

DETERMINING AND EVALUATING IDEAL PHYSICS TEACHER'S CHARACTERISTICS

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ABSTRACT: The main purpose of this study are; to investigate the characteristics of a prospective physics teacher, to evaluate attitudes of preservice physics teachers toward to be a physics teacher, and to evaluate preservice physics teachers' qualifications. In order to achieve the objectives of the study, literature have been searched in detail. Then, a questionnaire was developed to measure preservice physics teachers qualifications and attitudes of preservice physics teachers toward to be a physics teacher. The Questionnaire was administered to 50 preservice physics teachers from 4 universities; METU, Gazi, Hacettepe, and Marmara universities. The collected data were entered to the computer and analyzed by MS-Excel computer program. The results showed that preservice physics teachers had medium attitudes towards to be a physics teacher, knowledge of subject matter, knowledge of teaching methods, knowledge of measurements and evaluations, knowledge of classroom management, sociology and psychology, and knowledge of school administration.

KEY WORDS: *Characteristics of physics teachers, attitudes towards to be a physics teacher, ideal physics teacher*

ÖZET: Bu çalışmanın ana amaçları; ideal bir fizik öğretmenin özelliklerini araştırmak, fizik öğretmen adaylarının fizik öğretmeni olmaya karşı tutumlarını değerlendirmek, ve fizik öğretmen adaylarının yeterliliklerini değerlendirmektir. Çalışmanın amaçlarını gerçekleştirebilmek için detaylı bir alan taraması yapılmıştır. Sonra, fizik öğretmen adaylarının yeterliliklerini ve fizik öğretmeni olmaya karşı tutumlarını ölçmek için bir anket geliştirilmiştir.

Anket 4 farklı üniversiteden (ODTÜ, Gazi, Hacettepe, ve Marmara) toplam 50 fizik öğretmen adaylarına uygulandı. Toplanan veri bilgisayara girildi ve MS-Excel bilgisayar programı kullanılarak analiz edilmiştir.

Sonuçlar fizik öğretmen adaylarının fizik öğretmeni olmaya karşı tutumlarının, alan bilgilerinin, öğretim metodları bilgilerinin, ölçme ve değerlendirme bilgilerinin, sınıf yönetimi, sosyoloji ve psikoloji bilgilerinin, ve okul yönetimi bilgilerinin orta seviyede olduğunu göstermiştir.

ANAHTAR SÖZCÜKLER: *Fizik öğretmenlerinin özellikleri, öğretmen olmaya karşı tutum, ideal fizik öğretmeni.*

1. INTRODUCTION

One of the most important factors in teaching process is qualification of the teacher. Karakan [1] believes that teachers are perceived as playing primary role in students learning process. To adequately perform this role, certain teacher characteristics are potentially more valuable. Although there are many studies on these effective teacher characteristics, there has not been a definition depicting a "book model" teacher [2]. The Commission on Teacher Education of the American Council of Education in an extensive study of the qualities of the good teacher listed the following [3]:

- (1) respect for personality;
- (2) community-mindedness;
- (3) rational behavior and emotional surefootedness;
- (4) creative power;
- (5) skill in cooperation;
- (6) increasing knowledge, skill in mediating knowledge, breadth and integration of scholarship;
- (7) skill in mediating knowledge;
- (8) friendliness with children;
- (9) social understanding and behavior;
- (10) effective citizenship in the school;
- (11) skill in evaluation;
- (12) faith in the worth of teaching.

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Possibly the most significant data can be concerning pupil judgments of what qualities are important in the good teacher [3]. A study attempted to find out what high school students regarded as the good qualities of teacher. Twenty-eight teachers in a high school were ranked by their students, and the qualities they considered good and bad in teachers were listed. Thirty-three items were mentioned twenty times or more. These are listed below in descending order of mention:

- (1) good disposition, kindness, and patience;
- (2) impartiality;
- (3) ability to explain clearly;
- (4) discipline;
- (5) knowledge of subject;
- (6) fairness in marking;
- (7) sense of humor;
- (8) helps pupil out of class;
- (9) understands high school students;
- (10) knows how to interest pupils;
- (11) honest, and keeps his word;
- (12) good judgement;
- (13) good personality;
- (14) school spirit;
- (15) clear and definite in assignments;
- (16) distinguishes important and unimportant;
- (17) will-power;
- (18) leadership;
- (19) never laughs at pupils mistakes;
- (20) makes no use of detention rooms;
- (21) general knowledge as well as of her subject;
- (22) does not get off subject;
- (23) good voice;
- (24) knows ability of class;
- (25) able to give good advice;
- (26) appreciates whatever weaknesses pupils may possess;
- (27) uses good English;
- (28) supervises study, and allows study periods;
- (29) understands home conditions;
- (30) gives frequent tests;
- (31) ventilates room;
- (32) dresses conservatively;
- (33) and cooperates.

