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Original Article

Evaluation of the Professional Ethics Model of Physical Education Teachers in Iran

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Abstract

Introduction: Professional ethics among teachers is considered very important, and therefore the purpose of this research is to present the model of professional ethics of physical education teachers in Iran.
Material & Methods: In terms of purpose, the research is applied, and in terms of research method, it is descriptive-survey and cross-sectional. The statistical population of the research included all the professors, managers of the physical education department of the provinces, educational assistants of the departments and physical education teachers of the schools in the academic year 2022-2023, of which 483 people were selected based on the Cochran formula with the proportional sampling method. The required information was collected using a questionnaire. Kolmogorov-Smirnov test, one-sample t-test, exploratory and confirmatory factor analysis and SPSS and LISREL software were used for data analysis.
Results: The findings of the research show that the components proposed in the research model are effective in explaining professional ethics in physical education teachers and the presented model has a suitable fit.
Conclusion: The final model of professional ethics among physical education teachers consists of eight components: social responsibility, belonging to the scientific community, self-efficacy, scientific responsibility, respect for fairness and justice, legal ethics, environmental superiority and competitiveness, adherence to values and norms of the higher education system.
Keywords: *Professional ethics, Physical education teachers, Education*

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INTRODUCTION

The influencing factors in moral behavior are divided into thought, emotional traits and behavior according to human existence domains. What is recognized and conscious in thought is effective in the process of ego traits and manifests in the moral behavior of a person. Also, the repetition of the action and the habit of doing it, is formed in his personal traits and then in his thoughts [1]. Because of this function, ethics has always been the focus of thinkers and all schools have sought to find ethical structures in order to create more requirements and standards for their followers to comply with them [2]. Morality is actually a set of human traits that manifests in the form of behavior that comes from the inner nature of humans [3]. The continuation of a certain type of behavior is the reason that this behavior has an inner root in the depth of a person's soul and soul, which is called morality and is the center of all moral issues of humanity. Ethics is influenced by structures and relationships, culture, religion, normative and legal systems, family system, social learning, faith and experiences and attitudes of people. Just as we can discuss ethics at the macro level of the social system or ethics at the individual level,

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ethics at the level of subsystems, organizations and different jobs are also relevant [4]. Nowadays, due to the fact that sports and its various dimensions are considered as an important topic in various circles, and as an efficient tool and a unique phenomenon in order to create a dynamic and lively society, it has shown its many uses. Based on this, many thinkers believe that sports have an impact on individual and social growth and are like mirrors that reflect the culture, the good and the bad of that society [5]. The alarming and increasing trend of unethical behavior in organizations, including schools, has drawn the attention of scholars to this issue. Managers and leaders have paid more attention to professional ethics in order to face many challenges in this field and to run various organizations in schools, especially sports teachers [6]. Professional ethics, as a branch of ethics, looks at ethical duties in a profession and its ethical issues [7, 8]. Therefore, professional ethics deals with the issues and questions as well as the ethical principles and values of a professional system and supervises the voluntary actions of professionals in the field of their professional activity [9-11]. In another definition, professional ethics are considered as a set of standards and rules that should govern the behavior of all members of a profession. According to the belief of many behavioral science scientists, organizations are the undeniable facet of today's modern world, the nature of societies is shaped by organizations and existing relationships in the world around them [12]. Schools have a special place as one of the most basic organizations of every society [13]. In schools, sports teachers carry a heavy burden in the field of ethics. Their most important duty and responsibility in this field is to provide the necessary training. These people should encourage and support the spread of ethics in schools by forming ethical committees and commissions and deal with any moral problems of students. Expectations from sports teachers and reasonable and ethical demands from them, resolving occasional crises, fairness in behavior, respect for colleagues, acceptance of criticism, creating an atmosphere of service, psychological support, trusting students, taking initiative in well affairs determining moral ideals in schools. Ethics in schools is a persistent, consistent and fully planned effort that is made in order to improve and modernize the organization's system. The goal of school development is to improve the life of students and to improve the functioning of schools. Considering the importance of professional ethics in the development of the organization, it is necessary to pay attention to professional ethics in schools. Since the obstacles to change moral behavior in schools are students' ignorance and unfamiliarity with ethics in schools. Given that today no organization can develop without training. Therefore, it is necessary to create a spirit of cooperation, joint and collective work in organizations, and especially administrative and organizational ethics should be part of the training programs in the organization. Also, every once in a while, the professional ethics of experts and managers of organizations, including physical education teachers, should be evaluated and the level of professional ethics of teachers should be checked. Therefore, the purpose of this research is to design a model of professional ethics for physical education teachers in Iran.

