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Teachers' and Students' Perceptions of Effective Physics Teacher Characteristics

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Abstract

Problem Statement: What do teachers and students in Turkey perceive as the common characteristics of effective physics teachers?

Purpose of Study: The first aim was to investigate the common characteristics of effective physics teachers by asking students and teachers about the effects of teacher characteristics on student physics achievement and motivation. The second aim was to explore whether the effects of these characteristics were significantly associated with the geographical region, grade level, and gender of students, as well as with the region, gender, and year of teaching of teachers.

Methods: The data were gathered via a questionnaire that was administered to 2,177 high school students and 214 physics teachers in 9 cities from 3 geographical regions in Turkey. A mean score table was prepared, to compare effective physics teacher characteristics. Factor analysis was used to categorize these characteristics. After conducting missing data analysis and identifying descriptive statistics, MANOVA was used to test the null hypothesis.

Findings and Results: Teachers perceived teacher characteristics as having a greater effect on student motivation and achievement than did students. The eight main categories of effective physics teacher characteristics each had a strong effect on student motivation and achievement. These characteristics affected student achievement more than student motivation, according to teachers. Female students declared more than male students that physics teacher characteristics affected their motivation and achievement. Mediterranean-region students declared more than students from other regions that these characteristics significantly affected

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their motivation and achievement. Eleventh grade students declared more than tenth and ninth grade students that these characteristics affected their motivation and achievement.

Conclusions and Recommendations: The findings suggested that both students and teachers perceived physics teacher characteristics as affecting student achievement and motivation. The category that included the most effective characteristics was 'Pedagogical and Subject Matter Knowledge'. Physics teachers should be aware of their characteristics, and the characteristics of teachers should be taken into account in the process of selecting and assigning teachers.

Keywords: Effective teacher characteristics, teachers' perceptions, students' perceptions, physics teacher characteristics, student achievement, student motivation.

Effective teacher characteristics, including teacher actions and behaviors from the beginning till the end of a lesson, are paramount in terms of student learning. If teachers give suitable feedback to students and students share their ideas in classroom discussions, then student achievement, as well as motivation, will increase (Gylnn & Koballa, 2006). Teacher effectiveness is usually considered to be related to student learning outcomes, including student motivation and achievement (Fives, 2003). Effective teaching should involve "reflection on oneself, on classroom practice, on the students and their learning" (Opdenakker & Damme, 2006, p.15). The issues most related to effective teaching are the personal effectiveness of teachers and teachers' pre-service and in-service professional development activities (Haussler & Hoffmann, 2000).

Wayne and Youngs (2003) conducted a review study of 21 studies including meta-analyses and individual studies and declared that student learning depends on such teacher characteristics as testing skill, subject knowledge, and positive relationships with students. Survey studies designed by Duruhan, Akdağ and Güven (1990), and Ergün and Duman (1998) both implied that 'contacting students to understand the reasons for failure', 'ensuring active participation in class' and 'having a friendly attitude and demeanors' were perceived by students as effective teacher characteristics.

Student perceptions of teacher characteristics were analyzed by Korur (2001) and the teachers' perceptions were analyzed by Korur (2008). These studies yielded insight into the physics teacher characteristics that affect student achievement, motivation, and attitude. Such characteristics within the categories as pedagogical knowledge, preparation for lessons, and personal characteristics had an effect on student motivation. The teacher characteristics that affected student motivation in physics classes also affected their achievement (Korur, 2001; 2008).

Lederman, Ges-Newsome, and Latz (1994) stated that pedagogical knowledge is considered work toward the assessment of student understanding, whereas subject matter knowledge involves having the flexibility to present content in different

manners. Eryılmaz and İlaslan (1999) stated that physics teachers' characteristics are noteworthy and that pre-service physics teachers should be informed of the characteristics of effective teachers. Furthermore, subject matter knowledge and pedagogical knowledge were also considered effective physics teacher characteristics by Sperandeo-Mineo, Fazio and Tarantino (2006).

Brekelmans, Wubbels, and Creton (1990) implied a strong relationship between interactional behavior and student outcome in physics. Witcher et al. (2003) carried out a similar study to examine pre-service teachers' perceptions of the characteristics of effective college teachers. The results indicated that college students did not perceive teachers' personal characteristics, classroom management behaviors, and instructional techniques as relevant to characteristics of effective college teachers (Witcher et al., 2003). However, these findings differed from those of Wubbels, Tartwijk and Brekelmans (1995), who declared that teachers' classroom management behaviors and attitudes toward discipline are important characteristics to student learning. Witcher et al. (2003) showed that application of student-centered methods in the class, possession of subject matter knowledge, enthusiasm for teaching, and fair-mindedness and respectfulness were perceived by college students as characteristics of effective teachers. In addition, Alkhayyatt (2000) indicated that preparedness for lessons, use of examples, and use of experiments are the teacher characteristics that most greatly influence student motivation to learn.

Students should learn how to construct scientific knowledge in physics courses, and teachers should promote student learning through a variety activities, such as experiments (Aiello-Nicosia & Sperandeo-Mineo, 2000; Sperandeo-Mineo et al., 2006). Taylor and Dana (2003) found that students' scientific understanding was related to both teachers' use of meaningful learning activities, such as laboratory work, and teachers' subject matter knowledge. Kelly and Staver (2005) emphasized science teachers' professional development activities and classroom methods as the characteristics having the most affect on student self-conceptualization and motivation. Student motivation in physical science lessons has also been shown to be related to student achievement and learning outcomes (Tuan, Chin & Tsai, 2003).