Another study of interest in this connection is that which was made in 1947 by Witty. From nearly 12000 letters written by children on "The Teacher Who Helped Me Most" the following traits are listed in descending order of mention (cf., [3]):

- (1) cooperative democratic attitude;
- (2) kindness and patience;
- (3) wide variety of interests;
- (4) good appearance and pleasing manner;
- (5) fairness and impartiality;
- (6) sense of humor;
- (7) good disposition;
- (8) interest in pupil's problems;
- (9) flexibility;
- (10) use of recognition and praise;
- (11) superior teaching efficiency.

Bossing [3], in collaboration with a graduate student, has carried on an extended research to discover, significant traits of good secondary teachers. This study was made by comparing the

judgments of school superintendents and principals as to those qualities they deemed important for teachers to possess as they analyzed their own teachers. These judgments were then checked against data from the Appointment Bureau and the University Registrar's office records to discover other factors of value, particularly of a predictive nature. The study which involved data covering several years, yielded the following teacher traits or qualities that appear significant:

- (1) discipline,
- (2) teaching skill,
- (3) care of routine,
- (4) use of English,
- (5) tact,
- (6) adaptability,
- (7) sense of justice,
- (8) cooperation,
- (9) optimism,
- (10) school management,
- (11) promptness and regularity,
- (12) self-control,
- (13) initiative and self-reliance,
- (14) attention to individual needs,
- (15) skill in motivating work,
- (16) health,
- (17) resourcefulness,
- (18) voice,
- (19) enthusiasm.

There is a remarkable similarity in the findings of all those studies as to composite traits or qualities that make up the picture of the successful teacher.

In their article, Lunetta, Yager and Sharp [4] describe the characteristics of science teacher as follows:

- (1) preparation in the science that includes depth as well as breath,
- (2) competencies in performing certain skills needed for a variety of classroom teaching learning modes,
- (3) competencies in the psychological, sociological historical foundations of education,
- (4) flexibility in personal style that permits coping with change,
- (5) variety of experience with people all ages paralleling experiences needing to greater scientific proficiency,
- (6) experience with the creative aspects of science and some specific analysis of the meaning of such experience,
- (7) an understanding of the philosophy and history of science and experience with the interaction of science and society.

McDermott [5] declares the needs of high school physics teachers as follows:

- (1) Physics teachers should understand elementary physics in depth.
- (2) Physics teachers should examine origins of knowledge of physics.
- (3) Physics teachers should experience laboratory centred learning .
- (4) Physics teachers should acquire a sense of the unity of physics.
- (5) Physics teachers should relate physics to the real world.
- (6) Physics teachers should see physics as part of the real world.
- (7) Physics teachers should become familiar with good programs.
- (8) Physics teachers should apply learning theory to teaching.
- (9) Physics teachers should develop skills for inquiry in science.

The other dimension of preparing physics teachers is the courses included in the physics education curriculum. The distinction between a researcher in physics (physicist) and physics teacher must be emphasized in different curriculum they follow. There are some extra courses which contain some subjects that may not be necessary for high school physics teachers. Such courses like Quantum Mechanics, Differential Equations and Electromagnetic Theory are considered to be very complex and challenging for a high school physics teacher. In a research report prepared by the Commission on College Physics in the USA, it is expressed that “the teacher’s needs are different from those of the professional physicist. He does not need to learn to do quantum mechanical calculations or the mathematics of general relativity” [6].

According to XI. National Education Commission (Milli Eğitim Şurası) decisions [7], curriculum that educating high school teachers should contains 64.6% subject-matter courses, 10.4% general culture courses, 25% education courses.

In the Ministry of Education presses [8, 9], to be an ideal teacher you should;

1. know teacher missions.
 - * teaching mission.
 - * management and administration mission.
 - * good subject-matter knowledge.
 - * supervisor mission.
2. know daily, yearly and lesson planning.
3. know teaching and teaching methods.
4. know measurements and evaluating to taught contents.
5. know how to manage teacher-student relations.
6. know school process and society mission.
 - * school rules.
 - * good relations with other teacher.
 - * join the school activities.

These characteristics should be more detailed and research-based. That is why this study is undertaken. Turkish education system has some problems for years. One of them is “How to Educate Prospective Teachers”. Although there are some studies in Turkey [1, 10, 11], they do not fully cover all the aspects.

The purposes of this study are:

- i. to investigate the characteristics of an ideal physics teacher,
- ii. to evaluate attitudes of preservice physics teachers toward to be a physics teacher,
- iii. and to evaluate preservice physics teachers’ qualifications.