Now, with regard to the above-mentioned contents, the present research aims to evaluate the professional ethics model of physical education teachers in Iran. This model was developed and designed by the authors of this article in another research [14] and in this research the researchers intend to examine and evaluate its fit.

MATERIAL AND METHODS

This research is applied research in terms of its purpose, and in terms of its method, it is descriptive-analytical (non-experimental) from a cross-sectional survey group. The statistical population of the research included professors, managers of physical education departments of provinces, educational assistants of departments and physical education teachers of schools in the academic year of 2022-2023. The research was conducted based on the data collected from 483 subjects, based on Cochran's formula, with the relative classification sampling method of the target population. The research tool was a researcher-made questionnaire. This questionnaire has been used by fully studying the history of past researches and emphasizing the

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researches of some researchers [15-20] in the form of 32 design items and after confirming the validity and reliability. The validity of the questionnaire of the current research is of the face validity type, in this regard, the content of the questionnaire was examined by the experts and after their favorable opinion, it was found to be suitable for the research components. Cronbach's alpha was also used to determine the reliability of the questionnaire. The reliability of each of the research variables (social responsibility, belonging to the sports community, self-efficacy, scientific responsibility, respect for fairness and justice, legal ethics, environmental superiority and competitiveness, and adherence to the values and norms of the educational system) is calculated based on Cronbach's alpha coefficient (Table 1). Cronbach's alpha of the whole questionnaire was calculated as 0.85. Kolmogorov-Smirnov test, one-sample t-test and exploratory and confirmatory factor analysis were used to examine and analyze the data.

Kolmogorov-Smirnov test, one-sample t-test, exploratory and confirmatory factor analysis and SPSS and LISREL software were used for data analysis.

Table 1: Cronbach's alpha of research variables

Research variables	Cronbach's alpha
Social Responsibility	0.84
Belonging to the sports community	0.86
Autonomy	0.85
Scientific responsibility	0.84
Observance of fairness and justice	0.87
Legal ethics	0.86
Atmospheric superiority and competitiveness	0.83
Adherence to the values and norms of the educational system	0.38

RESULTS

First, by reviewing the literature and research history in Iran and the world, 23 items (items) were collected as possible effective factors. Then, a questionnaire consisting of 23 items based on a Likert scale of 1 to 5 was prepared and distributed among the professors, managers of the physical education department of the provinces, educational assistants of the departments and physical education teachers of the schools in question, and finally 483 completed questionnaires were collected. became. First, we investigated this issue using exploratory factor analysis; Does the desired structure have the ability to measure the desired goal or not? In general, the purpose of exploratory factor analysis is to discover the main dimensions of the structure designed to measure the desired variable, which in this research was the dimensions of professional ethics. To determine whether the desired data (sample size and relationship between variables) are suitable for factor analysis or not? Kaiser-Meier goodness of fit index and Bartlett test were used. The Kaiser-Meier proportionality test is an indicator of sampling adequacy that examines the smallness of partial correlation between variables. This index is in the range of zero and one. If the value of the index is close to one, the desired data (sample size) are suitable for factor analysis, and otherwise (usually less than 0.5), the results of factor analysis are not very suitable for the desired data. if its value is between 0.5 and 0.96). The data are average and the data should be extracted with more caution, and values greater than 0.7 indicate the appropriateness of the sample size. The results showed that the value of KMO (sampling adequacy) is equal to 0.88 and the significance level of Bartlett's sphericity test is equal to 0.0009.

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Therefore, in addition to the adequacy of sampling, the implementation of factor analysis based on the study's correlation matrix will also be justified. special values of 8 researched factors; greater than 3, which are responsible for approximately 68% of the total changes, among them the specific value of the first factor is equal to 28.57, the specific value of the second factor is equal to 10.21, the third factor is equal to 25.6, the fourth factor is equal to 6.01, The fifth factor is 4.90, the sixth factor is 4.65, the seventh factor is 3.69 and the eighth factor is 3.83.

According to the special values of the 8 factors and the graph, the computer was instructed to perform the principal component analysis based on the extraction of the 8 factors and sort the factor loadings greater than 0.50. In the questions related to each of the dimensions, the questions whose sharing ratio is less than 0.50 indicate that these questions are not well matched with the rest of the questions and it is better to be deleted. Of course, this should be done step by step. The results obtained are presented in the following tables. According to the results, it was determined that 8 factors were determined as follows: social responsibility, belonging to the scientific community, self-efficacy, scientific responsibility, respect for fairness and justice, legal ethics, environmental superiority and competitiveness, and adherence to the values and norms of the higher education system. Confirmatory factor analysis was used to determine the degree of fit and compatibility of the factors with the evaluated items, in other words, to determine the relationships between variables and their importance coefficients in explaining each of the factors of professional ethics from confirmatory factor analysis. two-stage), standard coefficients and t values have been used.