In regard to effective teacher characteristics, neither effective physics teachers' characteristics nor the effects of physics teachers' characteristics on student motivation and achievement have been analyzed in the literature. This study attempted to reveal students' and teachers' shared perceptions of effective physics teacher characteristics by surveying a large number of students and teachers to define a better tendency about effective characteristics. The research questions were as follows;

1. What do students and physics teachers perceive as the teacher characteristics that most affect student achievement and motivation?
2. Which teacher characteristics do physics teachers and students both perceive as affecting student achievement and motivation the most?
3. Are there mean differences in students' scores of the physics teachers' characteristics affecting students' motivation (SMOT) and students' scores

of physics teachers' characteristics affecting students' achievement (SACH), with regard to geographical region and to student gender and grade level?

4. Are there mean differences in teachers' scores of physics teachers' characteristics affecting students' motivation (TMOT) and teachers' scores of physics teachers' characteristics affecting students' achievement (TACH), with regard to geographical region and to teacher gender and year of teaching?

Method

Population and Sample

The population accessible to this study included 337 public high schools from 39 cities in 3 regions, the Black Sea, Mediterranean, and Central Anatolia – 250,000 students and 1,500 high school physics teachers in all. Public schools from 9 cities in 3 regions were chosen via simple random sampling method. Data was collected from a total of 2,177 students from 25 schools; the percentage of those who returned the questionnaire was 90%. 1,100 (50.5%) of the ninth to eleventh graders surveyed were female and 1,077 (49.5%) male. Data was collected from 214 teachers from 71 public schools, 25 of which were the same schools selected for students, and the response rate was 75%. The gender distribution of teachers was 76 (36%) female and 138 (64%) male.

Of the 214 physics teachers, 137 (64%) had graduated from educational faculties, and 147 (67%) had more than 10 years teaching experience. Of the 2,177 students, 888 (41%) were in ninth grade, 831 (38%) were in tenth grade, and 458 (21%) were in eleventh grade. 965 (44%) students and 114 (53%) teachers were from the Central Anatolia region; 606 (28%) students and 53 (24%) teachers were from the Mediterranean; and 606 (28%) students and 47 (21%) teachers were from the Black Sea region.

Data Collection Instrument

The data collection instrument used in this study was 'The Effects of Teachers' Characteristics on High School Students' Physics Achievement and Motivation Questionnaire' (ETAM), adapted from Korur (2008). The ETAM includes a two-dimensional, five-point Likert-type scale. The first dimension corresponded to the SMOT and TMOT. The second was related to the SACH and TACH. On the five-point Likert-type scale, 1 corresponded to 'decreased the most', 2 to 'decreased', 3 to 'no effect', 4 to 'increased', and 5 to 'increased the most'. Therefore, the maximum score for the SMOT, SACH, TMOT and TACH was 710. Higher scores showed that a higher number of students/physics teachers perceived a given characteristic of physics teachers as affecting student motivation and achievement to a greater degree.

Validity and Reliability

The ETAM consisted of 142 items and 20 demographic questions for students and the same 142 items and 6 demographic questions for teachers. A pilot study was carried out with 50 high school students, 3 high school physics teachers, and 2 graduate students, to gather their opinions and views on the format of the

questionnaire and the grammatical clarity of its items. Their feedback supported the face validity of the questionnaire. Reliability analysis of the ETAM showed that some of the items' corrected correlations were negative and that those items had opposing tendencies. Therefore, for the data, 33 items were recoded as 1 for 5, 2 for 4, 3 for 3, 4 for 2, and 5 for 1. The results of the reliability analysis indicated that α=.9541 for motivation and .9517 for achievement.

Survey research has identified four possible threats to internal validity. Mortality threat was evaulated by conducting missing data analysis. Location and instrumentation threat was guarded against by calling principals and physics teachers of the schools by phone systematically. Furthermore, students and teachers filled out questionnaires using the same detailed questionnaire application guide. Instrument decay had the least effect in this study, since data were gathered via a questionnaire, rather than through interviews. Confidentiality threat was also avoided by not asking teachers' and students' to give their names on their questionnaires. In addition, since the sample was randomly selected from the accessible population, population generalizability was high. In terms of ecological generalizability, surveying took place in ordinary classrooms in public high schools.

Procedures and Analysis of Data

A detailed literature search was conducted, and a questionnaire booklet and answer sheets were prepared. Permission to administer the questionnaire was obtained from the Ministry of National Education. Teachers' data were entered by hand and students' data were entered by scanning optic forms directly to computers. Statistical analysis was done using SPSS and MS-Excel.

After conducting missing data analysis, descriptive statistics for appropriate variables were initialized, and mean score tables were prepared. Factor analysis was also used to categorize the characteristics. MANOVA was used to identify the answers to the fourth and fifth research questions. For students, geographical region, gender, and grade level, and for teachers, geographical region, gender, and year of teaching, were set as independent variables. The dependent variables were the SMOT, SACH, TMOT, and TACH.

