STUDENT PERCEPTIONS ON THEIR PHYSICS AND MATHEMATICS TEACHERS' EFFECTIVENESS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
SECONDARY SCIENCE AND MATHEMATICS EDUCATION

DECEMBER 2006

Approval of the Graduate School of Natural and Applied Sciences

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ABSTRACT

STUDENT PERCEPTIONS ON THEIR PHYSICS AND MATHEMATICS TEACHERS' EFFECTIVENESS

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December 2006, 102 pages.

The purpose of this study was to investigate the high school students' perceptions on effectiveness of their physics and mathematics teachers. For this purpose a 71-item questionnaire, with a reliability coefficient of 0.97, was developed and applied to 1237 9th grade students in Ankara. 30 Physics teachers and 33 Mathematics teachers were evaluated by student ratings in 13 regular high schools and 6 Anatolian lycees. As a result, 17 % of physics teachers and 27% of mathematics teachers found to be considered effective by their students. In addition to this, it is found that specific effective teacher characteristics about teaching ability and interpersonal relationships are possessed in low amounts by most of the physics and mathematics teachers.

Keywords: Physics education, Mathematics Education, Perception, Effective teacher, Effective teacher characteristics, Student rarings.

ÖZ

FİZİK VE MATEMATİK ÖĞRETMENLERİNİN YETERLİLİĞİ HAKKINDAKİ ÖĞRENCİ ALGILARI

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Aralık 2006, 102 sayfa.

Bu çalışmanın amacı, fizik ve matematik öğretmenlerinin yeterliği ile ilgili öğrenci algılarını araştırmaktadır. Bu amaçla, 71 maddeden oluşan, güvenilirlik katsayısı 0.97 olan bir anket geliştirilmiş ve Ankara'daki 1237 9. sınıf öğrencisine uygulanmıştır. 13 normal lise ve 6 Anadolu lisesinde görev yapan 30 fizik ve 33 matematik öğretmeni öğrenci takdirleri ile değerlendirilmiştir. Sonuç olarak fizik öğretmenlerinin %17'sinin, matematik öğretmenlerinin %27'sinin öğrenciler tarafından yeterlikli olarak algılandığı bulunmuştur. Ayrıca, fizik ve matematik öğretmenlerinin çoğunun öğretme yeteneği ve kişiler arası ilişkilerle ilgili yeterlikli öğretmen karakterlerine düşük seviyede sahip olduğu bulunmuştur.

Anahtar Kelimeler: Fizik Eğitimi, Matematik Eğitimi, Algı, Etkili Öğretmen, Etkili Öğretmen Özellikleri, Öğrenci takdirleri.

To my family…

ACKNOWLEDGEMENT

I would like to thank my supervisor Assoc. Prof. Dr. Behiye UBUZ for her valuable guidance and patience.

I also want to thank to Assist. Prof. Dr. Ali ERYILMAZ, Assist. Prof. Dr. Erdinç ÇAKIROĞLU, Dr. Ömer Faruk ÖZDEMİR and Dr. Yusuf KOÇ for their valuable feedbacks and supports to this study.

I am grateful to my parents Beyhan KURAL and Rıfat KURAL who provided valuable support throughout my life and this study.

Special thanks goes to my by brother Cömert KURAL and my friends Seha TİRKEŞ, Süha TİRKEŞ, and Gökhan SERİN for their valuable contributions and supports to this study.

I also want to thank to administrators, teachers, and students who gave their time and helped by participating in this study.

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CHAPTER 1

INTRODUCTION

Our education system needs qualified teachers to train qualified people who are able to adapt to speed of change, which increases by the new millennium (Ergün, 2002). The places where the qualified people are trained are schools, which are the most functional parts of the educational systems. Therefore the need for effective school and class managements and effective teachers is obvious. In terms of student achievement, the teacher is a more significant factor than any kind of school resources (Rowe, 2003). As cited in Bossing (1952, p.515), J. F. Brown (1909), one of the American educational leaders wrote as follows:

> The teacher is, by all odds, the most influential factor in high school education. Curriculum, organization or equipment, which are important as they are, count for little or nothing except as they are vitalized by the living personality of the teacher.

Druva and Anderson (1983) supported the ideas above by stating that teachers play a primary role in students learning. When playing this role, certain characteristics are more effective in student learning. These effective teacher characteristics can be categorized under the following dimensions: Teaching ability, professional competence, evaluation, interpersonal relationships and personality traits (Knox & Morgan, 1985).

Like all other lessons, the quality of the teachers is very important for physics and mathematics lessons also. In Turkey, both physics and mathematics are difficult subject areas for students (Eryılmaz & Kırmızı, 2002; Dede & Dursun, 2004). In addition to this, according to 2006 University Entrance Examination (ÖSS) results, students in Turkey are not very successful at physics and mathematic lessons. There were 60 mathematics questions in the exam and the average of students' net correct answers to mathematics questions was 15.5. There were 60 science questions (16 biology, 18 chemistry and 26 physics questions) and the average of students' net correct answers to science questions was 9.7 (ÖSYM, 2006). There is research emphasizing the unsuccessfulness of students in physics lesson in Turkey (Eryılmaz, 1999). In her study, Eryılmaz (1999) states that one of the factors which might be related to declining achievement in physics is scarcity of qualified teachers.

Meeting the educational objectives is directly related to effectiveness of the classroom activities (Ergün, 2002). The assessment of the teachers who execute those classroom activities is as important as the assessment of these activities. In Turkish educational system assessment of teachers is done by register records. These records include a mark that is given by the school principal by considering teachers' one year of performance (MEB Teftiş Kurulu Başkanlığı, 2006). To evaluate the teachers' one year of work, the views of the school principals' or, in some cases, other educational directors' views are seen enough (Ergün, 2002).

On the other hand, the assessment of teacher must be considered differently from assessment of other civil servants because there are great differences between the roles of teachers and the roles of other officers (Ergün, 2002). An officer tries to satisfy only the person in the position of his or her chief. On the other hand, a teacher must satisfy their students and have to make them successful and happy by his or her work. Teachers are the people who do varied activities with students, lead them, give them desired behaviors and teach them cultural values and prepare them for the life. The school principal or other educational directors in the district make decisions of how much of these duties accomplished by the teacher. The students, who are directly affected by teachers' work success and directly face with the teacher, have no opportunity to assess their teachers (Ergün, 2002). The current teacher assessment system is neither reliable nor valid, since it considers students' views as unimportant although they are the most important part of the education (Altundepe, 1999).

On the other hand, method of assessing teachers by using student ratings is proved to be useful, valid and reliable by various studies (Cashin, 1995; Centra, 1993; Marsh, 1984). Student perceptions on effectiveness of their teachers are offered as a complementary factor in assessing teachers, instead of a single criterion (Cashin, 1995; Centra, 1993).

The aim of this study is to investigate the student perception on teaching effectiveness of their physics and mathematics teachers in regular high schools and Anatolian Lycees in Ankara.

1.1 The Main Problem and Sub-problems

1.1.1 Problem

What are the students' perceptions on effectiveness of their physics and mathematics teachers?

1.1.2 The Sub-problems

1. Are physics teachers considered as effective teachers according to student perceptions?
2. Do physics teachers have specific effective teacher characteristics related to dimensions of effective teaching?
3. Are mathematics teachers considered as effective teachers according to student perceptions?
4. Do mathematics teachers have specific effective teacher characteristics related to dimensions of effective teaching?

1.2 Significance of the Study

As it is stated in the introduction part, the effectiveness of teachers, who constitute the most affective factor on educational outcomes, is very important. In addition to this, evaluation is another important factor in education. Poor evaluation causes unfair judgments and fails to reveal shortcomings in performance, while good evaluation provides useful information for decision making and feedback for teachers to improve themselves (Centra, 1993).

On the other hand, in Turkey, the teachers are evaluated by people that they have even never seen before. The current assessment system is insufficient to monitor the situation in the classes and has negative effects on both students and teachers (Altundepe, 1999; Ergün, 2002). In addition to this, considering the views of the students for assessing teachers would make the teachers spend more effort in and out of the class for the improvement of students (Altundepe, 1999).

In Turkey there were limited studies investigating teaching effectiveness of the physics or mathematics teachers. More over, none of the studies investigated the students' perceptions on effectiveness of physics and mathematics teachers. This study can reveal information about the effectiveness of physics and mathematics teachers by investigating students' perceptions, who are the only witnesses of the actual situations in classrooms. Results of the study can also provide information about the extent of the effective teacher characteristics that are possessed by the currently enrolled physics and mathematics teachers.

Therefore, this study is significant, since it may lead further research investigating effectiveness of teachers in Turkey, factor affecting student perceptions on effective teaching. Moreover, Ministry of Education may realize the importance of the students' views on teacher effectiveness and may develop new systems to assess the teacher performance. The results of this

study can be helpful for constructing instruments to investigate teacher effectiveness, too.

