

FACTORS AFFECTING STUDENTS' ATTITUDES TOWARDS PHYSICS

ÖĞRENCİLERİN FİZİK DERSİNE YÖNELİK TUTUMLARINI ETKİLEYEN ETMENLER

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ABSTRACT

This paper attempted to investigate the combined and individual effects of certain independent variables (teachers' characteristics, gender, experience in teaching, age, students' gender, grade level and schools' conditions) on students' attitudes toward physics. The study was conducted with 317 tenth and eleventh grade science students from 5 high schools in Ankara. In this study, a physics attitudes scale and a physics teachers' characteristics scale were used. These tests consisted of 56 Likert-type questions. In order to analyze the obtained data, Multiple Regression and Correlation Analysis (MRC) was used. The results indicated that the combined effect of these independent variables on students' attitudes toward physics was significant. Also the teachers' characteristics, gender, experience in teaching, age, students' gender, and schools' conditions individually affected the students' attitudes toward physics significantly but grade level did not.

Key Words: Attitudes Toward Physics, Teacher's Characteristics, School's Conditions.

ÖZ

Bu makalede, bazı değişkenlerin (öğretmenin özellikleri, cinsiyeti, yaşı, öğretimdeki deneyimi, öğrencinin cinsiyeti, kaçınıcı sınıfta olduğu ve okul olanakları) öğrencilerin fiziğe karşı tutumuna olan etkisi bütün olarak ve ayrı ayrı incelenmiştir. Bu çalışma, Ankara'daki 5 liseden 317 onuncu ve onbirinci sınıf öğrencileriyle yapılmıştır. Öğrencilere fizik tutum ölçeği ve fizik öğretmeninin özellikleri ölçeği uygulanmıştır. Bu testler toplam 56 Likert tipi sorudan oluşmaktadır. Verileri analiz etmek için çok boyutlu regresyon ve ilişki analizi (MRC) metodu kullanıldı. Elde edilen sonuçlara göre yukarıda sayılan değişkenler toplu olarak öğrencinin fiziğe karşı tutumunu etkilemektedir. Öğretmenin özellikleri, cinsiyeti, yaşı, öğretimdeki deneyimi, öğrencinin cinsiyeti okul olanakları da ayrı ayrı öğrencinin fiziğe karşı tutumunu etkilemektedir. Ancak öğrencinin kaçınıcı sınıfta olduğu fiziğe olan tutumunu etkilememektedir.

Anahtar Sözcükler: Fiziğe Yönelik Tutum, Öğretmenin Özellikleri, Okul Olanakları.

1. INTRODUCTION

There have been many studies carried out to identify factors affecting students' achievements in science and specifically in physics. These studies were based on home, school, and individual influences on students' achievements. For example, in Bloom's study, 25% of the variances in school achievement could be attributed to how students felt toward what they were studying, their school environment, and their concept of self, and another 25% of the variances in school achievement were attributed to quality of instruction (cited from Simpson and Oliver, 1990).

For this study, as in Oliver and Simpson's study (1988), the idea that students' achievements in physics are influenced by their attitudes toward physics formed the main theme. Therefore, it is helpful to investigate factors affecting students' attitudes toward physics. In

many studies, the factors affecting students' attitudes toward science or physics are considered in mainly three groups as individual, home and school factors.

The purpose of this study is to investigate the relationship between physics teachers' characteristics, gender, age, experience in teaching, students' gender, grade level, school conditions, and students' attitudes toward physics. These factors were selected based on their frequency of use in the literature and the responses of 100 high school students who were asked to write down the factors affecting their physics achievements and attitudes, in a pilot study. Although the individual effects of these variables on students' attitudes towards physics were investigated in different studies, this is the first study to investigate the combined and individual effects of all seven variables on students' attitudes towards physics in a single study.

2. LITERATURE REVIEW

Many investigations reported that teachers' characteristics, age, experience, gender, students' gender, grade level and school conditions were the main factors affecting students' attitudes toward science, particularly toward physics (Tamir, Arzi, and Zloto, 1974; Cruickshank, Brainer and Metcalf, 1995; Bernard, Elsworth, Keefauver and Naylor, 1981; Fleming and Malone, 1983; Simpson and Oliver, 1990; Ayers and Price, 1975; Eryilmaz, 1992; and Ehindero, 1985).