Results

Descriptive Statistics

Students' perceptions of effective physics teacher characteristics. Descriptive statistics for the ETAM, related frequencies, and respective percentages, in terms of the SMOT and SACH, are categorized and presented in Table 1. As Table 1 indicates, the mean scores for the SMOT and SACH were approximately equal, which means that student motivation and achievement were almost equally affected by teacher characteristics. The skewness and kurtosis for the SMOT and SACH were within acceptable ranges for a normal distribution.

Table 1

Descriptive Statistics for the SMOT and SACH.

DV	IV	No	Students' No	Mean	S.D	Skewness	Kurtosis
SMOT	Gender	1	1077	497.7	49.95	-0.328	0.092
		2	1100	516.1	52.80	0.017	-0.247
	Region	1	965	504.4	49.78	0.256	-0.099
		2	606	523.3	53.54	0.029	-0.302
		3	606	494.8	50.67	0.145	-0.115
	Grade level	1	888	505.1	52.35	0.022	-0.346
		2	831	505.1	50.52	0.209	-0.200
		3	458	514.1	54.45	0.369	-0.065
SACH	Gender	1	1077	499.0	47.97	0.357	0.049
		2	1100	516.9	50.46	0.017	-0.255
	Region	1	965	503.6	48.05	0.286	-0.180
		2	606	526.9	49.83	0.104	-0.434
		3	606	496.1	48.08	0.068	-0.094
	Grade level	1	888	508.7	50.38	0.034	-0.338
		2	831	504.9	48.51	0.205	-0.285
		3	458	512.3	51.81	0.415	0.008

N= 2177

(Gender 1:Male, 2:Female; Geographical region 1:Central Anatolia, 2:Mediterranean, 3:Black Sea; Grade level 1:9th grade, 2:10th grade, 3:11th grade)

The 2,177 students were classified according to tendency in the scales from 1 to 5. As shown in Table 1, female students' mean scores were higher than male students' mean scores for both the SMOT and the SACH. However, the 'general' mean scores in Table 1 merely indicated the number of students who tended to choose items. Therefore, it was necessary to calculate students' mean scores of each item for motivation and achievement respectively, since it was crucial to identify the teacher characteristics that most affected these variables. For this purpose, scales 1 to 5 were recoded as 3 for '0', 2 and 4 for '1' and 1 and 5 for '2'. Item mean scores above '1' for the SMOT and the SACH were listed in descending order. Characteristics above the item mean score 1 were noted as those that most affected student motivation and achievement.

Analysis of the item means indicated that students perceived the characteristics of physics teachers that most affected student motivation as being slightly different from those that most affected student achievement. The item means for the SMOT and the SACH were analyzed together, and 6 of the first 10 items were matched. The most important teacher characteristics as perceived by students have been summarized in Table 2.

Table 2

The Most Effective Characteristics for the SMOT and SACH

Characteristics for the SMOT	Characteristics for the SACH
1. Being interested in some students more than the whole class.	
2. Lecturing reluctantly.	
3. Answering students' physics-related questions easily.	
4. Coming to lessons prepared.	
5. Possessing necessary knowledge of the subject matter.	
6. Preparing a suitable medium for learning in class.	
7. Having a friendly attitude to students.	7. Giving lectures with appropriate details.
8.Using language offensive to students.	8.Taking student questions into consideration and repeating subject matter.
9.Considering his/her own personal problems.	9.Solving problems in lessons that are similar to university entrance examination questions.
10. Being honest with students.	10.Offering courses in addition to normal class hours.

Table 2 reveals that characteristics like 'considering his/her own personal problems' had a greater effect on student motivation than on student achievement. Likewise, 'giving lectures with appropriate details' affected student achievement but not motivation.

Physics teachers' perceptions of effective physics teacher characteristics. Teachers' answers to the ETAM were used to identify descriptive statistics for physics teachers' perceptions of effective teacher characteristics, in terms of two main scores – the TMOT and the TACH. Descriptive statistics for various parts of the ETAM are presented in Table 3.

Table 3

Descriptive Statistics for the TMOT and TACH.

DV	IV	No	Teachers' No	Mean	S.D	Skewness	Kurtosis
TMOT	Gender	1	138	565.1	35.40	-0.249	1.639
		2	76	574.3	29.70	0.534	0.478
	Region	1	114	565.2	39.06	0.009	1.191
		2	53	574.2	25.22	0.309	-0.103
		3	47	569.4	26.98	-0.394	0.883
	Year of Teaching	2	26	567.0	37.69	-0.135	-0.544
		3	141	568.7	33.29	-0.204	2.829
		4	46	568.5	33.68	0.141	-0.310
		5	1	556.0			
TACH	Gender	1	138	555.0	37.61	0.165	0.799
		2	76	557.1	35.40	0.348	0.516
	Region	1	114	554.2	40.23	0.346	0.711
		2	53	560.2	33.77	0.092	0.166
		3	47	554.5	31.08	-0.147	0.765
	Year of Teaching	2	26	552.8	36.08	0.039	-0.686
		3	141	553.9	36.34	0.308	1.44
		4	46	562.8	38.77	-0.002	-0.288
		5	1	556.0			

N=214

(Gender 1:Male, 2:Female; Region 1:Central Anatolia, 2:Mediterranean, 3:Black Sea; Year of teaching 1:0-5 years, 2:6-10 years; 3:11-20 years, 4:21-30 years, 5:31 years and above)

The mean scores for the TMOT and the TACH showed that teachers perceived the characteristics of effective physics teachers as affecting student motivation much more than student achievement. The standard deviation values altogether showed that most teachers provided almost the same scores. The skewness and kurtosis of the TMOT and the TACH could be seen as indications that the distribution was approximately normal. When the SMOT and the SACH scores in Table 1 were compared with the corresponding mean scores of the TMOT and the TACH in Table 3, it was clear that teachers' mean scores were higher than students' mean scores.