1.3 Definition of Important Terms

Since there is a variety in the terminology, it is necessary to define important terms that were used in the study.

Following terms are necessary to understand this study more effectively;

a) Effective Teacher Characteristics: These characteristics are categorized in the following five groups: teaching ability, professional competence, evaluation, interpersonal relationships and personality traits (Knox & Morgan, 1985).

b) Student perceptions on teaching effectiveness: It refers to how students conceive their teachers in terms of their teaching ability, professional competence, evaluation, interpersonal relationships and personality traits.

c) Effective Teacher: In this study, the teachers who have scores equal or grater than 2.5 from Student Perceptions on Physics and Mathematics Teacher Effectiveness Questionnaire, according to their students' perceptions, were considered as effective teachers. The process is explained in detail in Chapter 3.

CHAPTER 2

REVIEW OF RELATED LITERATURE

In this chapter, review of the literature on defining effective teaching characteristics and, validity and reliability issues of student ratings of teaching effectiveness is presented.

2.1 Effective Teaching

One of the primary concerns for educators is effective teaching. However, effective teaching is an elusive concept and it is not easy to identify the specific teaching characteristics that are considered as effective (Harris, 1998). Ingersoll (2001, p.42) noted that "there is surprisingly little consensus on how to define a qualified teacher". Although there is not a common definition for effective teacher, there are vast numbers of researchers who attempted to define characteristics of effective teachers (Harris, 1998).

Centra (1993) characterizes effective teaching as; good organization of subject matter and course, effective communication, knowledge of and enthusiasm for the subject matter and teaching, positive attitude toward students, fairness in examinations and grading and flexibility to approach teaching. Sherman (1987) identifies following characteristics, some of which are similar to those were mentioned by Centra:

- Enthusiasm (pleasure in teaching; love of and interest in the subject)
- Clarity (clear explanation of concepts; systematic presentation of materials)

- Preparation and organization (detailed course outlines; established course objectives; good definition of evaluation procedures)
- Stimulation (stimulation of interest; ability to motivate students)
- Knowledge (grasp of subject matter)

Sheffield (1974), in his book "Teaching in Universities: No one way", summarizes the most often mentioned effective teacher characteristics as follows:

- Master of his/her subject, competent
- Well prepared for the lesson
- Relates subject to real life, practical
- Encourage students' questions and opinions
- Enthusiastic about his/her subject
- Approachable, friendly, available
- Concerned for students progress
- Has a sense of humor, amusing
- Warm, kind, sympathetic
- Uses teaching aids effectively

According to Darling-Hammound, Wise and Pease (1983), the effective teacher must have mastered the ability to teach. This ability includes the skills needed to transmit knowledge, skills, and attitudes from teacher to student (Darling-Hammound, Wise & Pease, 1983). The ability to develop an atmosphere that encourages student learning can also be considered within this category.

Knox and Mogan (1985, p.26) defines characteristics of effective teaching by categorizing behaviors identified as effective into five broad categories:

1. *Teaching ability:* The process of transmission of knowledge, skills and attitudes, and the creation of an atmosphere in which this is done.
2. *Professional competence:* The teacher's theoretical and practical knowledge used in teaching as well as the teacher's attitude toward the profession.
3. *Evaluation of students:* The type and amount of feedback the student receives from the teacher.
4. *Interpersonal relationships:* A state of reciprocal interest or communication between two or more people.
5. *Personality traits:* The totality of individual's attitudes, emotional tendencies and character traits, which are not specifically related to teaching or interpersonal relationships but may affect both.

These five categories are determined as a result of a broad review of the literature and they encompass all aspects of teaching characteristics (Knox and Mogan, 1985). Therefore these five categories are used as the organizing framework for the following discussion of effective teaching.

2.1.1 Teaching Ability

Quite a number of studies are found in the education literature following different methods to find out the characteristics of effective teaching. Studies investigating the correlation between specific teacher characteristics and overall effective teaching indicate that teacher characteristics related to teaching ability are important for effective teaching (Jirovec, Ramanath, & Alvarez, 1998; Mishra, 1985; Smith & Cranton, 1992).

In a study conducted by Smith and Cranton (1992), student ratings of teacher behaviour were collected from a sample of 42,407 students. They divided a set of 20 teaching skills into four factors: Interest and Atmosphere, Organization and Clarity, Evaluation, and Discussion. The former two are directly related to teaching ability. Items such as “inspires interest in course material” and “creates an atmosphere conductive to learning” (Smith & Cranton, 1992) were included in factor of Interest and Ability. The factor Organization and Clarity included items such as “clarifies relationships among major and minor topics” and “wraps things up at the end of the class” (Smith & Cranton, 1992). The factors of Interest and Ability and Organization and Clarity, together, accounted for 72 percent of the variance in teaching effectiveness. So, characteristics about teaching ability, such as organizing and clarity, are important for effective teaching.

Mishra (1985) examined the correlations between specific characteristics and an overall rating of instructional effectiveness. 50 volunteered instructors were rated by 1,650 students by using a 23-item

instrument with reliability of 0.85. 22 items on the rating scale were correlated with a high-inference rating of teaching effectiveness. The characteristics like motivating students for maximum learning, interesting way of presentation, explaining clearly and accomplishing course objectives make the most significant contributions to the students' conceptions of effective teacher.

Jirovec et al. (1998) conducted a study with undergraduate and graduate students and found a strong correlation between characteristics about teaching ability and overall student evaluation of teaching effectiveness (Jirovec, Ramanath, & Alvarez, 1998). Jirovec et al. (1998) defined three dimensions of teaching ability: rapport, organization, and evaluation and grading. They collected data about faculty using an instrument which is developed to measure the dimensions of teaching ability. Data analysis revealed a strong correlation between each of the dimensions of teaching ability and the overall student evaluations, with almost 78% of the variance in teacher evaluation explained by organization skills.

In addition to studies investigating the correlation between specific teacher characteristics and overall effective teaching, some studies focused on observation of teachers who are considered as effective teachers. In a study, which is conducted at Stanford University, 49 sections of calculus and geometry courses were visited and a questionnaire was administered in each class asking students to rate their teacher on lesson organization and clarity (Hativa, 1983). Five teachers who rated very high and four teachers who rated very low were chosen. The lessons of each of these nine teachers were tape-

recorded end transcribed. According to results of the analysis of these transcripts, effective teachers, while presenting their lesson, attract students' attention and facilitate students' abilities to follow what is being taught. They structure the material, stimulate the students' interest in what is being taught, and provide good oral and good visual presentation. Teacher should connect the new materials with the old related material stored in the learners' memory to help students understand and assimilate the new material and they should present the new material in a good sequence, explain what they are doing while teaching and why, and adjust their teaching to overcome students' difficulties in learning. Teachers should also help students retain the material taught by identifying what to remember using strategies of emphasizing and summarizing (Hativa, 1983).

Another study attempted to find out what high school students regarded as the good qualities of teacher twenty-eight high school teachers were ranked by their students, and the qualities they considered good and bad teachers are listed (Bossing, 1952). Thirty-three items were mentioned twenty times or more. Those of them which are related to teaching ability are listed below in descending order of mention:

1. Ability to explain clearly
2. Discipline
3. Knows how to interest students
4. Clear and definite assignments
5. Distinguishes important and unimportant

6. Does not get off subject

7. Knows ability of class

8. Uses good English

According to the studies mentioned above, characteristics like clear explanation, good organization, creation an suitable atmosphere for learning and attracting students' interest onto subject are considered as effective teaching characteristics, which constitute the teaching ability dimension.

2.1.2 Professional Competence

Professional competence can be defined as the teacher's theoretical and practical knowledge used in teaching as well as the teacher's attitude toward the profession (Knox & Morgan, 1985). The teacher's knowledge base in the subject matter being taught, his/her pedagogical knowledge and his/her pedagogical content knowledge can be considered within this category. Teachers and students agree that professional competence is essential for effective teaching (Collinson, 1999; Parker & Magnensen, 1986).

Many researchers have examined the perceptions of effective teaching held by novice and experienced teachers (Collinson, 1999; Parker & Magnensen, 1986). Parker and Magnensen asked new instructors to rate outstanding qualities of teachers they remembered from their education. According to new teachers, five qualities to be most important for effective teaching are knowledge of subject, organization, concern for students, enthusiasm for the subject being taught, and friendly and personable nature.

Collinson (1999) conducted a study to determine how experienced teachers define excellent teaching and importance of professional competence for effective teaching was demonstrated. She interviewed 81 secondary school teachers who had a reputation for excellence. These teachers identified professional knowledge as essential for excellence.

In a list that is prepared by YÖK for observing teaching effectiveness of teacher prospective teachers, knowledge of subject area, organizing and class management are stated as dimensions related to teaching competence. "Understanding subject area, concept and skills", "Knowing teaching program related to area" and "Knowing information technologies related to subject area" are items mentioned about this dimension (YÖK, 2006).