Table 2: Status of explanatory variables of professional ethics

Sub-dimensions	Standard load factor	t-value	R^2	Result
Social Responsibility	0.66	8.84	0.43	Significant
Belonging to the sports community	0.52	8.52	0.27	Significant
Autonomy	0.68	10.35	0.46	Significant
Scientific responsibility	0.71	11.72	0.50	Significant
Observance of fairness and justice	0.73	11.67	0.53	Significant
Legal ethics	0.73	11.68	0.53	Significant
Atmospheric superiority and competitiveness	0.71	11.27	0.51	Significant
Adherence to the values and norms of the educational system	0.33	5.10	0.11	Significant

The standard factor coefficient of the social responsibility component in explaining professional ethics is equal to 0.66, the t value is equal to 8.48, which is greater than 1.69, so we conclude that the social responsibility component is effective in explaining professional ethics. The standard factor coefficient of the component of belonging to the sports community in explaining professional ethics is equal to 0.25, the value of t is equal to 8.25, which is greater than 1.69, so we conclude that belonging to the scientific community is effective in explaining professional ethics. The standard factor coefficient of the self-efficacy component in explaining professional ethics is equal to 0.86, the t value is equal to 10.53, which is greater than 1.69, so we conclude that self-efficacy is effective in explaining professional ethics. The standard factor coefficient of the component of scientific responsibility in explaining professional ethics is equal to 0.17, the value of t is equal to 27.11, which is greater than 1.69, so we conclude that scientific responsibility is effective in explaining professional ethics. The standard factor

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coefficient of fairness and justice in explaining professional ethics is equal to 0.37, the t value is equal to 11.76, which is greater than 1.69, so we conclude that fairness and justice is effective in explaining professional ethics. The standard factor coefficient of the legal ethics component in explaining professional ethics is equal to 0.73, the t value is equal to 11.86, which is greater than 1.69, so we conclude that legal ethics is effective in explaining professional ethics. The standard factor coefficient of the component of atmospheric superiority and competitiveness in explaining professional ethics is equal to 0.71, the value of t is equal to 11.72, which is greater than 1.69, so we conclude that atmospheric superiority and competitiveness is effective in explaining professional ethics. Finally, the factor coefficient is not stable, the component of adherence to the values and norms of the educational system in explaining professional ethics is equal to 0.33, the value of t is equal to 5.01, which is greater than 1.69. Therefore, we conclude that adherence to the values and norms of the higher education system is effective in explaining professional ethics. Therefore, all the considered components are effective and meaningful in explaining professional ethics. After performing the confirmatory factor analysis, we examine the adequacy of the fitted model. The results showed that the value of chi-square statistic in the model is 11.61, the degree of freedom of the model is 456, and the result of their ratio is 2.43, which is within the acceptable range. On the other hand, model fit indexes such as CFI, NFI, NNFI, and IFI are all acceptable and appropriate, and the SRMR index is 0.270. After exploratory and confirmatory factor analysis, the normality of variables related to professional ethics was investigated. The way to conclude in this test is that if the value of sig is less than 0.05, the data is abnormal and if it is more than 0.50, the data is normal. One-sample t-test was used to examine the status of research variables. Table (3) shows the results of a sample t-test.

Table 3: Examining the current status of the research variables, based on the one-sample t-test

Variables	Mean	SD	t-value	d.f.	p-value	Results
Social Responsibility	2.91	0.71	-2.36	383	0.0186	Accepted
Belonging to the sports community	3.15	0.93	3.14	383	0.0018	Accepted
Autonomy	2.87	0.73	-3.37	383	0.0008	Accepted
Scientific responsibility	2.70	0.85	-6.81	383	0.00009	Accepted
Observance of fairness and justice	2.62	0.85	-8.66	383	0.00009	Accepted
Legal ethics	2.85	0.85	-3.53	383	0.00005	Accepted
Atmospheric superiority and competitiveness	2.68	0.85	-7.46	383	0.00009	Accepted
Adherence to the values and norms of the educational system	3.18	0.83	4.21	383	0.00009	Accepted

DISCUSSION

The analysis of research findings shows that the average of professional ethics components of physical education teachers is at a favorable level. Among the components of professional ethics, social responsibility has the highest coefficient of variation with 0.84, and adherence to the values and norms of the educational system has the lowest coefficient of variation with 0.38. The findings of this study are consistent with the results of some researches [21-23].

