology in improving the performance of teachers of other subjects and provide solutions for teachers to use this type of technology as much as possible.

Conflicts of Interest: The authors hereby declare their absence of any conflict of interest, thereby indicating their impartiality and lack of bias towards any particular entity or group.

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«مقاله پژوهشی»

واکاوی مولفه‌های اثربخش فناوری اطلاعات و ارتباطات در فرآیند بهبود عملکرد معلمان تربیت‌بدنی: یک مطالعه کیفی

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چکیده

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هدف: هدف از انجام پژوهش حاضر، شناسایی و واکاوی مولفه‌های اثربخش فناوری اطلاعات و ارتباطات در فرآیند بهبود عملکرد معلمان تربیت‌بدنی بود.

روش شناسی: روش پژوهش حاضر کیفی و استخراج یافته‌ها در دو مرحله انجام پذیرفت. در مرحله اول، به منظور گردآوری اطلاعات از پایگاه‌های داخلی و خارجی معتبر از روش مرور سیستماتیک به شیوه سیلوا استفاده شد. بعد از انجام غربالگری، تعداد ۲۵ مقاله داخلی و خارجی معتبر برای بررسی ادبیات پژوهش در نظر گرفته شد. در مرحله دوم برای دست یافتن به اشباع نظری، از روش پدیدارشناسی به منظور استخراج تجارب زیسته افراد استفاده شد و تعداد ۱۰ نفر از متخصصین رشته تربیت‌بدنی با مدرک تحصیلی کارشناسی‌ارشد و دکتری-تخصصی برای انجام مصاحبه انتخاب شدند. یافته‌های حاصل از هر دو مرحله، در سه مرحله باز، محوری و گزینشی کدگذاری شدند.

نتایج: یافته‌های حاصل، خروجی گام اول پژوهش، شامل ۱۶ مولفه اثربخشی فناوری اطلاعات و ارتباطات در بهبود عملکرد معلمان تربیت‌بدنی و همچنین ۱ مولفه مربوط به راهکارهای بکارگیری اثربخش فناوری در برنامه درسی تربیت‌بدنی بود. خروجی حاصل از پدیدارشناسی تجارب‌زیسته مصاحبه‌شوندگان نیز در ۳ بخش مزایا، موانع و راهکارهای بکارگیری فناوری اطلاعات و ارتباطات در برنامه درسی تربیت‌بدنی مطرح شد.

نتیجه گیری: نتایج نشان داد که بکارگیری فناوری اطلاعات و ارتباطات توسط معلمان تربیت‌بدنی از جهات متعددی موجب بهبود عملکرد و ارتقای مهارت‌های معلمی آن‌ها شده و از آنجایی که دانش‌ها، مهارت‌ها و روش‌های تدریس جدید و نوین برای پیشرفت معلمان تربیت‌بدنی اهمیت ویژه‌ای دارد و بهره‌گیری از فناوری اطلاعات و ارتباطات دستیابی به این امور را تسهیل کرده است، بنابراین، ضروری است که برنامه‌های جامع و کاربردی در جهت عملی کردن این مسئله در نظر گرفته شود.