In their article Lunetta, Yager and Sharp (1974, p.497) describe the characteristics of science teacher as follows:

1. Preparation in science that includes dept as well as breath.
2. Competencies in performing certain skills needed for a variety of classroom teaching and learning modes
3. Competencies in the psychological, sociological and 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 end society.

McDermott (1975) declares the needs of high school physics teachers as follows:

1. Physics teachers should understand elementary physics in dept.
2. Physics teachers should examine origins of physics.
3. Physics teachers should experience laboratory centered 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.

Korur (2001), prepared an instrument with 142 items related to teacher characteristics and applied it to 2177 high school students. Students were asked to state their ideas about effects of each specific teacher characteristics on their achievement in physics lesson, motivation and attitude towards physics, by using a Likert-type questionnaire. In this study some items about professional competence (i.e. “Having knowledge of subject matter”, “Being prepared for the lesson”, and “Answering students’ physics questions easily) are found to be positively effective on students’ physics achievement.

In terms of professional competence, having subject matter knowledge and pedagogical content knowledge, being familiar with the current

developments in subject area and being enthusiastic about the profession can be defined as the effective teacher characteristics.

2.1.3 Evaluation of Students

Research show that the ability to fairly and adequately evaluate students impacts teaches' effectiveness. According to the literature, while there are researchers who found weak positive relationships between the evaluation characteristics of the teachers and the effective teachers (Smith & Cranton, 1992; Jirovec et al., 1998), there are ones who found stronger correlations, too (Sieh & Bell, 1994). Some researchers, on the other hands, surveyed the expectations of students from their teachers and found that evaluation is an important factor for effective teaching (Duruhan, Akdağ & Güven, 1990).

Smith and Cranton (1992), in their study described earlier, identify evaluation as one of the factors that accounted for the variance in teaching effectiveness. Items asking if students were informed of their progress in class, if teachers provided explanations of evaluation procedures, and if evaluation was consistent were included in their questionnaire. Smith and Cranton (1992) reported a correlation between evaluation and teaching effectiveness, but evaluation only accounted for 17 percent of the variance in teaching effectiveness.

A study conducted by Jirovec et al. (1998), on social work students, revealed that the instructor's skill in grading was identified as one of the dimensions of teaching effectiveness. Students were asked to complete an

instrument designed to measure teaching ability. Items related to evaluation asked if grading procedures had been explained, if feed back was prompt, and if exams were fair. Similar to Smith and Cranton's (1992) findings, evaluation accounted for only small amount of variance in teaching effectiveness.

Other researchers have found evaluation skills to be more important. In a study designed to examine perceptions of clinical teachers, 199 students and 22 faculty members were asked to rank effective teaching behaviors (Sieh & Bell, 1994). Both students and faculty rated evaluation of students as the most important characteristics of the effective teachers.

Duruhan, Akdağ and Güven (1990) covered a group of 258 eleventh grade students from three high schools from Turkey and investigated students' expectations of teachers' behaviors in and out of the class. The teacher behaviors that students expected and were directly related to evaluation are as follows:

a) If a student on the chalkboard does the problem in a wrong way the teacher should help him/her and to understand the reason why he/she cannot solve the problem.
b) Teachers should give homework and assignment in order to support the subjects that were taught.
c) Teachers should prepare the exams consists of many questions covers the whole topic in the type of short answer or multiple choice. Teacher should also give related feedback to students.

Another study asking for students ideas was conducted by Mogan and Knox (1987). They identified and compared characteristics of 'best' and 'worst' clinical teachers as perceived by university nursing faculty and students. Some of the highly rated items like "Corrects students' mistakes without belittling them" and "Identifies students' strengths and limitations objectively" are directly related to evaluation. Studies mentioned above revealed that teacher characteristics like giving homework in that support learning, giving feedback to students, correcting their mistakes without belittling them and evaluating objectively are effective teaching characteristics about evaluation.

2.1.4. Interpersonal Relationships

Interpersonal relationships can be defined as interactions between/among groups and individuals. Good interpersonal relationships include empathy, honesty, trust, tolerance, awareness, and the setting aside of self (Collinson, 1999). Some of the researchers investigated the opinions of students and teachers to find factor of effective teaching and found that teacher's interpersonal relationships play a role in the teachers' effectiveness (Collinson, 1999; Walsh & Maffei, 1994; Witty, 1947 (cited in Bossing)). In addition to this, there are researchers who investigated the correlation between students' perception of teachers' interpersonal relationships and their evaluation of teacher effectiveness (Teven & McCroskey, 1997).

Collinson (1999) interviewed with a group of teachers who identified as excellent. They stated that effective teachers can maintain good interpersonal relationships with the students, other teachers, and the community (Collinson, 1999).

According to Walsh and Maffei (1994) the relationship between the student and the teacher is an important factor for teaching effectiveness. The relationship can affect education in three ways. First, a good student-teacher relationship makes education more enjoying experience for both teachers and students. Second, a good relationship improves student evaluations of teachers. Finally, a good relationship enhances student learning. Walsh and Maffei (1994) developed an instrument of 46 items in order to identify behaviors that affect the student-teacher relationship according to students' and teachers' perceptions. Most rated five behaviors that students identified as enhancing the student-teacher relationship include treating students equally regardless of race and sex, learning the students' names quickly, showing patience in explaining points to students, treating students as equals, and smiling and displaying friendly demeanor (Walsh & Maffei, 1994). For each behavior that was identified as enhancing student-teacher relationship, female students ranked the behavior as more important then male students did.

As cited in Bossing (1952, p.524), another study of interest about this dimension is conducted by Witty (1947). From nearly 12000 letters written by children on "The Teacher Who Helped Me Most" the following traits are listed in descending order of mention (cited from Bossing, 1952):

1. Cooperative democratic attitude
2. Kindliness and patience
3. Wide variety of interest
4. Good appearance and pleasing manner
5. Fairness and impartiality
6. Sense of humor
7. Good disposition
8. Interest in pupils problems
9. Flexibility
10. Use of recognition and praise
11. Superior teaching efficiency.

Caring is another behavior that influences the student-teacher relationship. According to Teven & McCroskey (1997), caring may be defined as "good will" or "intent toward the receiver". They designed a study to correlate student perception of teacher caring with teacher evaluations, course content evaluations, and learning. They asked a sample of 235 university students to complete a series of questionnaires. Results indicated that students who perceive their teachers as caring gave higher evaluation scores to those teachers, the course content, and amount of learning.

Korur (2001, p.96), as a result of his study which is designed to find the effects of physics teachers' characteristics on students' attitudes, motivation and achievement, concluded that teachers should;

- Be enthusiastic in teaching because students can easily notice whether the teachers are willing to teach or not.
- Have a smile in their face
- Take care of students' gender, age, current achievement, motivation and attitude.

The studies mentioned above revealed that behaving students in a friendly way, showing interest in their problems, showing enthusiasm in teaching, fairness and impartiality, learning their names quickly and treating students equally are examples to effective characteristics related to interpersonal relationships dimension.

2.1.5 Personality Traits

The final category of teaching effectiveness is teacher's personality traits. The attitudes, emotional tendencies, and character traits that form the personality of the teacher are included in this category (Mogan and Knox, 1987).

The difficulty of determining how to measure personality traits can be an obstacle in conducting research that relates effective teaching to personality traits is. Some researchers have approached this issue by asking teachers to describe their own personality traits, the personality traits of other teachers and by asking students to describe the traits of faculty (Feldman, 1986). Others designed instruments to measure personality traits and investigated the relationships between student perceptions of classroom environment and

teacher effectiveness and teachers' personality traits (Fisher & Kent, 1998; Renaud & Murray, 1996).

As a result of a meta-analysis of data gathered from 16 studies, Feldman (1986) concluded that there is no relationship between students' perceptions of teacher effectiveness and the teachers' personality traits as measured by the teachers themselves. However, the meta-analysis shows that the relationship exists when the teachers' personality traits are measured by their professional peers or by their students. The relationship between teaching effectiveness and teacher personality according to students' or other teachers' perception can be explained in three ways (Feldman, 1986). First, there is a true relationship between the personality and effectiveness. In this case, a question asking why this relationship does not appear when teachers describe their own personality traits arises. Feldman (1986) suggests that teachers may act different from their personality in classroom and at work. For example, a shy teacher who is shy in daily life may appear to be a social person in the classroom. Second, the relationship between teacher personality traits and effectiveness can be explained by the use of the same sample to measure personality and effectiveness. Students and colleagues who found a teacher enthusiastic and energetic may consider that teacher is also effective even though there is no relationship between teacher personality traits and effectiveness. Third, the relationship between teacher personality traits and effectiveness can be explained by assuming that there is a true relationship between the perception of teacher personality and perception of teacher

effectiveness, but the perception of teacher personality is not an accurate reflection of the teacher's actual personality (Feldman, 1986). Two of the possible explanations mentioned above assume that the perceptions of teachers' personality and perceptions on teaching effectiveness are related.