In the explanation of these results, it can be said that the higher the average professional ethics and its components, it can be expected that sports activities performed by coaches and physical education teachers can have a positive effect on students' learning. In general, education is considered as a profession that has an ethical nature, and compliance with the mentioned ethical matters is considered a requirement of education. In addition, the responsibility of teachers and trainers towards students and also towards each other will make them enjoy more respect and success

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among themselves and they will feel better about their responsibility. In addition, in this case, the person is responsible and accepts responsibility for the decision and its consequences, he cares about honesty and good reputation in his work, he is sensitive and ethical and performs his duties with all his strength and sincerity. By observing the ethics of education, schools can institutionalize professional ethics in all theoretical and practical activities of schools and promote the general culture of the society, transfer human values and make the values, humane, cultural and moral principles objective in students' life situations.

The results showed that all the variables of the research are normal, as a result, a parametric test was used to test these variables. After testing the normality of the variables, the status of the research variables was determined.

Keeping students' secrets, trust and respect, justice and fairness, excellence of behavior, having motivation, spirit of cooperation, respect for educational laws and the components of politeness and decency and professional ethics of education have been significant. In their explanation, it can be said that the professional ethics of education is very important for physical education instructors, these results are in line with the results of some researches in this field [23, 24]. Observance of each component of professional ethics of education by physical education instructors can guarantee the teaching-learning process. In fact, observing them helps the students to get the best education and on the other hand, the value of learning and the place of science and science learning are preserved. Physical education instructors must create a space for students to develop their potential. They must observe issues including moral issues in education. Therefore, the ethics of education in schools guarantee the happiness and well-being of individual and group students. Failure to comply with it will lead to the promotion of unhealthy relationships, injustice, improper clothing, reduction of commitment, lack of honorable and respectful behavior, failure to comply with laws and educational values.

Dealing with teaching ethics has been raised in most parts of the world in recent decades. Today, dealing with the principles of teaching ethics, with concepts such as ethical codes, has become popular. The existence of ethics in the performance of duties is one of the necessary conditions in every profession, job and work environment. Because educational environments, especially schools, play an important role in the education of people and the growth and development of society. This necessity becomes more important in such circles.

In general, although the principles of professional ethics related to the job of a teacher in the schools of different countries are specific and subject to the laws of each country, but often in all of them principles such as empowering students, impartial communication with students, confidentiality, respect for colleagues and the mastery of the principles of education is seen.

Finally, according to the findings of the research, it is suggested:

1) Farhangian University should define and categorize the norms of professional behavior for Farhangian universities all over the country in the form of an ethical charter in order to increase the professional ethics of professional training of students and physical education instructors.

2) Education and training should design a system where students can record suggestions, criticisms and problems of professional ethics in teacher education.

CONCLUSION

This research was done with the aim of presenting the model of professional ethics of physical education teachers in Iran. It is natural that there are other ethical components that can be defined in the field of research. Limiting the moral components in the course of education and teaching, which is the most objective activity of teachers, is of particular importance because of its impact on the course of education. Bringing up the teacher's ethics in the form of mentioning the manners that the teacher is obliged to observe has been more or less attention since the past. So that, from the researcher's point of view, teaching and physical activity, which implies moral responsibility, is a difficult, complex and sometimes laborious task that undoubtedly requires having the highest moral qualities.

ETHICAL CONSIDERATIONS

Ethical issues (such as plagiarism, conscious satisfaction, misleading, making and or forging data,

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publishing or sending to two places, redundancy, etc.) have been fully considered by the writers.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