The mean scores for teachers' perceptions, in Table 3, indicated teachers' general tendencies. To identify the items that most affected student motivation and achievement, the scale was recoded, as it was for student data. All of the item mean scores for the TMOT and the TACH that were above '1' were listed in descending order. Scores for the TMOT and the TACH were analyzed together, and 5 of the first 10 items were matched. Teachers' perceptions of the most effective physics teacher characteristics have been summarized in Table 4.

Table 4

The Most Effective Characteristics for the TMOT and TACH

Characteristics for the TMOT	Characteristics for the TACH
1. Answering students' physics-related questions easily.	
2. Lecturing reluctantly.	
3. Making physics lessons interesting by giving examples from daily life.	
4. Using language offensive to students.	
5. Getting angry with students' faults and shouting at or hitting students who are disrupting the classroom atmosphere.	
6.Knowing all students and calling them by their names.	6. Possessing necessary knowledge of the subject matter.
7. Humiliating students in front of their friends with the aim of punishing.	7. Giving lectures with appropriate details.
8.Giving low grades to instill discipline.	8. Possessing the mathematics and geometry background necessary for physics.
9. Being efficiently motivating.	9. Coming to lessons prepared.
10. Being hard-hearted, intolerant and tedious.	10.Making use of physics laboratories in lessons.

Table 4 indicates that teachers perceived characteristics like 'answering students' physics-related questions easily' as most affecting student motivation and achievement. Moreover, characteristics related to transferring subject matter knowledge to students by making use of laboratories and giving lectures with appropriate details were perceived by teachers as affecting student achievement more than student motivation.

Teachers' and students' shared perceptions of effective physics teacher characteristics. The mean scores of each item for the TMOT and TACH in this study and the corresponding mean scores of the SMOT and SACH were analyzed together, to identify common effective physics teacher characteristics. First, the item mean scores for both the TMOT and TACH, and the SMOT and SACH were listed. Second, scores

for items related to motivation and achievement were added separately, and the final score for each item was calculated. The cut-off point for the final scores was specified as 2.20. A total score of 2.00 (1 for student mean and 1 for teacher mean) indicated that teachers and students perceived a particular item as having an effect, albeit a weak one, on student motivation or achievement. However, this study aimed to find out which characteristics most affected student motivation and achievement.

In the matched list, 57 items were above the total mean score of 2.20 for the SMOT and TMOT and 46 for the SACH and TACH. Therefore, the final scores for individual items were listed in descending order for both the SMOT-TMOT and the SACH-TACH. Then, items were matched from both parts and their mean scores added. The combined 38 items and their respective mean scores are given in Appendix A. The rest of the items, which fell below a final mean score of 2.20, were eliminated.

Factor analysis of the 38 items was carried out using principal component analysis as an extraction method and varimax with Kaiser Normalization as a rotation method. There were 8 factors with eigen values of 1.0 or higher extracted by the SPSS program. These factors accounted for, totally, 54.958 % of the variance. Therefore, 8 categories were related to the 38 effective teacher characteristics. In Table 5, the names of the all categories, with respect to item numbers in the descending order of factor loadings, are given.

Table 5

Categories and Corresponding Items

No.	Teacher Characteristics Category	Number of Item	Item Number
1	Possession and Transference Subject Matter Knowledge	5	1, 2, 4, 9, 18
2	Knowledge of Profession and Teaching Techniques	6	40, 41, 47, 51, 87, 141
3	Use of Technology in the Classroom	3	67, 70, 71
4	Enthusiasm for Teaching	5	20, 23, 25, 36, 50
5	Activities for Meaningful Learning	6	22, 34, 60, 61, 63, 72
6	Classroom Management	4	31, 37, 39, 130
7	Personal Characteristics	3	7, 78, 131
8	Attitude Toward Discipline in the Classroom	6	98, 100, 101, 102, 104, 108

Researchers derived the name of the categories in Table 5 by considering related literature, the characteristics underlying the categories, and expert views. Effective physics teacher characteristics mostly fell into the categories entitled to 'knowledge of profession and teaching techniques', 'activities for meaningful learning', and 'attitude toward discipline in the classroom'.

Inferential Statistics

The assumptions of multivariate analysis of variance (MANOVA) are normality, linearity of dependent variables, multicollinearity and singularity, equality of variances, and independency of observations. The variables were tested for these assumptions, and all of the assumptions were met. MANOVA was conducted to answer the third research question. Significant differences were found according to geographical region, student gender, and grade level with respect to the dependent measures of the SMOT and the SACH. For region, $F(4,2177)=.938$, $p=.000$; for gender, $F(2,2177)=.972$, $p=.000$; and for grade level, $F(4,2177)=.984$, $p=.000$. Analysis of variance (ANOVA) on each dependent variable was conducted as a follow-up to MANOVA. In Table 6, the follow-up results for the third research question are given.