Fisher and Kent (1998) investigated the relationship between student and teacher perceptions of the classroom environment, and teacher personality in colleges in Australia. They have concentrated on teacher personalities and found significant associations between teacher personality type and perceptions of classroom environment, with about 10% of variance in classroom environment due to effects of teacher personality. Researchers concluded that even though this variance is small, it is important since there are so many variables contributing to the classroom environment and it is difficult to control these variables.

Another factor affecting the personality of teachers, and thus their teaching effectiveness is age (Renaud & Murray, 1996). In a study conducted by Renaud and Murray a strong correlation was found between student perceptions of teaching effectiveness and specific personality traits. Personality traits of a sample of 33 faculty member in a Canadian university were measured by faculty peer ratings on a scale of 29 personality traits. An inverse relationship is found between the identified personality traits and age (Renaud & Murray, 1996). Five of personality traits that are predominant among younger teachers are sociable nature, approval-seeking, seeking help and advice, liberal attitude toward change and progression, and extroversion. These

personality traits are closely associated with perceived teaching effectiveness (Renaud & Murray, 1996).

In Korur's study (2001), which is mentioned before, some of the characteristics that were found affective on students' achievement and motivation can be considered within the personality traits category. Those items include being flexible and tolerant, cheerfulness, being dynamic and energetic and self respect.

2.2. Reliability and Validity Issues of Student Ratings

Here, a review of the literature related to validity and reliability of student ratings is given. When we go over the literature, we can see the different meta-analysis studies attempting to summarize reviews of the literature on student rating of teaching (Cashin, 1995; Feldman, 1988, 1989a, 1989b, 1992, 1993; Marsh, 1982, 1984). The results of these studies can answer the questions and dispel some misconceptions about student ratings. For example, many teachers and administrators believe that student ratings are only popularity contests. However, research show that use of student ratings is a valid, multidimensional and reliable method for evaluation of teachers (Cahin, 1995).

2.2.1 Validity

As teaching is a complex activity, it is important to evaluate it on different dimensions of effective teaching. For example, a teacher may be well

organized but lack enthusiasm. A number of factor analytic studies have been conducted (Abrami, d'Apollonia & Cohen 1990; Feldman, 1976; Kulik and McKeachie, 1975) and it was concluded that student ratings are multidimensional, i.e., they measure several different aspects of teaching.

In addition, researchers who want to validate students rating with respect to construct validity tried various approaches to show that student ratings are logically related to various other indicators of effective teachers. These approaches are summarized as follows:

Student Learning: Theoretically, student learning is the best criterion for the effective teaching. In other words, students of more effective teachers should learn more and be more successful. Some researchers compared multi-section courses to study this theory. In this type of study, different teachers teach the different sections of the same course using the same textbook, same syllabus and the same external final exam, which is prepared by some one other than the teachers. Cohen (1981) and Feldman (1989a) reviewed this kind of studies and examined the correlation between students' grades taken from the external final exam and various student rating items. Cohen (1981) and Feldman (1989a) reported useful correlations. According to these relationships, it can be concluded that in the classes, where students gave higher ratings to the teacher, students learn more and do better at the final exam.

Teachers' Self Ratings: Examining the correlation between student ratings and teachers' self ratings is another validation approach. In a review paper about correlation between instructors' self ratings and student ratings,

conducted by Feldman (1989b), 19 studies were cited and an average correlation of 0.29 was found between instructors' self ratings and student ratings. On the other hand, in another study, Marsh, Overall and Kessler asked instructors to rate two different courses to see whether the course instructors rated higher was also rated higher by the students. The median correlation (based on six factor scores) between the instructors self ratings and the student ratings was 0.49 (1979). In another study Marsh and Dunkin (1992) used nine factor scores and they found a median correlation of 0.45 (cited in Cashin (1995)).

The Ratings of Others: In one study, conducted by Kulik and McKeachie (1975), student ratings correlated with administrator's ratings, raging from 0.47 to 0.62. However, Feldman (1989b) found a lower average correlation of 0.39, between the student ratings and the administrators' ratings.

In their study, mentioned above, Kulik and McKeachie (1975) focused on colleague's rating also and showed that student ratings correlated with colleague's ratings, 0.48 to 0.69. Feldman (1989b) found an average correlation of 0.55. In another study, Feldman (1988) reviewed 31 studies and found that students' view of effective teaching was very similar to the faculties view (average correlation is .71).

In some studies, trained external observers were used. Feldman reviewed five studies and found positive correlations between global student ratings and trained observer ratings with an average correlation of 0.50 (1989b).

Comparison with Student Comments: Ory, Braskamp and Piper (1980) conducted a study covering 14 classes and found a correlation of 0.93 between global instructor item and students' comments. This study shows that the information from student ratings overlaps considerably the information from student comment.

Possible Sources of Bias: For student ratings, bias can be defined as a circumstance that unduly influences a teacher's ratings, although it has nothing to do with the teacher's effectiveness. There are studies focusing on effects of student and teacher characteristics, such as age, gender and students motivation on student ratings (Cashin, 1995; Dooris, 1997; Feldman, 1983, 1992, 1993; Marsh & Hocevar, 1991; Sixbury & Cahisn, 1995).

Majority of the studies showed that age of the instructor or years of teaching experience are not correlated with student ratings (Cashin, 1995). On the other hand, in studies that found small correlation, these correlations tend to be negative (Feldman, 1983). In a longitudinal study, Marsh and Hocevar (1991) analyzed student ratings of the same instructors for as long as 13 years and found no systematic changes over the years.

There is mixed evidence on the effects of students' or instructors' gender on student ratings. Some studies have found no differences, some have found that female students give lower ratings to male instructors than to female instructors; some studies showed that female teachers receive higher ratings regardless of students' gender (Dooris, 1997). Feldman (1992) reviewed 14 laboratory or experimental studies (i.e. students rated descriptions of fictitious

teachers) and found no difference in global ratings in most of the studies, but in a few studies male teachers got higher ratings. In another study, Feldman (1993) reviewed 28 studies of actual ratings of real teachers, and found that women teachers got very slightly higher ratings ($r = 0.02$).

Student motivation seems to have impact on student ratings. According to Marsh and Dunkin (1992) teachers seem more likely to receive higher ratings from students who had a prior interest in the subject matter (cited in Cashin, 1995). A review study conducted by Sixbury and Cashin (1995), a correlation of 0.40 was found between the item "I had a strong desire to take this course" with the other 37 items. Positive but low correlations (from 0.10 to 0.30) were found between students ratings and expected grades (Braskamp and Ory, 1994).

To test the validity of student ratings, there are studies using different validation methods, in literature. Since the review of literature showed that multidimensionality of students' perceptions is very important for construct validity, in our study, multidimensionality of student responses to the questionnaire were tested by using factor analysis. In addition to this, correlation between of students' responses to each item and responses to the global item was calculated. Necessary information for conducting other validation methods (e.g. student achievement, student gender, colleague observation) was not taken in this study.

2.2.2 Reliability

In educational measurement, reliability covers consistency, stability and generalizability of items. For student ratings, reliability can be determined form correlations among responses to different items designed to measure the same component of effective teaching and from studies of interrater agreement (i.e., agreement among ratings by different students in the same class). Reliability varies depending upon the number of raters (Cashin, 1995). That is more raters will increase the reliability of the study. One of the most commonly used method for testing reliability is calculating Cronbach Alpha (Fraenkell & Wallen, 1999).

Stability is a measure of agreement between raters over time. In general, ratings of the same teacher tend to be similar over time (Braskamp and Ory, 1994; Centra, 1993). Overall and Marsh (1980) reviewed longitudinal studies, comparing end-of-course ratings with ratings by the same students at least one year after graduation, and found average correlation of 0.83.

Genaralizability is related to the accuracy of data in reflecting the teacher's general teaching effectiveness, not just in a particular class. Marsh (1982) conducted a study and examined data from 1, 364 courses, dividing them into four categories: same instructor teaching the same course but in different terms, the same instructor teaching different courses, different instructors teaching the same courses, different instructors teaching different courses. Then, he correlated student ratings in the four categories for items related to instructor (e.g., enthusiasm, organization, discussion) and

background items (e.g., student's reason for taking course, workload) and found practically meaningful correlations for same instructors as shown below (the correlations for background items are in parenthesis):

	Same Course	Different Course
Same Instructor	0.71 (0.69)	0.51 (0.34)
Different Instructor	0.14 (0.49)	0.06 (0.21)

It can be concluded that the instructor, not the course, is the primary determinant of the student ratings.

According to the literature on reliability issue, agreement among different students' responses appears to be important for the reliability. Therefore, calculating Cronbach Alpha coefficient to test consistency of the student responses to the questionnaire is inevitable for our study.