Teacher Characteristics: In many studies, it is stated that teacher characteristics affect students' attitudes and achievements. In the study carried out by Simpson and Oliver (1990), it is reported that teacher evaluations, the general attitudes of teachers, and the specific attitudes of teachers toward their classes would be linked closely to students' attitudes toward and achievements in science. A total of 12 schools, 178 science classes and 4500 students were included in their study. Moreover, in Tamir et al. (1974), it is stated that the skillful teacher seems to have a decisive effect on students' attitudes toward physics. In their study, the sample consisted of 157 students enrolled in 6 classes. In addition, Cruickshank et al. (1995) pointed out that personal characteristics of teachers affect how they will teach, how sociable they are, and how supportive they are of youth.

Teacher's Age, Experience, and Gender: The effects of teacher's age, experience, and gender are considered to be the factors affecting students' attitudes towards and achievements in physics. Barnes' study (1987) indicates that teachers get better at teaching during the first few years, level off, and then probably decline somewhat. Thus, teacher's age and experience in teaching affect how he teaches and therefore also students' attitudes toward the course and students' achievements in the course (cited from Cruickshank et al., 1995).

Bernard et al. (1981) carried out a study about the role of gender in teacher-student evaluations. In their study, high school students' impressions and expectations from teachers were related to teacher gender. Male teachers were rated as being more intelligent and more able to individualize instruction and motivate students than female teachers. Thus, positive attitudes toward male teachers were revealed in students' more positive attitudes toward courses taken from male teachers. 363 11th and 12th grade students participated in their study. Moreover, Cruickshank et al. (1995) indicated that male teachers are more often found to be more dominant and authoritarian than female teachers. Their classrooms are more or-

ganized and teacher-controlled. Conversely, female teachers maintain warmer classes and seem to be more tolerant. These differences affect students' attitudes and achievements.

Students' Gender: Most studies about attitudes toward science or achievement in science indicate significant gender influences on attitudes toward science and achievement in science. The study carried out by Fleming and Malone (1983) explored the relationships of students' characteristics, including gender, to students' attitudes toward science by meta-analysis. One of the results of this study indicates that the students' gender affects their attitudes towards science with males generally scoring slightly higher than females. The same result is also pointed out by Simpson and Oliver's study (1990). In their study, 60 Likert-type items were used. A total of 12 schools, 178 science classes and 4500 students were included. In addition, in the study of Ayers and Price (1975), males indicated a preference for science more often than females. The subject for the study consisted of 232 males and 233 females. Moreover, in the study of Tamir et al. (1974), the relations between students' gender and their attitudes towards physics were examined. Statistically significant differences between male and female were found in their attitudes. That is, females had less positive attitudes toward physics and physicists. In the study, the sample consisted of 157 students enrolled in 6 classes. Also, Eryilmaz (1992) pointed out significant gender differences in physics achievement in his study of 435 university students. Moreover, in Ehindero's study (1985), the relation between physics achievement, students' expectations and students' gender were investigated. The study showed that females constituted the majority of the low expectancy and successful group. In this study, the subjects were 70 secondary school students (35 boys and 35 girls).

Grade Level: Fleming and Malone (1983) stated that attitudes toward science increase from middle school to high school. The study carried out by Simpson and Oliver (1990) indicated that there were no differences between 11th and 12th grade students' attitudes toward science. In their study, 60 Likert-type items were used and 4500 students were included. Also, in the study of Tamir et al. (1974), only a few differences were revealed between 11th and 12th grade students. 12th grade students appeared to have more realistic attitudes.

School: In the study of Tamir et al. (1974), it was stated that school variables involving physical environment play an important role in the formation of attitudes

toward physics. The same result is pointed out by Simpson and Oliver's study (1990) on attitudes toward science.

3. METHOD

3.1 Subjects

The population of the study was the 10th and 11th grade students taking a physics course in inner city and suburban high schools in Ankara during the 1998-1999 school year. The study sample was 317 students from 5 schools. One of them was an Anatolian high school, another was a suburban high school and the others were inner-city high schools. Therefore the sample was a sample of convenience.

There were 179 10th grade and 137 11th grade students. There were 174 female (55%) and 143 male (45%) students in this study.

3.2 Measuring Tools

In this study, two scales were used: the Physics Attitudes Scale (PAS) to assess mainly the students' attitudes toward physics and the Physics Teacher Characteristics Scale (PTCS) to assess the physics teachers' characteristics. In addition, there were demographic questions to identify the teachers' gender, age, experience in teaching and the students' grade level. The teachers answered these questions.