Table 6

ANOVA Results for the Third Research Question

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.
Region	SMOT	255987.287	2	127993.644	50.896	.000
	SACH	321644.637	2	160822.319	70.716	.000
Gender	SMOT	187719.914	1	187719.914	74.646	.000
	SACH	173570.874	1	173570.874	76.321	.000
Grade Level	SMOT	33329.571	2	16664.785	6.627	.001
	SACH	14723.016	2	7361.508	3.237	.039

ANOVA indicated significant differences in the SMOT and SACH scores, in terms of all independent variables (geographical region, gender, and grade level). Tukey results for students region are given in Table 7.

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Table 7

Tukey Test Results by Students Region

Dependent Variable	Region (I)	Region (J)	Mean Difference (I-J)	Std.Error	Sig.
SMOT	Central Anatolia	Mediterranean	-18.9000*	2.5992	.000
		Black Sea	9.5538*	2.5992	.001
	Mediterranean	Central Anatolia	18.9000*	2.5992	.000
		Black Sea	28.4538*	2.8809	.000
SACH	Central Anatolia	Mediterranean	-23.3611*	2.4717	.000
		Black Sea	7.4673*	2.4717	.007
	Mediterranean	Central Anatolia	23.3611*	2.4717	.000
		Black Sea	30.8284*	2.7396	.000

There were significant mean differences, p=.000, among all regions for both the SMOT and the SACH. According to these findings, Mediterranean students were more likely than Black Sea and Central Anatolia students to declare that physics teachers' characteristics affected their motivation and achievement. Students from the Central Anatolia were more likely than students from the Black Sea to report that these characteristics affected their motivation and achievement. Tukey results by student grade level are given in Table 8.

Table 8

Tukey Test Results by Student Grade Level

Dependent Variable	Grd.Level (I)	Grd.Level (J)	Mean Difference (I-J)	Std.Error	Sig.
SMOT	9th	10th	-3.3085E-02	2.4204	1.000
		11th	-8.9714*	2.8849	.005
	10th	9th	3.308E-02	2.4204	1.000
		11th	-8.9383*	2.9184	.006
SACH	9th	10th	3.7843	2.3017	.227
		11th	-3.6373	2.7435	.381
	10th	9th	-3.7843	2.3017	.227

	11th	-7.4216*	2.7753	.020

There were no statistically significant mean differences, at the level of p=.05, between the ninth and tenth grades for the SMOT and the SACH. In terms of the SMOT, there were significant mean differences between the ninth and eleventh grades, p=.005, and the tenth and eleventh grades, p=.006. Eleventh grade students declared more often than ninth and tenth grade students that physics teachers' characteristics affected their motivation. There were also no significant mean differences between ninth and eleventh grade students, with regard to the SACH, but there were significant mean differences between the tenth and eleventh grades, p=.020. In other words, eleventh grade students, more than tenth grade students, thought that teacher characteristics affected their achievement.

MANOVA was also conducted to answer the fourth question of whether teachers' geographical regions, gender, and year of teaching had significant effects on the TMOT and the TACH. For region, F(4,214)=.967, p=.158; for gender, F(2,214)=.994, p=.569; and for year of teaching, F(2,214)=.977, p=.597. According to these values, there were no statistically significant main effect for at least one dependent variable according to geographical region, teacher gender, and year of teaching. Hence, dependent variables, the TMOT or the TACH, were not explained by the main and interaction effects of the independent variables. When the estimation of effect sizes were considered, the partial eta-squared values of teacher gender, year of teaching and geographical region for each dependent variables were nearly zero. In other words, the results were neither statistically nor practically significant for these independent variables.

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Discussion and Conclusion

Some categories of teacher characteristics have been found to affect student achievement and motivation (Lederman et al., 1994; Witcher et al., 2003; Wubbels et al., 1995). The six categories identified in this study from teachers' and students' shared perceptions supported the findings of the literature. Moreover, this study found new categories of physics teacher characteristics, like 'using technology in the classroom' and 'activities for meaningful learning', that were also effective.

Opdenakker and Damme (2006) and Fives (2003) concluded that 'teaching techniques' and 'classroom management skills' support student learning. Studies of teacher characteristics have suggested similar results in Turkey (Duruhan et al. 1990; Ergün & Duman, 1998). Drawing on teachers' and students' shared perceptions, this study showed that there are six additional categories of physics teacher characteristics that affect student motivation and achievement.

Aiello-Nicosia and Sperandeo-Mineo (2000) stated that students perceived the ability to properly plan lessons and knowledge of subject matter as effective teacher characteristics. Least important were teacher gender and grooming. The descriptive

statistics generated by this study similarly suggested that students and teachers perceived physics teachers' gender, physical appearance, and age as having the least effect on student motivation and achievement. Teachers' perceptions of the effects of teacher characteristics, on the other hand, showed that pedagogical knowledge, subject matter knowledge, and classroom management techniques affected student motivation and achievement (Duruhan et al., 1990; Eryılmaz & İlaslan, 1999; Wayne & Youngs, 2003). However, in the study of Witcher et al. (2003), the college students did not perceive personal characteristics and classroom management techniques as effective teacher characteristics. In this study, both students and teachers identified teachers' 'Possession and Transference of Subject Matter Knowledge' and 'Enthusiasm for Teaching' as the categories that most affected student motivation and achievement.