2.3 Factors Affecting Turkish Physics and Mathematics Teachers' Teaching Effectiveness

In this part of the thesis, studies on factors affecting mathematics and physics teachers' teaching effectiveness in Turkey are presented. Most of the researchers investigated pre-service mathematics and physics teachers' opinions about their effectiveness or the effectiveness of the university education (Eryılmaz, 1999; İlaslan & Eryılmaz, 1999; Ubuz, 2002). Others investigated the class activities used by physics and mathematics teachers by using student perceptions (Bereketoğlu, 2002; Görgen & Tahta, 2005).

Ubuz (2002) interviewed 12 pre-service mathematics teachers and a mathematics teacher, who had three years of experience, and asked their opinions about teacher education, university education, teaching and life after graduation, and sufficiencies and insufficiencies about teaching. Both the mathematics teacher and pre-service teachers complained about the insufficiency of courses about high school mathematics curriculum. Some of the pre-service teachers stated that their knowledge about high school mathematics was higher when they graduated from high school. Likewise, the mathematics teacher revealed that during the university education, education students get alienated from high school mathematics. In addition to this, pre-service teachers complained about the absence of courses that focus on the use of mathematics in daily life and history of mathematics in mathematics education departments of universities. The mathematics teacher also maintained that courses about practice teaching should be taught through the whole university education instead of only last one or two years, in order to construct necessary teaching skills.

Another study about pre-service teachers' opinions was conducted by Eryılmaz and İlaslan (1999). They developed a questionnaire to evaluate pre-service physics teachers' attitude toward being a physics teacher and to evaluate their qualifications. The questionnaire included a part asking the pre-service physics teachers to state five factors that prevent them from being a qualified physics teacher. They applied the questionnaire to 50 pre-service physics teachers from METU, Gazi, Hacettepe and Marmara universities. The

results showed that pre-service teachers' attitude toward being a physics teacher, knowledge of subject matter, knowledge of teaching methods, knowledge of measurement and evaluation and knowledge of classroom management were at medium level. Most of the pre-service teachers agreed that the important problems that prevent their qualifications were as follows: The practice teaching course they took was too short and ineffective, they were educated as physicists instead of teachers as a result of taking advanced physics courses that are required in the curricula, the number of physics courses offered by the department that are related to high school physics content were not enough, so were the laboratory courses related to high school physics contents.

In addition to studies focusing on pre-service teachers' opinions, some researchers attempted to measure teacher candidates' knowledge levels by using competence tests. Eryılmaz (1999) aimed to evaluate content-based competency of pre-service physics teachers at Turkish universities. She developed a competency test and applied it 160 pre-service physics teachers. Results of her analysis revealed that university level physics courses are not effective enough to promote knowledge of the pre-service physics teachers at the high school level. She recommended that the content of the physics courses in the undergraduate programs should be modified and made parallel to that of high school physics courses, history of science course should be added to the physics teacher education curriculum.

Görgen and Tahta (2005) aimed to determine the problems that occur in teaching mathematics according to high school student viewpoints and to propose solutions for these problems. They developed a 20-item questionnaire and applied it to 415 high school students in Muğla. The items in the questionnaire asked whether some activities take place in the classes or not and how important these class activities are. According to students' responses to the questionnaire, following activities are important according to students but mathematics teachers use these activities rarely: Giving examples from daily life during the mathematics lesson, using instructional technology (overhead projector, computer etc.), measuring the students' level of understanding to determine the deficiencies in students achievement at the end of each unit, paying attention to individual differences among students. On the other hand, according to students, teachers behave friendly and tolerant but not enough to meet students' expectations.

Bereketoğlu (2002) conducted a study to find out factors affecting physics teachers' characteristics about organizing teaching-learning activities. He interviewed 8 physics teachers working in high schools in Trabzon and surveyed 40 physics teachers working in high schools in Artvin and Van to get their views and opinions about the factors mentioned above. In the interviews and surveys, information about teachers' general knowledge, activities that they use in teaching and the reasons for preferring those activities were searched. Findings of the study revealed that the teachers use lecturing, question-answer and problem solving methods in classes most of the time. The

reasons for choosing these activities are heavy load of curriculum, university entrance examination, students' knowledge levels, effect of parents and school administrators, teachers' education, teaching experience and school settings. Teachers stated that they do not use alternative activities to enrich their teaching styles because of heavy load of the curriculum and the students' high motivation to be prepared for the university entrance examination instead of understanding all concepts included in the curriculum. Moreover, even though the teachers are aware of the importance of experiments, they do not prefer to do experiments or demonstrations because of the insufficiency of school settings and crowdedness of classrooms, in addition to the reasons mentioned above.

Like Bereketoğlu, Azar (1998) investigated physics teachers' opinions about factors affecting their teaching effectiveness. He surveyed physics teachers, working in highs schools, in order to determine the problems that physics teachers face during their teaching life. He divided his sample in to four groups according to teachers' year of service. First, second, third and fourth group of teachers had one year, 2-3 years, 4-5 years and more than 6 years of teaching experiences, respectively. The first group (0-1 year) stated that they had problems in setting class discipline, answering students' questions, getting students' trust, using time, subject matter knowledge. According to these teachers, important reasons for these problems are the insufficiency of their university education and crowdedness of the classes. Second group (2-3 years) of teachers' problems was class discipline, subject

matter knowledge, shortage of time, in ability to activate students and deficiencies in laboratory equipments. According to the third (4-5 years) group, they had problems in setting class discipline, guiding students to make research, evaluating students' success objectively, motivating students and preparing students for university entrance examination. These teachers complained about crowdedness of classrooms, heavy load of curriculum and students' low mathematical abilities. The last group (more than 6 years) stated that they find themselves ineffective in class discipline, dealing with students' problems, recognizing individual differences, motivating students, encouraging students for active participation and evaluation.

Results of the studies mentioned above showed that, in Turkey, teacher education in universities is insufficient in promoting mathematics and physics teacher candidates' knowledge at high school level or their teaching abilities. In addition to this, some problems about class activities (that are used by physics and mathematics teachers in high schools) were determined. In the current study, effects of these factors on teaching effectiveness of physics and mathematics teachers will be determined by student perceptions.

2.4 Summary of Findings from the Reviewed Studies

1. Effective teaching has been described as encompassing the traits of

    a) Teaching ability (Bossing, 1952; Knox & Morgan, 1985; Darling-Hammound et al., 1983; Jirovec, Ramanath, & Alvarez, 1998; Hativa, 1983; Mishra, 1985; Smith & Cranton, 1992)

b) Professional competence (Collinson, 1999; Lunetta, Yager & Sharp 1974; Knox & Morgan, 1985 ; Korur, 2001; Parker & Magnensen, 1986; YÖK, 2006)

c) Evaluation of students (Duruhan, Akdağ & Güven 1990; Jirovec et al.,1998; Mogan & Knox 1987; Sieh & Bell, 1994; Smith & Cranton, 1992)

d) Interpersonal relationships (Collinson, 1999; Korur, 2001; Teven & McCroskey, 1997; Walsh & Maffei, 1994; Witty 1947)

e) Personality traits (Feldman, 1986; Fisher & Kent, 1998; Mogan & Knox, 1987; Korur, 2001; Renaud & Murray, 1996).

2. Student ratings are found to be valid, reliable, multidimensional, stable, unaffected by potential biases and useful for feedback from students (Abrami, Apollona, & Cohen, 1990; Braskamp & Ory, 1994; Cashin, 1995; Centra, 1993; Cohen, 1981; Dooris, 1997; Feldman, 1988, 1989a, 1989b, 1992, 1993; Kulik & McKeachie, 1975; Marsh, 1982, 1984; Marsh & Hocevar, 1991; Marsh, Overall & Kessler 1979; Overall & Marsh 1980).

3. Research about factors affecting Turkish physics and mathematics teachers' teaching effectiveness was reviewed (Bereketoğlu, 2003; Eryılmaz, 1999; İlaslan & Eryılmaz,1999, Görgen & Tahta, 2005; Ubuz; 2002)

As a result of the findings in the literature, important effective teacher characteristics defined and categorized. Since, possession of these characteristics are essential for effective teaching and thus for effective education, investigation of these characteristics must be taken into consideration. In the second part of the review of the literature, studies focused on validity and reliability issues of student ratings were presented. It is shown that using student perceptions is a valid, reliable and bias-free method to evaluate teaching effectiveness. In addition to this appropriate validity and reliability the review paper also focuses on the methodology of such studies. In the third part, findings of Turkish studies about factors affecting physics and mathematics teachers' teaching effectiveness were summarized. The aim of this work is to investigate the effectiveness of physics and mathematics teachers by using student perceptions on teacher effectiveness.

CHAPTER 3

METHOD

In the first two chapters, the purpose of the study is explained, the significance of the study is stated, and the review of the related literature is made. In this chapter, population and sample, development of the instrument, procedures used in collecting and analyzing the data are explained.