Some items of the PAS were taken directly, some of them were adapted from the previous attitude scales (Akdur, 1996; Başer, 1996; Doruk, 1992; Sancar, 1984; Tamir et al., 1974) and a few of them were developed in this study. Finally, we got 24 items in Turkish. The PAS is a 5 point Likert scale where 5 is "fully agree", 4 is "agree", 3 is "undecided", 2 is "partially disagree", and 1 is "fully disagree".

The PTCS has been prepared to measure physics teachers' characteristics. The test items are mainly based on five criteria: knowledge of science particularly physics, planning and organization, teaching methods, personal relations and enthusiasm. These five criteria are important for effective science particularly physics teaching (Trowbridge, Bybee and Sund, 1967). There is an almost equal number of items for each criterion. Some of the items were adapted from the "Teaching Assistant Evaluation Form" (Çağlar, 1998). Also the other items were made based on the professional qualities of good teacher trainers (Borg, 1998). The PTCS involves 32 items in Turkish. It is a 5-point Likert scale like PAS. The PAS and PTCS are given in Appendix A and B, respectively.

To find face validity evidences, a lecturer at METU and a physics teacher in Atatürk Anatolian Lycee examined the items. Then, test items were judged in terms of whether each item could measure what it is supposed to measure to collect the content-related evidences. Also, these scales were individually applied to five students to eliminate any difficulty with the items. Cronbach Alpha reliability coefficients of 317 high school students' scores were calculated by SPSS program. The reliability coefficient for the PAS and PTCS were 0.85 and 0.96, respectively. These values indicate that the tests' scores have high reliability.

3.3 Procedure

To identify the potential variables affecting students' physics achievements and attitudes, a pilot study was conducted. The sample in the pilot study consisted of 100 students in the Atatürk Anatolian High School and Başkent High School. The students were asked to write down the factors influencing their achievements in physics and their attitudes toward physics. The results of the pilot study were used to develop items in the scales.

The scales were applied to 317 tenth and eleventh grade students from different schools in Ankara. 170 students had female physics teachers and 147 students had male physics teachers. There were 4 female teachers and 3 male teachers. The scales were applied to maximum of two classes (one tenth-grade and one eleventh-grade) in each school. The students were asked not to write their names on the scales. This made it possible to obtain more sincere responses. After entering all the data on to the computer, statistical analyses were performed by Microsoft Excel and SPSS computer programs.

3.4 The Main Problem and Hypotheses

The main problem of this study is to investigate the relationship between physics teacher's characteristics, gender, age, experience in teaching, student's gender, grade level, school conditions, and students' attitudes toward physics in Ankara.

As a temporary solution, the following hypothesis is stated in null form and tested for a significance at ($\alpha = 0.05$) level:

The seven variables together (physics teachers' characteristics, gender, age, experience in teaching, and students, gender, grade level, and school conditions) do not explain a significant amount of variance in students' attitudes toward physics.

3.5 Variables

The variables of this study are the tenth and eleventh

grade students' attitudes toward physics (SA), physics teacher's characteristics (TC), gender (TG), age (TA), experience in teaching (TE), and students' gender (SG), grade level (GL) and school conditions (SC). In Table 1, all the variables are represented with their type and how they are measured in the study.

Table 1

Summary of the Variables of the Study

VARIABLES	TYPE	TYPE OF ITEMS	NUMBER OF ITEMS
SA	dependent	Likert-type question	24
TC	independent	Likert-type question	32
TG	independent	noted by researcher	1
TA	independent	noted by researcher	1
TE	independent	noted by researcher	1
SG	independent	multiple-choice	1
GL	independent	noted by researcher	1
SC	independent	noted by researcher	2

The students' attitude toward physics is the dependent variable in this study and is measured by the scores on the PAS.

The independent variable TC can be defined as the behaviors and activities of the science teacher and particularly that of the physics teacher concerned with knowledge of science and physics in particular, planning and organization, teaching methods, personal relations and enthusiasm (Trowbridge, Bybee and Sund, 1967). The operational definition of this independent variable is the score on the PTCS.

To identify gender, females are scored with 2, and males are scored with 1. Moreover, during the administration of the scales, the schools were observed and categorized with respect to the existence of a physics laboratory and teaching materials, number of physics teachers, class size, and the school environment from 1 to 5. The higher values stood for better conditions.