2. METHODOLOGY

2.1. Procedure

In this study, the following steps were undertaken to reach the purpose;

- The problem and objectives of the study were clearly stated.
- The journals and theses in the libraries of METU, Ankara and Gazi Universities were searched to find related studies.
- A questionnaire was developed to measure preservice physics teachers qualifications and attitudes of preservice physics teachers toward to be a physics teacher.
- The Questionnaire was administered to 50 preservice physics teachers.
- Finally, the collected data were entered to the computer and analyzed by MS-Excel computer program.

2.2. Measuring Tools

A questionnaire was developed to measure preservice physics teachers' qualifications and attitudes of preservice physics teacher toward to

be a physics teacher. The questionnaire has nine parts. The first part is related to personal information. The second part contains a question "What are the five elements that prevent you being a qualified physics teacher". Other seven parts have 92 Likert type items. A sample item from each part is given in the appendix. The seven parts and number of the questions in each part are as follows:

- attitudes toward to be a physics teacher (20 items)
- knowledge of subject-matter (8 items)
- knowledge of teaching methods (9 items)
- knowledge of measurements and evaluations (12 items)
- knowledge of classroom management, sociology and psychology (6 items)
- knowledge of school administration (8 items)
- teacher characteristics (29 items)

2.3. Subjects

The subjects of this study were 50 preservice physics teachers from four universities (30 from METU, 5 from Gazi University, 7 from Hacettepe University, 8 from Marmara University).

Birth dates of the preservice physics teachers range between 1973 and 1976. 40% of them are born in 1976, 22% of them are born in 1975, 28% of them are born in 1975 and 10% of them are born in 1973.

56% of the sample are male, 44% of them are female. The University Entrance Examination scores of the preservice physics teachers in this study are between 440 and 530.

8% of their scores are between 440 and 449. 20% of their scores are from 450 to 475. 50% of their scores are from 476 to 499. Finally, 22% of their scores are between 500 and 530.

First preferences of the preservice physics teachers in the University Entrance Examination (UEE) were accumulating in the engineering faculty. 64% of them chose the engineering faculties, 26% of them chose medical science and 10% of the preservice physics teachers chose science faculties. What a pity that none of the participants chose the education faculties as a first preference in the UEE.

While 54% of the preservice physics teachers were graduated from science department of the high schools, 40% of them were graduated from mathematics, and 6% of them were graduated from vocational schools.

3. RESULTS

3.1. Factors that Prevent Preservice Physics Teachers from Being a Qualified Physics Teacher

In this part, the thinking of the preservice physics teachers about problems that prevent their qualifications during their education were studied. There are basically seven different answers to the question;

- 84 % of the preservice physics teachers agree that they take an ineffective and short practice teaching course.
- 70 % of the preservice physics teachers believe that they have been educated as a physicist and there are advanced physics courses in the curricula.
- 68 % of the preservice physics teachers say that their physics courses related with high school physics contents are not enough in number.
- 52 % of the preservice physics teachers claim that there is not enough laboratory courses related high school physics contents and given laboratory courses are too complex to apply in Turkish High Schools.

- 44 % of the preservice physics teachers believe that they learn the concepts by memorizing and theoretically. So they do not know relations of physics with daily life.
- 30 % of the preservice physics teachers believe that they are troubled about their future, because their jobs do not give trust.
- 26 % of the preservice physics teachers say that they did not want to be in education faculties.

3.2. Attitudes Toward to be a Physics Teacher

Mean, and standard deviation of preservice physics teachers' attitudes toward to be a physics teacher are given in Table 1. The first number in the parenthesis indicates that there are 20 items to measure preservice physics teachers' attitudes and the possible minimum score is 20. The second number in the parenthesis indicates that the possible maximum score is 100. The preservice physics teachers' mean on the attitude items is 46.36 over 100. This could be normal for students from other faculties but this is too low for preservice physics teachers. They are prospective physics teachers but they have very low attitudes to be a physics teacher.

3.3. Qualifications of Preservice Physics Teachers

Table 1 shows the mean, standard deviation, maximum, and minimum scores of all variables. The first numbers in the parentheses indicate the number of the questions to measure that variable and the possible minimum score on that variable. The second numbers in the parentheses indicate the possible maximum score on that variable.

The preservice physics teachers have above average scores on knowledge of subject matter,

knowledge of teaching methods, knowledge of measurement and evaluation, knowledge of classroom management, sociology and psychology, knowledge of school administration, and teacher characteristics.