3.1 Population and Sample

In this study, the sample consists of 63 teachers (30 physics teachers and 33 Mathematics teachers) who work in 13 regular high schools and 6 Anatolian Lycees in six central district of Ankara (Mamak, Çankaya, Yenimahalle, Keçiören, Etimesgut, and Sincan). The accessible population consists of 92 Physics teachers and 235 Mathematics teachers who work in 13 regular high schools and 6 Anatolian Lycees. In these districts, students were sampled in class unit. A total number of 1237 9^{th} grade students in 41 classes rated their physics and mathematics teachers by filling the Student Perceptions on Physics and Mathematics Teacher Effectiveness Questionnaire (SPPMTEQ).

In Table 3.1, number of male and female physics and mathematics teachers who participated in the study and total number of the Physics and Mathematics teachers working in those 19 schools are given. In addition, the numbers of students who evaluated each teacher is given in Table 3.2.

Table 3.1 Information about teachers who participated in the study.

	Participated Male Teachers (n)	Participated Female Teachers (n)	Year of Service	Teachers in 19 High Schoolls (n)
Physics	18	12	Ranges from 9 to 28	92
Mathematics	14	19	Ranges from 5 to 26	235
TOTAL	32	31		327

Table 3.2 Number of students evaluated each teacher.

Physics Teacher	Number of Students	Mathematics Teacher	Number of Students
1	99	1	99
2	83	2	83
3	55	3	55
4	30	4	30
5	45	5	29
6	59	6	16
7	30	7	30
8	59	8	29
9	22	9	30
10	28	10	31
11	18	11	28
12	27	12	50
13	21	13	18
14	38	14	27
15	31	15	21
16	36	16	38
17	35	17	31
18	69	18	71
19	14	19	39
20	9	20	30
21	17	21	14
22	50	22	9
23	50	23	37
24	42	24	30
25	47	25	50
26	38	26	89
27	59	27	25
28	26	28	13
29	28	29	29
30	30	30	30
		31	26
		32	28
		33	30

Number of students who participated in the study was 1232, while the total number of students from all grades was 25694.

The target population of the study was all regular highs schools (79) and Anatolian Lycees (35) in Ankara. The list of the general high schools and Anatolian Lycees in Ankara was received from the related web page of the Ministry of National Education (MEB, 2006). The public high schools and Anatolian Lycees were chosen by stratified random sampling to make sure that the proportions of schools in the districts in the study are the same as in the population. At first, it is aimed to apply the study in 20% of all regular high schools and Anatolian Lycees in Ankara. As the application of the study was done at the end of the spring semester, which is a relatively busy period of time for schools, not all of the schools were available. Administrators of some schools refused to participate in the study because of their heavy examination schedules. Therefore the study was conducted in the classes which were said to be available by the school administrators. Even though the exact number of the teachers in the target population is unknown, the number of the schools that accepted to participate was more than the 15% the total number of the regular high schools and Anatolian Lycess.

The distribution of total number of general high schools and Anatolian Lycees and the schools that participated was shown in Table 3.3.

Table3.3 Number of schools in districts of Ankara.

	General High Schools	Anatolian Lycees
Mamak	2 / 12	1 / 4
Çankaya	4 / 18	1 / 11
Yenimahalle	3 / 14	1 / 5
Keçiören	2 / 15	1 / 5
Sincan	1 / 5	1 / 1
Etimesgut	1 / 4	1 / 3
Altındağ	0 / 9	0 / 5
Gölbaşı	0 / 2	0 / 1
TOTAL	13 / 79	6 / 35

(Participated / total)

3.2 Instrument

The only instrument used in this study is Student Perceptions on Physics and Mathematics Teacher Effectiveness Questionnaire (SPPMTEQ). The instrument was developed to measure the extent of effective characteristics that are possessed by mathematics and physics teachers, according to students' responses. As a result of a review of literature, the instrument, was developed by using or adapting items from Nursing Clinical Teacher Effectiveness Inventory developed by Knox and Mogan (1985), and Mogan and Knox (1987), the items stated as effective on students' physics achievement, motivation and attitudes by Korur (2001), other findings from the literature (Centra, 1993; Eryılmaz & İlaslan, 1999; Hativa, 1983; Marsh, 1982) and items added by the researcher (hoca ben bu cumleyi cozemedim, bi sey The list of items and the sources from which the items were taken or adapted are given in Table 3.4. The first version of the instrument consisted of 54 items. The

items translated into Turkish were checked by an instructor from the Department of Modern Languages. Then, a validation group that consists of two professors, one measurement and evaluation expert, one doctorate student, two physics teachers and one mathematics teacher evaluated the instrument. Members of the validation group are asked to examine the appropriateness of the questionnaire by using an expert judgment form (see APPENDIX A). In addition, the instrument was shown to 6 high school students. They checked the clarity of the items. According to the feedback from these two groups, 6 items were found to be unclear or irrelevant to the related teacher characteristics and removed. On the other hand, it was concluded that there must be more items related to teaching methods in the questionnaire and 15 new items were added. Then, the instrument was checked by the validation group again. According to the second feedback, one item is removed and 9 more items added. Therefore, the instrument took its last form, which includes 71 items.

Table 3.4 The list of items and the related references.

Item Numbers	Reference
1, 3, 4, 6, 14, 19, 25, 26, 27, 33, 37, 38, 39, 42, 43, 50, 51, 52, 53, 55, 57, 61, 62, 63, 64, 65, 66, 67, 68, 70	Knox & Mogan, 1985; Mogan & Knox, 1987
9, 16, 20, 23, 32, 34, 35, 36, 60	Korur, 2001
7, 8, 21, 30, 31, 58	Eryılmaz & İlaslan, 1999
2, 10, 13, 15, 46, 47, 56, 69	Centra, 1993
5, 11, 17, 18	Hativa, 1983
48, 49, 59	Marsh, 1982
12, 22, 24, 28, 40, 41, 44, 45, 54, 71	Developed by the researcher.

The questionnaire consisted of 70 Likert-type items that are focused on teacher characteristics about teaching ability (1.-28. items), professional competence (29.-41. items), evaluation (42.-52.), interpersonal relationships (53.-62.) and personality traits (63.-70.) and one global item (which is also Likert-type) asking for an overall evaluation of the teacher. The items were statements asking whether the teacher has the related particular characteristics. The instrument had two parts. The first part was a three-page photocopy (see APPENDIX B) on which the aim of the study, confidentiality conditions and instructions to answer the questionnaire, and questionnaire items were written. The second part of the instrument is an optical answer sheet (see APPENDIX B). There were two different column groups (for evaluating physics and mathematics teachers separately) containing Likert-type scales on the optical answer sheet. The students were asked to read the items from the photocopies and give their responses to each item for Physics and Mathematics teachers by using related column groups on the optical answer sheet. In the scale, 0 corresponds to ‘strongly disagree’, 1 corresponds to ‘disagree’, 2 corresponds to ‘indecisive’, 3 corresponds to ‘agree’. The possible maximum score was 4 and the possible minimum score was 0.

3.3 Validity and Reliability

In order to have content validity, the literature is reviewed and a list of effective teacher characteristics is obtained. The instrument was developed by using the effective teacher characteristics mentioned in the literature.

In order to be sure about the face validity, the questionnaire was shown to professors, doctorate students, physics and mathematics teachers and students as stated in the instrument part. For internal validity, the instrument was also checked by an instructor of Modern Languages for the appropriate translations used in the instrument.

To control the data collector bias or mistakes, the instrument was applied by the researcher in all classes. As explained in the procedure part, it was emphasized that the names of the classes, students or teachers will remain secret. In this way, students were made sure that it is impossible to punish or reward teachers or students as a result of the student responses to the instrument. In addition to this, Mathematics and Physics teachers were asked to leave classes during the application. All these precautions are taken to make students behave objective and feel free to state their perceptions.

As a construct validity study, factor analysis was conducted, by varimax method, to check whether the student responses are multidimensional or not. As explained in Chapter 2 (see 2.2.1), multidimensionality is the ability of student ratings to measure several aspects of teaching effectiveness. Another purpose of conducting factor analysis is to check whether the items about effective teacher characteristics were grouped in the similar factors as given in

the literature. The dimensions of the effective teacher characteristics for physics and mathematics teachers' were shown in Table 3.5 and Table 3.6. Items with factor loading of 0.4 and higher were taken.