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Alkhayyatt (2000) showed that teacher characteristics like 'enthusiasm', 'organizing valuable activities', 'answering students' questions', 'subject matter knowledge', 'preparation for lessons', 'use of examples', and 'use of experiments' had the greatest influence on student motivation to learn. The present study revealed a greater number of characteristics than those considered by Alkhayyatt (2000). 38 physics teacher characteristics were perceived by teachers and students as affecting student motivation and achievement. Both teachers and students concluded that physics teachers who possessed most of these characteristics had a strong effect on student motivation and achievement in physics lessons. Moreover, the characteristics that were derived from students' and teachers' shared perceptions have been better defined by this study than other, similar characteristics were in previous studies.

'Lecturing reluctantly', 'using language offensive to students', 'being interested in some students more than the whole class', 'answering students' physics-related questions easily', and 'coming to lessons prepared' strongly affected both student motivation and achievement in physics. The first, second, and third characteristics had negative effects. Teachers and students indicated that teachers who came to lessons prepared, had enough subject matter knowledge, and could transfer this knowledge enthusiastically were able to motivate their students and increase their achievement. Knowledge transfer is most effectively achieved by providing meaningful learning activities and by answering students' physics-related questions. On the other hand, teachers who did not pay attention to the words they used during lessons, who did not teach by engaging whole class, and who taught reluctantly inevitably decreased their students' motivation and achievement. Moreover, teachers perceived that physics teachers' characteristics had a greater effect on student motivation and achievement than did students. Teachers also perceived these characteristics as affecting student achievement more than student motivation.

Geographical region, student gender, and grade level had statistically significant combined effects on both dependent variables, the SMOT and the SACH. Female students, more than male students, perceived that physics teacher characteristics affected their motivation and achievement. Significantly, students from the Mediterranean region perceived the most, while students from the Black Sea region perceived the least, that physics teacher characteristics affected their motivation and

achievement. Physics teachers' characteristics affected eleventh grade students more than they did tenth and ninth grade students for the SMOT and the SACH. Geographical region, teachers' gender, and year of teaching did not have a statistically significant combined effect on either of the dependent variables, the TMOT or the TACH. With respect to the overall findings of this study, effective physics teacher characteristics were crucial to ensuring that teachers transferred knowledge and utilized optimal programs that were a mixture of instructional methods and learning outcomes.

Teachers should try to exhibit effective physics teacher characteristics frequently during lessons. During routine school inspections by the Ministry of National Education, teachers should be observed and evaluated with these characteristics in mind. When candidate teachers are to be placed in educational faculties, their characteristics could be taken into consideration. A similar study could be done on groups of high and low achievers in physics courses. A comparable study could be undertaken of teachers in other disciplines.

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Öğretmen ve Öğrencilerin Fizik Öğretmeninin Etkili Niteliklerini Algıları (Özet)

Problem Durumu

Öğretmen nitelikleri, literatürde genel olarak, öğretmenlerin sınıftaki davranışları olarak incelenmiştir. Ayrıca bu çalışmalarda etkili öğretim açısından öğretmen niteliklerinin önemi vurgulanmıştır. Fakat yapılan çalışmalar, fizik öğretmeninin hem fizik dersinde hem de sınıf içi davranışlarındaki niteliklerini araştırmamıştır. Bu çalışma kapsamında ulaşılan öğrenci ve öğretmen sayısı ve kullanılan anket düşünüldüğünde ulaşılan sonuçlar bu alandaki boşluğun önemli bir kısmını dolduracaktır. Öğrencinin fizik başarısına ve motivasyonuna en etkili fizik öğretmeni nitelikleri, öğretmen ve öğrencilerin ortak algıları ile bu çalışma kapsamında saptanmıştır. Öğretmen niteliklerinin etkilerini açıklamada bazı değişkenlerin öğrencinin fizik başarısını ve motivasyonunu etkilemedeki rolü incelenmiştir.

Araştırmanın Amacı

Bu çalışmada, ilgili literatürde belirtilen önemli nitelikleri içeren bir anketle, öğrencilerin ve öğretmenlerin ortak algıları ile en etkili fizik öğretmen niteliklerini tespit etmek amaçlanmaktadır. Bu algılarından belirlenen fizik öğretmeninin etkili nitelikleri ile öğrenci başarısı ve motivasyonu arasındaki ilişki araştırılmıştır. Bu niteliklerin başarı ve motivasyonu etkilemede coğrafi bölge, öğrencinin sınıf seviyesi ve cinsiyeti, öğretmenin hizmet süresi ve cinsiyeti gibi değişkenlerin hangi düzeyde katkısı olduğu araştırılmıştır.

Araştırmanın Yöntemi

Çalışmada uygulanan ankette, öğrenciler için 20 soruluk, öğretmenler için 6 soruluk 'Kişisel Bilgiler' kısımları bulunmaktadır. Öğretmen ve öğrencilerden cevap kâğıdında 'Başarı' ve 'Motivasyon' sütunlarında yer alan ve niteliğin hangi düzeyde etkili olduğunu 5'li Likert tipi ölçekte 142 nitelik için ayrı ayrı işaretlemeleri istenmiştir. Anket Türkiye'deki üç bölgedeki 9 ilde, devlet liselerinin 9., 10., ve 11. sınıf seviyesinden 2177 devlet lisesi öğrencisine ve aynı bölge ve illerde 214 lise fizik öğretmenine uygulanmıştır. Uygulamadaki birliktelik açısından, öğretmen ve öğrenciler anketleri 'Anket Uygulama Yönergesi' doğrultusunda doldurmuşlardır. Verilerin betimsel istatistikleri, faktör analizi ve çıkarımsal istatistikleri için MS-Excel ve SPSS programları kullanılmıştır.