4. RESULTS

4.1 Descriptive Statistics

Figure 1 shows that most of the students have higher scores in the PAS. Therefore, the distribution is left-skewed. According to Table 2, the mean value of the

students' attitudes toward physics and that of the physics teachers' characteristics are higher than the mean of the corresponding possible minimum and maximum values for the scales, 72 and 96, respectively. Thus, most of the students have scores close to the maximum value in both PAS and PTCS. As a result, we can say that most of the students have positive attitudes toward physics and positive ideas about their physics teachers.

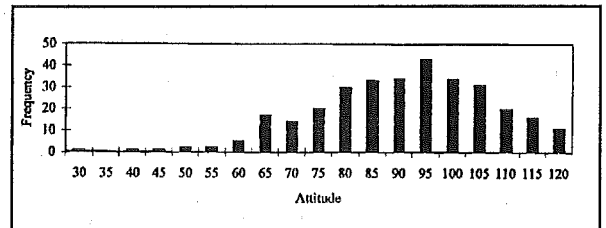


Figure 1. Histogram of Students' Attitudes Toward Physics

Table 2 shows the results of the descriptive statistics of students' attitudes toward physics, teacher characteristics, age, and experience, and school condition. According to the Table, all the students have middle-age physics teachers; most of the students have expert physics teachers whose experiences are at least over 5 years; and the schools in this study are generally in a good condition.

Table 2

Overall Analyses of Students' Attitudes Toward Physics (SA), Teacher Characteristics (TC), Age (TA), Experience (TE), and School Condition (SC)

	SA	TC	TA	TE	SC
Mean	88.61	111.11	36.57	12.31	6.94
St. Dev.	16.08	28.59	4.16	4.61	1.37
Min.	29.00	37.00	30.00	5.00	5.00
Max.	120.00	160.00	43.00	22.00	9.00
Pos. Max.	120.00	160.00	N.A	N.A:	10.00
Pos. Min.	24.00	32.00	N.A:	0.00	2.00

4.2 Inferential Statistics

The stated hypothesis was tested using MRC followed by ANOVA.

As Table 3 indicates, the seven variables explained a significant amount of variances in the students' attitudes toward physics.

This result is significant at the 0.05 level of significance. Thus, the null hypothesis is rejected. 17.6 percent of the variances in the physics attitudes scale scores are explained by the seven variables together.

Table 3

MRC Results for Combined Effect of Seven Independent Variables

Regression Statistics					
Multiple R					0.418
R Square					0.174
Adjusted R Square					0.156
Standard Error					14.772
Observations					317
	df	SS	MS	F	Sig. F
Regression	7	14258.7	2036.9	9.3	0.00*
Residual	309	67431.1	218.2		
Total	316	81689.8			

* $p \leq 0.05$

The individual effect of each independent variable can be seen in Table 4. According to this table, TC, TG, TA, TE, SG and SC explain individually a significant amount of variance in SA. This result is significant at the 0.05 level of significance ($p \leq 0.05$). However, there is no significant correlation between GL and SA. This result is not significant at the 0.05 level of significance ($p \leq 0.05$).

Table 4

Results of Multiple Regression Analysis for Seven Independent Variables

	Coefficients	Standard Error	t ratio	P-value
Intercept	0.41	29.15	0.05	0.96
TG	-12.84	2.80	-4.59	0.00*
TA	1.24	0.51	2.43	0.02*
TE	-1.86	0.51	-3.65	0.00*
SC	5.22	1.01	3.19	0.00*
SG	-4.99	1.70	-2.94	0.00*
GL	2.87	1.80	1.60	0.11
TC	0.23	0.04	5.24	0.00*

* $p \leq 0.05$

Using Table 4, a multiple regression equation can be written in order to estimate students' attitude scores from six independent variables. This equation is

$$Y = 0.23 * X_1 - 12.84 * X_2 + 1.24 * X_3 - 1.86 * X_4 - 4.99 * X_5 + 5.22 * X_6$$

Where Y represents the predicted attitude scores and X_1 , X_2 , X_3 , X_4 , X_5 , and X_6 represent teacher's characteristics, gender, age, experience in teaching, students' gender, and school conditions, respectively. Grade level is excluded from the equation because it does not have a significant correlation with the dependent variable.

4.3 Summary of the Results

1. The combined factors of teachers' characteristics, age, gender, experience in teaching, students' gender, grade level, and school condition affect students' attitudes toward physics.
2. Teachers' age, gender, experience in teaching, students' gender and school condition individually explain a significant amount of variance in students' attitudes toward physics.
3. There is no significant difference in 10th and 11th grade students' attitudes toward physics.