Table 3.5 Factors of Effective Physics Teacher Characteristics

	Factor, (Eigenvalue; % of Variance)	
Item	**I. Personality Traits and Relations with Students, (27.721; 14.639)**	**Factor Loading**
58	Sabırlı ve hoşgörülüdür	0.705
53	Öğrencileri diğer öğrencilerin yanında eleştirmez	0.692
52	Öğrencilerin hatalarını düzeltirken onları küçük düşürmez	0.676
68	Açık fikirli ve önyargısızdır	0.644
48	Not verirken adaletli davranır	0.642
59	Öğrencilere karşı arkadaşça davranır	0.617
67	Derse ve kendisine yönelik eleştirilere Açıktır	0.614
47	Öğrencilerin başarılarını değerlendirirken tarafsız davranır	0.613
63	İstekli ve heveslidir	0.609
55	Öğrencileri destekler ve cesaretlendirir	0.602
64	Öğretmekten zevk alır	0.598
61	Öğrencileri dikkatlice dinler	0.593
62	Öğrencilerle kişisel olarak ilgilenir	0.529
49	Yaptığı sınavlardaki sorular derste işlenilen konuları İyi yansıtır	0.523
57	Sınıfta karşılıklı saygı havası oluşturur	0.498
65	Dinamik ve enerjik bir insandır	0.482
66	Kendine güveni vardır	0.476
50	Öğrencilerin dersle ilgili beklentilerini önemser	0.464
15	Öğrencilerin sorularına Açıktır	0.413
16	Öğrencilerin sorularını dikkate alarak, anlaşılmayan konuları tekrar anlatır	0.409
Item	**II. Teaching Ability (2.662; 28.435)**	**Factor Loading**
6	Sınıfta öğrenme için elverisli bir ortam sağlar	0.719
4	Öğrencilerin ilgisini konu üzerine çeker	0.695
7	Sınıfta disiplini sağlamakta başarılıdır	0.691
5	Ders süresi boyunca öğrencilerin ilgisini canlı tutmaya çalisir	0.680
1	Ders anlatimi Açıktır	0.674
12	Bilgilerini öğrencilere aktarmakta başarılıdır	0.663

Table 3.5 (Continued)		
2	Dersin konusu ve amaci hakkında Açıklayici bilgi verir	0.650
10	Ders süresini etkili biçimde kullanir	0.626
3	Önemli noktalari vurgular	0.612
8	Sınıf içi problem durumlari ile basa çikabilir	0.580
11	Ders konularını bir bütünlük içinde anlatır	0.576
17	Dersi takip etmeyi kolaylastiracak bir düzen içinde anlatır	0.522
71	Genel olarak çok etkili ve basarili bir öğretmen oldugunu düşünüyorum	0.482
40	İyi bir Fizik/Matematik öğretmeni modeli oluşturur	0.471
13	Deneysel örnekler ya da gösterilerle anlamayı kolaylastirir	0.464
21	Degisik öğrenme hızına sahip öğrencilere aynı sınıfta ders anlatmakta başarılıdır	0.437
27	Öğrencilerin derse katılımını sağlar	0.420
Item	**III. Professional Competence (2.353; 35.127)**	**Factor Loading**
30	Matematik ve geometri konularına hakimdir	0.615
29	Konu bilgisine yeterince sahiptir	0.597
31	Grafikleri, denklemleri, diyagramlari en yararli biçimde kullana bilir	0.555
41	Fizik/Matematik dersini sever	0.546
35	Öğrencilerin dersle ilgili sorularını kolayca cevaplar	0.482
34	Kavramlarin öğrenilmesine önem verir	0.436
Item	**IV. Evaluation (1.470; 40.901)**	**Factor Loading**
44	Öğrencilerin kendilerini gelistirmeleri için önerilerde bulunur	0.606
18	Ders sonunda konuyu pekiştirici ödevler verir	0.559
19	Konu üzerinde yapilan tartişmalarda aktif olmaları için öğrencileri tesfik eder	0.471
14	Öğrenciler konuyla ilgili zorluk çektiklerinde özel olarak yardim eder	0.434
24	Farklı çözüm yollari gösterir	0.430
23	Konuları birden fazla farklı yollarla (Düz anlatim, soru-cevap, problem çözme, grup tartismasi vb) anlatır	0.428
20	Anlatımını öğrencilerin seviyesine indirger	0.422
25	Öğrencileri, olayların yorumunu yapmaya ve mantıklı düsünmeye yönlendirecek sorular sorar	0.419
28	Öğrencileri gözlem yapmaya yönlendirir	0.413
26	Öğrencilerin bir olay ya da problem hakkındaki düsüncelerini bir araya getirmelerine yardimci olur	0.401

Table 3.5 (Continued)

Item	V. Using Extra Activities (1.404; 46.02)	Factor Loading
37	Kendi alanında okudugu kitaplarla ilgili konuşmalar yapar	0.702
38	Kendi alanındaki yeni gelişmelerden sınıfta bahseder	0.666
32	Derste tahtanın yaninda tepegöz, slayt gösterici, bilgisayar gibi materyallerden yararlanir	0.604
45	Ara sınavlar yapar	0.550
39	Öğrencileri dersle ilgili yararli kaynaklara yönlendirir	0.430
44	Yaptığımiz ödevlerle ilgili dönüt verir	0.400
Item	**VI. Making Lesson Excating (1.804; 46.022)**	**Factor Loading**
22	Dersi günlük hayattan örneklerle ilginç ve eğlenceli bir hale getirir	0.534
69	İyi bir espri anlayışına sahiptir	0.504
56	Öğrencilerin isimlerini çabuk öğrenir	0.440
Item	**VII. Identifiable (1.090; 52.817)**	**Factor Loading**
54	Öğrencilerin yakalasmaya çekindikleri bir öğretmendir	0.665
60	Bazı öğrencilerle daha fazla ilgilenip, sınıfin tamamını düsünmez	0.595
70	Düzensiz bir kişidir	0.590
33	Derse hazırlıksız gelir	0.457

Table 3.6 Factors of Effective Mathematics Teacher Characteristics

Factor, (Eigenvalue; % of Variance)		
Item	**I Professional Competence and Evaluation (30.803; 16.139)**	**Factor Loading**
30	Matematik ve geometri konularına hakimdir	0.633
34	Kavramlarin öğrenilmesine önem verir	0.616
29	Konu bilgisine yeterince sahiptir	0.596
35	Öğrencilerin dersle ilgili sorularını kolayca cevaplar	0.585
46	Konuyu anlayip anlamadigimizi kontrol etmek için sikça sorular sorar	0.580
44	Yaptığımiz ödevlerle ilgili dönüt verir	0.578
31	Grafikleri, denklemleri, diyagramlari en yararli biçimde kullanabilir	0.576
42	Öğrencilerin kendilerini gelistirmeleri için önerilerde bulunur	0.572
41	Fizik/Matematik dersini sever	0.557
24	Farklı çözüm yollari gösterir	0.543

Table 3.6 (Continued)

43	Öğrencilerin derste gösterdikleri performans hakkında yapici yorumlarda bulunur	0.538
49	Yaptığı sınavlardaki sorular derste islenilen konuları İyi yansıtır	0.525
39	Öğrencileri dersle ilgili yararli kaynaklara yönlendirir	0.524
40	İyi bir Fizik/Matematik ögretmeni modeli oluşturur	0.522
66	Kendine güveni vardır	0.512
36	Öğrencilerin sorularına mantıklı yaklaşıp cevabini bilmedigi sorulari arastirip öğrencilere Açıklar	0.504
71	Genel olarak çok etkili ve basarili bir ögretmen oldugunu düşünüyorum	0.503
63	İstekli ve heveslidir	0.487
16	Öğrencilerin sorularını dikkate alarak, anlaşılmayan konuları tekrar anlatır	0.458
55	Öğrencilerin dersle ilgili beklentilerini önemser	0.456
23	Konuları birden fazla farklı yollarla (Düz anlatim, soru-cevap, problem çözme, grup tartismasi vb) anlatır	0.449
61	Öğrencileri dikkatlice dinler	0.441
27	Öğrencilerin derse katılımını sağlar	0.432
56	Öğrencilerin isimlerini çabuk öğrenir	0.426
18	Ders sonunda konuyu pekiştirici ödevler verir	0.415
15	Öğrencilerin sorularına Açıktır	0.405
Item	**II. Teaching Ability (2.586; 30.207)**	**Factor Loading**
6	Sınıfta öğrenme için elverisli bir ortam sağlar	0.716
4	Öğrencilerin ilgisini konu üzerine çeker	0.691
5	Ders süresi boyunca öğrencilerin ilgisini canlı tutmaya çalisir	0.683
1	Ders anlatimi Açıktır	0.674
2	Dersin konusu ve amaci hakkında Açıklayici bilgi verir	0.670
7	Sınıfta disiplini sağlamakta başarılıdır	0.661
12	Bilgilerini öğrencilere aktarmakta başarılıdır	0.657
8	Sınıf içi problem durumlari ile basa çikabilir	0.607
11	Ders konularini bir bütünlük içinde anlatır	0.595
3	Önemli noktalari vurgular	0.589
10	Ders süresini etkili biçimde kullanir	0.552
17	Dersi takip etmeyi kolaylastiracak bir düzen içinde anlatır	0.529
13	Deneysel örnekler ya da gösterilerle anlamayı kolaylastirir	0.476
21	Degisik öğrenme hızına sahip öğrencilere aynı sınıfta ders anlatmakta başarılıdır	0.426
20	Anlatımını öğrencilerin seviyesine indirger	0.425

Table 3.6 (Continued)