Araştırmanın Bulguları

Betimsel istatistik bulguları öğrencilerin ve öğretmenlerin genel eğilimlerini tespit etmede önemlidir. Ortalama puanlara göre, fizik öğretmeni nitelikleri öğrencilerin başarısını ve motivasyonunu aynı oranda etkilemektedir. Fizik öğretmen niteliklerinin öğrenci başarısını ve motivasyonunu, kız öğrenciler erkek öğrencilerden daha fazla etkilediğini düşünmektedir.

Her bir nitelik için öğretmen ve öğrencilerin algıları ortalama puanlara dönüştürülmüş ve puanı '1'in üzerinde olan nitelikler alınmıştır. Öğrencilerin algılarına göre, öğrencinin başarısını ve motivasyonunu öğretmenin farklı nitelikleri

etkilemektedir. Öğretmenlerin algıları, öğrencilerin algılarına göre, fizik öğretmen niteliklerinin motivasyon ve başarıya daha etkili olduğu yönündedir. Öğrencilerin ve öğretmenlerin ortak algılarına göre, öğrencilerin başarısını ve motivasyonunu en çok etkileyen ilk 10 nitelikleri eşleştirildiğinde; 'dersi içten gelmeyerek anlatması', 'öğrencilere kötü kelimeler kullanması', 'bazı öğrencilerle daha fazla ilgilenip, sınıfın genelini düşünmemesi', 'öğrencilerin fizik konularıyla ilgili sorularına rahatlıkla cevap vermesi', 'derse hazırlıklı gelmesi' en etkili beş nitelik olarak bulunmuştur. Öte yandan, ortak algılar incelendiğinde, öğretmenin cinsiyeti, sosyo ekonomik durumu, yaşı en az etkili nitelikler olarak belirlenmiştir.

Öğrencilerin motivasyonunu ve başarısını etkileyen öğretmen nitelikleri madde bazında öğretmenlerin ve öğrencilerin ortalama puanları toplanarak bir toplam puana dönüştürülmüştür. Sonuç olarak; motivasyonu etkileyen 57 nitelik, başarıyı etkileyen 46 nitelik ortaya çıkmış ve bunlar eşleştirilerek bir kesim noktası belirlenmiş, bu puanın üzerinde toplam puana sahip 38 ortak fizik öğretmen niteliği en etkili nitelikler olarak tespit edilmiştir. Bu ortak nitelikler üzerinden yapılan faktör analizi sonucunda, nitelikler 8 faktörde toplanmıştır. Bu 8 faktörden öğretmen niteliklerinin toplandığı kategoriler oluşturulmuştur. Kategoriler, içindeki nitelikler gözönüne alınarak, literatürden desteklenerek, ve uzman görüşleri alınarak isimlendirilmiştir. Bu kategorilerden en çok niteliğin toplandığı üç kategori 'Meslek Bilgisi ve Öğretim Yöntemleri', 'Anlamlı Öğrenme Aktiviteleri', ve 'Sınıf içi Disiplin Tutumu' dur.

Öğrencilerden elde edilen veriler kullanılarak, öğrencilerin motivasyonunu etkileyen öğretmen nitelikleri puanı ve başarısını etkileyen öğretmen nitelikleri puanı iki bağımlı değişken olarak atanmıştır. Bu bağımlı değişkenler ile coğrafi bölge, $F(4,2177)=0,938$, $p=0,000$; öğrencinin sınıf seviyesi $F(4,2177)=0,984$, $p=0,000$; ve cinsiyeti $F(2,2177)=0,972$, $p=0,000$ arasında anlamlı farklar bulunmuştur. Ortalama farklarını tespit etmek amacıyla yapılan Tukey testi sonuçlarına göre; Akdeniz Bölgesi'ndeki öğrenciler fizik öğretmen niteliklerini başarı üzerinde daha etkili olduğunu belirtmişlerdir. Daha sonra Karadeniz ve en son İç Anadolu Bölgesi'ndeki öğrenciler olarak sıralanmaktadır. Sınıf seviyeleri açısından bakıldığında, 11. sınıf seviyesindeki öğrencilerin 10. sınıftaki öğrencilere göre fizik öğretmen niteliklerinin başarı üzerinde daha etkili olarak algıladıkları belirlenmiştir. 9. sınıflar ile 10. sınıflar ve 9. sınıflar ile 11. sınıflardaki öğrencilerin ortalama puanları arasında anlamlı bir fark bulunamamıştır.

Öğretmenlerden elde edilen veriler kullanılarak, başarıyı etkileyen ve motivasyonu etkileyen fizik öğretmeni nitelikleri puanları bağımlı değişken olarak atanmıştır. Bu değişkenler ile coğrafi bölge, öğretmenin cinsiyeti ve hizmet süresi değişkenleri arasında istatistiksel olarak anlamlı farklar bulunmamıştır. Bağımsız değişkenlerin kısmi eta-kare değerleri, her bir bağımlı değişken için sıfıra yakın olarak bulunmuştur. Dolayısıyla sonuçlar bu bağımsız değişkenler için pratikte de anlamlı değildir.