5. CONCLUSION AND DISCUSSION

This study has demonstrated that physics teachers' characteristics are related to students' attitudes toward physics. This result agrees with one of the results of the study carried out by Simpson and Oliver (1990) who report that the general attitudes of teachers would be linked closely to students' attitudes toward science. Also, in Tamir et al. (1974), it is stated that the teacher seems to have an effect on students' attitudes toward physics.

The teachers' age and experience in teaching make a significant difference in students' attitudes toward physics. This result may be close to the Barnes' conclusion (1987) which stated that teachers get better at teaching during the first few years, level off, and then probably decline somewhat.

One of the results of this study is that teacher's gender has a significant effect on students' attitudes toward physics. This result agrees with the study of Bernard et al. (1981). It was indicated that high school students' impressions and expectancies of teachers were related with teacher gender. This relation causes the difference in students' attitudes toward the course taking from male teachers and taking from the female teachers. Moreover, Cruickshank et al. (1995) stated some differences between male and female teachers and effects of these differences on students' attitudes and achievements.

It is believed that males have higher positive attitudes toward physics or generally toward science than females. There are many studies pointing out the gender difference in attitudes toward science and toward physics (Fleming and Malone, 1983; Simpson and Oliver, 1990; Ayers and Price, 1975; Tamir et al., 1974). The analyses of our study also show that there is a significant difference in attitudes toward physics between male and female students. Male students have more positive attitudes toward physics than female students.

There is no significant difference between 10th and

11th grade students' attitudes toward physics. This result agrees with the studies of Tamir et al. (1974) and Simpson and Oliver (1990).

The analyses of this study show that the school conditions explain a significant amount of variances in students' attitudes toward physics. The result agrees with the result of Tamir et al.'s study (1974). In which it was stated that school variables play an crucial role in the formation of attitudes toward physics. The same result is also pointed out by Simpson and Oliver's study (1990) for attitudes toward science.

The results of this study reveal that teacher's characteristics involving general behaviors, knowledge, planning, organization, teaching methods, personal relations and enthusiasm are important in the formation of students' attitudes toward physics. Thus, they should be improved to increase students' attitudes toward physics. Moreover, school conditions should be improved in order to have more students with positive attitudes toward physics.

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Appendix A: Physics Attitude Scale (PAS)

AÇIKLAMA: Bu anket sizin fizik dersine karşı tutumunuzu ölçmek için hazırlanmıştır. ANKETE İSMİNİZİ YAZMANIZA GEREK YOKTUR. Soruları dikkatli okuduktan sonra, her cümle için karşısındaki 5 seçenektan (Kesinlikle Katılıyorum, Katılıyorum, Kararsızım, Katılmıyorum, Kesinlikle Katılmıyorum) size en uygun seçeneğe ait parantezin içine çarpı (X) işareti koyunuz.

	KESİNLİKLE KATILYORUM	KATILYORUM	KARARSIZIM	KATILMIYORUM	KESİNLİKLE KATILMIYORUM
1. Fizik dersini severim.	()	()	()	()	()
2. Fizik dersi beni korkutur.	()	()	()	()	()
3. Fizik dersine girerken büyük bir sıkıntı duyarım.	()	()	()	()	()
4. Fizik dersi benim için ilgi çekicidir.	()	()	()	()	()
5. Fizik dersi olmasa öğrencilik hayatı daha zevkli olur.	()	()	()	()	()
6. Derslerim içinde en sevimsizi fiziktir.	()	()	()	()	()
7. Fizik dersi sınavından çekinirim.	()	()	()	()	()
8. Fizik dersinde zaman geçmek bilmez.	()	()	()	()	()
9. Arkadaşlarımla fizik konularını tartışmaktan zevk alırım.	()	()	()	()	()
10. Fiziğe ayrılan ders saatlerinin fazla olmasını dilerim.	()	()	()	()	()
11. Fizik dersi çalışırken canım sıkılır.	()	()	()	()	()
12. Diğer derslere göre fizik dersine çalışmaktan daha çok hoşlanırım.	()	()	()	()	()
13. Fizik dersi eğlenceli bir derstir.	()	()	()	()	()
14. Fizik ile ilgili kitapları okumaktan hoşlanırım.	()	()	()	()	()
15. Fiziğin günlük yaşantıda önemli bir yeri yoktur.	()	()	()	()	()
16. Fizik konularıyla ilgili daha çok şey öğrenmek isterim.	()	()	()	()	()
17. Fizikle ilgili çözemediğim bir problemle karşılaştığımda çözünceye kadar uğraşırım.	()	()	()	()	()
18. Yıllarca fizik okusam bıkmam.	()	()	()	()	()
19. Fiziği öğrendikçe fizik dersine olan ilgim artıyor.	()	()	()	()	()
20. Düşünce sistemimizi geliştirmede fizik öğrenimi önemlidir.	()	()	()	()	()
21. Fizik dersi çevremizdeki doğa olaylarının daha iyi anlaşılmasında yardımcı olur.	()	()	()	()	()
22. Fizik dersi seçmeli olsaydı, yine fizik dersini seçerdim.	()	()	()	()	()
23. İleride sahip olmak istediğim meslek ile fiziğin bir alakası vardır.	()	()	()	()	()
24. Fizik dersi somut (beş duyudan biri ya da birkaçı ile saptanabilen) bir derstir.	()	()	()	()	()