Table 1. Mean, Standard Deviation, Maximum, and Minimum Scores of All Variables

	Parts of the Scale	Mean	SD	Max	Min
T1	Attitudes toward to be a physics teacher (20-100)	46.36	10.66	81	33
T2	Knowledge of subject matter (8-40)	30.64	4.58	38	21
T3	Knowledge of teaching methods (9-45)	31.64	3.99	40	22
T4	Knowledge of Measurement and Evaluation (12-60)	45.54	5.60	57	35
T5	Knowledge of classroom management, sociology and psychology (6-30)	22.26	3.35	30	16
T6	Knowledge of school administration (8-40)	24.38	4.90	35	15
T7	Teacher characteristics (29-145)	112.1	15.95	137	68

Table 2 shows the correlation coefficients among the variables. Statistically significant correlation coefficients are marked with asterisks. For example, teacher characteristics variable is not correlated with attitudes toward to be a physics teacher and knowledge of school administration variables. However, as expected it is correlated with knowledge of subject matter, knowledge of teaching methods, knowledge of measurement and evaluation, and knowledge of school administration.

Table 2. Correlation Coefficients Among the Variables

	T1	T2	T3	T4	T5	T6
T1						
T2	-0.21					
T3	0.16	0.37*				
T4	0.11	0.39*	0.67*			
T5	0.33*	0.23	0.24	0.16		
T6	0.31*	0.24	0.39*	0.36*	0.50*	
T7	0.02	0.53*	0.33*	0.41*	0.48*	0.21

* $p \leq 0.05$

4. DISCUSSION AND CONCLUSIONS

The responses of the preservice physics teachers show that they have great problems. Main result of this study is that most of the preservice physics teachers do not ready to take mission in the high schools. According to results of the questionnaire most of the preservice physics teachers will be graduated below the ideal standards.

All of the preservice physics teachers take physics courses related by the high school physics contents in first two years of the their university education. This affects them negatively. While they are studying advanced physics courses, they forget the details of the freshman physics. First year introductory physics courses are admittedly insufficient for teaching a high school physics course. However, it does not follow that advanced physics courses provide useful preparation for preservice physics teachers. Although work beyond the introductory level may help preservice physics teachers deepen their understanding of physics, no guidance is provided about how to make appropriate use of this knowledge in teaching students.

Major concern in the preservice physics teachers' knowledge, developments should be

directed in practical ways and every day examples of phenomena - being taught. Preservice physics teachers have conceptual difficulties. It has large effect on their achievement in physics. So, laboratory is an important factor affecting training of preservice physics teachers. Working thorough parts of PSSC is a great deal more valuable than merely reading about these programs.

Teaching courses in the university programs are not effective. Most of the preservice teachers do not be ready to teach physics after taking those courses. For example, they do not know how teaching methods can be used effectively or what should be done in problem situations in the class. Especially, practice teaching courses are insufficient. Less time, negative attitudes of some guide teachers and lots of taken courses in the last semester are some of the reasons of the problem. The teaching courses also do not give any thing about school administration and management to the preservice physics teachers.

Another important result is that none of the preservice physics teachers chose the education faculties as the first preference in the UEE and their attitudes toward to be a physics teacher is too low. This problem is probably more important than the previous one, because even if they have the ideal teacher's characteristics, they do not have positive attitude to use that knowledge.

5. SUGGESTIONS

In the light of the findings, it is clear that the physics education curriculum in the universities should be improved. Future physics teachers need to know basic physics subject very well but it is evident that most of them loose their interest about those subjects during their hard education.

The content of the physics courses in B.Sc. programs should be modified and be parallel to that of high school physics courses to get higher efficiency. To promote conceptual understanding of preservice physics teachers, introductory physics

laboratories should be improved. Preservice physics teachers should have a chance to discover the advantages of learning by active participation. To make the relations of physics with real and daily life, some extra courses should be added to the curriculum like history of science, ecology and environment, or astronomy.

To prepare the preservice physics teachers better for the active school life, they should spend more time in high schools during their education and preservice teachers should have more active

roles during their practice teaching in different area like school management.

We have to find a way to improve preservice physics teachers attitudes toward to be a physics teacher. The suggestions above would help to this purpose. In addition to these, the instructors in the university educate the preservice teachers. That is why, they should be a model teacher in the first place. The instructors should have the ideal teacher characters and high attitudes, and then show these to the preservice teachers.

Appendix: Sample Questions from the Scale

Parts of the Scale	A Sample Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
T1	My ideal job was to be a teacher					
T5	I can establish discipline in the classroom					
T7	I do believe as a physics teacher candidate that I have eager to teach.					

		Excellent	Good	Normal	Bad	Very Bad
T2	How is your knowledge about mechanics?					
T3	How is your knowledge about the content and usage of cooperative learning?					
T4	How is your knowledge about preparation of multiple choice test items?					
T6	I know the regulations and rules of schools.					

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