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REFERENCES

1. Soltani I. A look at the development of human resources in the health of the administrative system. Journal of Administrative Transformation, 2006; 7(35, 36): 95-106. (In Persian).
2. Sirvani A. Normative ethics. 2nd ed. Iran/Tehran: Youth Thoughts Association Press. 2007. (In Persian).
3. Mirkamali SM, Hajkhozeime M. Design patterns the professional ethics of elementary school teachers: case study of government boys' primary school teachers in Tehran. Educational and Scholastic Studies, 2016; 5(1): 9-30. (In Persian).
4. Shaghozaei F, Marziyeh A, Nastezaei N. The relationship of professional ethics with social competence and job performance case study: staff of Zahedan technical and vocational training organization. Public Management Researches, 2018; 11(39): 113-134. DOI: http://doi.org/10.22111/JMR.2018.4013
5. Neda`I T, Alavi K. Morals in sports with the attitude of fair game. Journal of Philosophical Theological Research, 2009; 10(2): 187-220. DOI: http://doi.org/10.22091/PFK.2008.233
6. Mirkamali S M. Ethics and social responsibility in educational management. Journal of Psychology and Educational Science, 2003; 33(1): 201-221. (In Persian).
7. Naderian Jahromi M. (2011). Ethics in sport. 1st ed. Iran /Tehran: Nasima Press. (In Persian).
8. Zakizadeh A, Dehghan Dehnavi H, Rabbani M, Sadeghian A, nayebzadeh S. A review of research on the professional ethics of managers. Int. J. Ethics Soc., 2023; 5 (1) :4-12. Doi: http://doi.org/10.52547/ijethics.5.1.2
9. Khayatmoghadam S. Study of the effects of managers' professional ethics on the decision-making strategies: moderator role of information management systems capacity. Int. J. Ethics Soc., 2021; 3 (3) :19-27. DOI: http://doi.org/10.52547/ijethics.3.3.19
10. Nejati N, Maetoofi A, Farhadi Mahalli A, Ghaffari R. Provide a model for evaluating public policy with an emphasis on professional ethics. Int. J. Ethics Soc., 2021; 3 (1) :24-32. DOI: http://doi.org/10.52547/ijethics.3.1.24
11. Kheiri A. Analysis of levels of sports ethics, personality and goal orientation of student athletes. [Ph.D. thesis]. Payam-e-Noor University, Tehran, Iran. 2011. (In Persian).
12. Gharamaleki B. Structural modeling of relationship between professional ethics and social responsibility with organizational accountability. Ethics in Science and Technology,2015; 10 (1): 29-39. (In Persian). DOR: https://dorl.net/20.1001.1.22517634.1394.10.1.4.5
13. Aramideh M R. Review and solutions of teachers' professional ethics in schools. 5th International Conference on New Research Achievements in Social Sciences, Educational Sciences and Psychology, Tehran. 2019. (In Persian).
14. Mousavi F, Vashni A, Heidari F, Mohammadi N, Soleimani F, Gheisarzadeh M. Professional ethics of educational principals. Ethics in Science and Technology, 2017; 11(4): 58-65. (In Persian). DOR: https://dorl.net/20.1001.1.22517634.1395.11.4.10.4
15. Semradova I, Hubackova S. Teacher responsibility in distance education. Procedia -Social and Behavioral Science, 2016; 217: 544-550.
16. Al-Hothali H M. Ethics of the teaching profession among secondary school teachers from school leaders perspective in Riyadh. International Education Studies, 2018; 11 (9): 47-63. DOI: https://doi.org/10.5539/ies.v11n9p47
17. Malone M. Ethics education in teacher preparation: a case for stakeholder responsibility. Journal Ethics and Education, 2020; 15(1): 77-97. DOI: https://doi.org/10.1080/17449642.2019.1700447
18. Puiu S, Ogarca RF. Ethics management in higher education system of Romania. Procedia Economics and Finance, 2015; 23: 599-603. DOI: https://doi.org/10.1016/S2212-5671(15)00564-X
19. Poorsadegh N, Bahavarnia V, Zolfaghari R. The model of development of professional ethics through the identification of factors affecting it. Journal of Management and Human Resources, 2019; 10 (40): 37-64. (In Persian).
20. Beikzadeh J, Sadeghi A, Kazemi M, Ghal'e R. Professional ethics is the inevitable necessity of today's organizations. Journal of the Era of Management, 2010; 4(16,17): 58-63. (In Persian).
21. Arasteh HR, Nave Ibrahim AR, Motalebifar A. Status of teaching ethics among the faculty members of public Universities in Tehran. Journal of Strategic Culture, 2010; 3(8-9): 203-219. (In Persian).
22. Ardalan M, Azizi A. Relationship between organizational health and professional ethics of teachers: mediating role of person -organization fit. Ethics in Science and Technology, 2020; 15 (1): 79-85. DOR: https://dorl.net/20.1001.1.22517634.1399.15.1.11.7
23. Kaya A, Çelik D, Dalgıç Ai. Professional values and job satisfaction levels of pediatric nurses and influencing factors: A crosssectional study. The Journal of Pediatric Research, 2020; 7(1): 58-64. DOI: https://doi.org/10.4274/jpr.galenos.2019.68815
24. Arghadeh F, Ghasem Zadeh A, Zavar T. (2020). The role of ethics, professionalism & organizational identity of faculty members on their individual accountability. Ethics in Science and Technology, 15 (3): 83-90. (In Persian). DOR: https://dorl.net/20.1001.1.22517634.1399.15.3.12.2.

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