Appendix B: Physics Teacher Characteristics Scale (PTCS)

AÇIKLAMA: Aşağıdaki cümleler sizin **fizik öğretmeniniz** ile ilgili düşüncelerinizi ölçmek için hazırlanmıştır. Anket sonuçları gizli tutulacaktır ve size veya öğretmeninize yönelik herhangi bir uygulamada kullanılmayacaktır.

	KESİNLİKLE KATILYORUM	KATILYORUM	KARARSIZIM	KATILMIYORUM	KESİNLİKLE KATILMIYORUM
1. Derslere planlı ve hazırlıklı gelir.	()	()	()	()	()
2. Konuları düzenli bir şekilde anlatır.	()	()	()	()	()
3. Yeni konularla eski konular arasında ilişki kurar.	()	()	()	()	()
4. Sınıfta öğrenme için elverişli bir ortam sağlar.	()	()	()	()	()
5. Konuyu pekiştiren ödevler verir.	()	()	()	()	()
6. Sınav soruları öğrenci başarısını ölçebilir niteliktedir.	()	()	()	()	()
7. Öğrencinin notunu verirken tarafsız davranır.	()	()	()	()	()
8. Derslerde tepegöz, video, bilgisayar gibi araç - gereçler kullanmaya çalışır.	()	()	()	()	()
9. Konularla ilgili günlük hayattan örnekler verir.	()	()	()	()	()
10. Öğrencilerin derse katılımını sağlar.	()	()	()	()	()
11. Konularla ilgili deney, gözlem, grup çalışmaları gibi etkinlikler düzenler ve yapar.	()	()	()	()	()
12. Konuları birden fazla farklı yollardan anlatır.	()	()	()	()	()
13. Lise-1 fizik konularına hakimdir.	()	()	()	()	()
14. Lise-2 fizik konularına hakimdir.	()	()	()	()	()
15. Lise-3 fizik konularına hakimdir.	()	()	()	()	()
16. Fizik kavramlarının öğrenilmesine önem verir.	()	()	()	()	()
17. Konuyu anlatırken ders notlarına çok bağlı kalır.	()	()	()	()	()
18. Öğrencilerin fizik konularıyla ilgili sorularına rahatlıkla cevap verir.	()	()	()	()	()
19. Güncel fizik konularında kendini geliştirir.	()	()	()	()	()
20. Konuları büyük bir şevkle anlatır.	()	()	()	()	()
21. Derslerine gereken ciddiyeti, önemi verir.	()	()	()	()	()
22. Ders sürelerini iyi kullanır.	()	()	()	()	()
23. Öğrenci sorunlarından anlar ve onlara yardım eder.	()	()	()	()	()
24. Mesleğini severek yapar.	()	()	()	()	()
25. Derste çok hareketli ve yaratıcıdır.	()	()	()	()	()
26. Dersi veya kendisi ile ilgili eleştirilere açıktır.	()	()	()	()	()
27. Öğrencilerin konularla ilgili düşüncelerini açıklamalarına izin verir ve onları dinler.	()	()	()	()	()
28. Öğrencilere samimi, içten ve anlayışlı davranır.	()	()	()	()	()
29. Öğrencilere ders dışında zaman ayırır.	()	()	()	()	()
30. Konuşması açık ve yalındır.	()	()	()	()	()
31. İyi bir fizik öğretmenidir.	()	()	()	()	()
32. İyi bir insandır.	()	()	()	()	()