Araştırmanın Sonuçları ve Öneriler

Araştırmanın en önemli sonucu, öğretmenlerin ve öğrencilerin algılarına göre fizik öğretmeni nitelikleri öğrencilerin başarı ve motivasyonunu etkilemede önemlidir. Konu bilgisine hakim, derse hazır ve istekli bir fizik öğretmeni, bu niteliklerini anlamlı öğrenme aktiviteleri ile birleştirip öğrenciye aktarabilirse öğrenciyi güdüler ve başarısını artırabilir.

Öğretmen niteliklerinin toplandığı 8 kategoriden, en etkili niteliklerin toplandığı iki kategori 'Konu Bilgisine Sahip Olması ve Aktarması' ve 'Öğretimdeki İstekliliği' dir. Buna göre; hem öğrenciler, hem de öğretmenler bu kategorilerdeki niteliklere sahip fizik öğretmenlerinin, öğrenci başarısını ve motivasyonunu artıracağını düşünmektedirler. Fizik öğretmenleri, öğrencilere göre, öğretmen niteliklerinin öğrencinin başarı ve motivasyonunu etkilemede daha önemli olduğunu düşünmektedir.

Öğrencilerde cinsiyet, bölge sınıf seviyesi gibi değişkenler, öğretmen niteliklerinin etkisini açıklamada önemli olmuştur. Kız öğrenciler öğretmen niteliklerinin başarıya etkisinin daha çok olduğunu düşünmektedir. Ayrıca 11. sınıf öğrencileri öğretmen niteliklerinin başarıya etkisinin daha çok olduğunu düşünmektedirler. Akdeniz bölgesindeki öğrenciler öğretmen niteliklerini oldukça büyük bir ortalama farkı ile başarıya daha etkili olduğunu belirtmişlerdir.

Fizik öğretmenleri, öğrencilerin başarısını etkileyen nitelikler hakkında bilgi sahibi olmalıdır. Milli Eğitim Bakanlığı tarafından düzenli olarak yapılan öğretmen değerlendirme ve teftiş süreçlerinde bu nitelikler göz önüne alınabilir. Bu çalışma, aynı amaçla fizik dersinde başarıları yüksek ve düşük gruplardaki öğrenciler üzerinde yapılabilir. Diğer branş öğretmenlerinin etkili nitelikleri üzerine benzer çalışmalar yapılabilir.

Anahtar Sözcükler: Etkili öğretmen nitelikleri, öğretmenlerin algıları, öğrencilerin algıları, fizik öğretmen nitelikleri, öğrenci başarısı, öğrenci motivasyonu.

APPENDIX A

The matched mean scores from the perceptions of teachers and students

	Motivation (Mean Scores)			Achievement (Mean Scores)		
No.*	TMOT	SMOT	Total	TACH	SACH	Total
001	1.24	1.25	2.49	1.35	1.27	2.62
002	1.25	1.17	2.42	1.32	1.30	2.62
004	1.24	1.07	2.32	1.40	1.16	2.56
007	1.33	1.22	2.55	1.27	1.12	2.39
009	1.46	1.34	2.80	1.37	1.39	2.76
018	1.37	1.29	2.66	1.51	1.37	2.88
020	1.25	1.10	2.35	1.23	1.15	2.38

022	1.26	1.15	2.41	1.12	1.16	2.28
023	1.15	1.16	2.32	1.04	1.24	2.28
025	1.31	1.20	2.52	1.27	1.27	2.53
031	1.41	1.42	2.83	1.21	1.33	2.54
034	1.34	1.13	2.47	1.27	1.20	2.46
036	1.56	1.38	2.94	1.37	1.37	2.74
037	1.38	1.19	2.57	1.24	1.20	2.44
039	1.31	1.15	2.46	1.28	1.18	2.47
040	1.13	1.20	2.33	1.23	1.30	2.53
041	1.10	1.12	2.22	1.23	1.20	2.43
047	1.34	1.16	2.49	1.17	1.28	2.45
050	1.22	1.11	2.33	1.14	1.12	2.27
051	1.14	1.07	2.21	1.25	1.16	2.42
060	1.43	1.10	2.53	1.35	1.13	2.47
061	1.28	1.05	2.32	1.23	1.02	2.25
063	1.59	1.19	2.77	1.35	1.11	2.46
067	1.36	1.02	2.38	1.27	1.02	2.29
070	1.36	1.10	2.47	1.13	1.09	2.21
071	1.31	1.18	2.49	1.16	1.18	2.35
072	1.31	1.05	2.36	1.15	1.05	2.20
078	1.40	1.09	2.49	1.26	1.04	2.30
087	1.10	1.13	2.23	1.16	1.15	2.32
098	1.55	1.13	2.68	1.31	1.09	2.41
100	1.42	1.16	2.58	1.16	1.14	2.30
101	1.59	1.28	2.87	1.46	1.23	2.69
102	1.55	1.13	2.68	1.35	1.04	2.38
104	1.44	1.16	2.60	1.22	1.10	2.32
108	1.44	1.14	2.58	1.23	1.08	2.31
130	1.49	1.14	2.63	1.24	1.08	2.32
131	1.46	1.15	2.61	1.29	1.08	2.37
141	1.16	1.04	2.21	1.19	1.07	2.26

* Descending order with respect to the item numbers in the questionnaire