Item	III. Relations with Students (1.999; 37.196)	Factor Loading
52	Öğrencilerin hatalarını düzeltirken onları küçük düşürmez	0.662
53	Öğrencileri diger öğrencilerin yaninda elestirmez	0.641
58	Sabirli ve hosgörülüdür	0.523
48	Not verirken adaletli davranir	0.500
61	Öğrencilere karşı arkadaşça davranir	0.482
47	Öğrencilerin basarilarini değerlendirirken tarafsız davranir	0.465
57	Sınıfta karşılikli saygı havası oluşturur	0.448
55	Öğrencileri destekler ve cesaretlendirir	0.442
Item	**IV. Extra Activities (1.486; 43.634)**	**Factor Loading**
37	Kendi alanında okudugu kitaplarla ilgili konuşmalar yapar	0.673
32	Derste tahtanın yaninda tepegöz, slayt gösterici, bilgisayar gibi materyallerden yararlanir	0.660
38	Kendi alanındaki yeni gelişmelerden sınıfta bahseder	0.651
45	Ara sınavlar yapar	0.540
28	Öğrencileri gözlem yapmaya yönlendiri.	0.512
22	Dersi günlük hayattan örneklerle ilginç ve eğlenceli bir hale getirir	0.449
Item	**V. Personality Traits (1.199; 49.565)**	**Factor Loading**
65	Dinamik ve enerjik bir insandir	0.597
69	İyi bir espri anlayışına sahiptir	0.540
64	Ögretmekten zevk alır	0.489
67	Derse ve kendisine yönelik elestirilere Açıktır	0.463
62	Öğrencilerle kisisel olarak ilgilenir	0.446
68	Açık fikirli ve önyargısızdır	0.427
Item	**VI. Identifyible (1.167; 53.951)**	**Factor Loading**
25	Öğrencileri, olayların yorumunu yapmaya ve mantıklı düsünmeye yönlendirecek sorular sorar	0.444
26	Öğrencilerin bir olay ya da problem hakkındaki düsüncelerini bir araya getirmelerine yardimci olur	0.420
14	Öğrenciler konuyla ilgili zorluk çektiklerinde özel olarak yardim eder	0.404
21	Konu üzerinde yapilan tartişmalarda aktif olmaları için öğrencileri tesvik eder	0.400

When we look at the factor analysis results, by considering the multidimensionality of the student responses, we see that items were grouped

in several different factors. So, it can be concluded that the questionnaire used in this study is able to measure different aspects of effective teaching for both physics and mathematics teachers.

When the consistency of factors are examined together with the examples from the literature, we can see that items in the questionnaire are grouped into similar dimensions as mentioned in our review of literature on effective teaching, except several items which were located in different groups. The dimensions obtained from both physics and mathematics teachers' data are similar to the categories of effective teaching characteristics given by Knox & Morgan (1985). They categorized the effective teacher characteristics under the dimensions of teaching ability, professional competence, evaluation, interpersonal relationships and personality traits. In the factors obtained from physics teachers' data, most of the characteristics about personality traits and inter-personal relationships are gathered in the same dimension. On the other hand in the teaching ability and professional competence dimensions some items are separated and constitute another two dimensions which can be defined as using extra activities and making lesson exciting. When we look at the factors obtained from mathematics teachers' data, most of the characteristics about professional competence and evaluation were combined in the same factor. At the same time, several items about professional competence and teaching ability gathered in a factor called using extra activities. As mentioned in the review of literature part, it is possible to categorize effective teacher characteristics in various ways and some

characteristics may represent more than one dimensions of effective teaching. Therefore, distribution of the items to the factors for physics and mathematics teachers can differ slightly. In our study, since the factor analysis results revealed that students' responses show a multidimensional characteristics and the items were grouped in similar dimensions as in the literature, we can conclude that the validity of the study was also confirmed by the factor analysis.

In addition to factor analysis, relationship between each teacher characteristics given by the items and the overall effective teaching was also investigated. For this purpose, the correlations between the mean scores given to each items and the score given to the global item (Item 72) were calculated. For social sciences correlations between 0.4 and 0.6 are considered as relationships with practical value. On the other hand, when a correlation higher than 0.65 is obtained it can be concluded that the relationship is strong enough to make accurate predictions (Fraenkell & Wallen, 1999, p.318). Therefore, the items with high correlation with the item 72 ($r \geq 0.6$) were assumed to express important effective teacher characteristics. In Table 3.7 Pearson correlations relating items 1 through 70 to Item 71 are given for Physics and Mathematics teachers data.

Table 3.7 Pearson correlations relating items 1 through 70 to Item 71

For Physics Teachers' Data				For Mathematics Teachers' Data			
Items	r	Items	r	Items	r	Items	r
1	0.62**	36	0.52**	1	0.62**	36	0.57**
2	0.55**	37	0.31**	2	0.59**	37	0.31**
3	0.51**	38	0.34**	3	0.56**	38	0.42**
4	0.51**	39	0.48**	4	0.59**	39	0.52**
5	0.50**	40	0.62**	5	0.57**	40	0.70**
6	0.55**	41	0.45**	6	0.61**	41	0.51**
7	0.42**	42	0.51**	7	0.49**	42	0.53**
8	0.43**	43	0.44**	8	0.48**	43	0.49**
9	-0.14**	44	0.43**	9	-0.04	44	0.52**
10	0.49**	45	0.27**	10	0.52**	45	0.24**
11	0.52**	46	0.46**	11	0.61**	46	0.53**
12	0.58**	47	0.46**	12	0.64**	47	0.50**
13	0.41**	48	0.43**	13	0.45**	48	0.52**
14	0.47**	49	0.48**	14	0.55**	49	0.53**
15	0.49**	50	0.49**	15	0.53**	50	0.57**
16	0.52**	51	-0.12**	16	0.58**	51	-0.07*
17	0.54**	52	0.40**	17	0.60**	52	0.42**
18	0.28**	53	0.37**	18	0.35**	53	0.44**
19	0.45**	54	-0.06	19	0.49**	54	-0.01
20	0.48**	55	0.50**	20	0.54**	55	0.58**
21	0.51**	56	0.41**	21	0.54**	56	0.50**
22	0.41**	57	0.53**	22	0.43**	57	0.59**
23	0.49**	58	0.50**	23	0.54**	58	0.57**
24	0.51**	59	0.50**	24	0.59**	59	0.54**
25	0.48**	60	0.10**	25	0.57**	60	0.19**
26	0.49**	61	0.55**	26	0.54**	61	0.59**
27	0.49**	62	0.41**	27	0.55**	62	0.52**
28	0.48**	63	0.62**	28	0.46**	63	0.63**
29	0.51**	64	0.59**	29	0.64**	64	0.62**
30	0.43**	65	0.49**	30	0.59**	65	0.61**
31	0.49**	66	0.51**	31	0.58**	66	0.56**
32	0.14**	67	0.51**	32	0.14**	67	0.56**
33	0.23**	68	0.53**	33	0.25**	68	0.60**
34	0.47**	69	0.46**	34	0.55**	69	0.64**
35	0.53**	70	0.18**	35	0.65**	70	0.19**

**. Correlation is significant at the 0.01 level.

*. Correlation is significant at the 0.05 level.

As it is seen from Table 3.7, majority of the items have practically meaningful correlation with the global item. In Table 3.8 and Table 3.9 the items with high correlations with item 71 are given for Physics and mathematics teachers.

Table 3.8 The items correlating highly with item 71 for Physics teachers.

Item Number	Item Expression (r^*)
2	He / She explains clearly (0.616).
41	He / She is a good model of Physics / Mathematics Teacher (0.620).
64	He / She is desirous and enthusiastic (0.615).

Table 3.9 The items correlating highly with item 71 for Mathematics teachers.

Item Number	Item Expssion (r)
2	He / She explains clearly (0.623).
7	He /She creates an atmosphere suitable for learning in the class (0.609)
12	He/ She explains the subjects in integrity (0.613).
13	He /She is successful at transmitting his / her knowledge to students (0.644)
30	He / She has enough subject matter knowledge (0.635).
36	He /She answers students' questions easily (0.654).
41	He / She is a good model of Physics / Mathematics Teacher (0.700).
64	He / She is desirous and enthusiastic (0.633).
65	He / She enjoys teaching (0.618).
66	He / She is a dynamic and energetic person (0.606)
69	He / She is open minded and has no prejudgments (0.600)

When we have a look at the characteristics listed in Table 3.8 and Table 3.9, we conclude that the characteristics that are found to be important factors of effective teaching are similar to those in the literature. For both Physics and Mathematics teachers "explaining clearly" is appeared to be important. Clarity and organization mentioned as important for effective teaching by Bossing (1952), Hativa (1983), Mishra (1980) and Sherman (1987). Hativa emphasized that it is important to organize the lesson in order to make it easy to follow and remember for students (1983). Some of the findings in Table 3.9 (items 7, 12 and 13) show that students' perceptions of effective teacher characteristics are consistent with those mentioned by Hativa.

Being desirous and enthusiastic or enjoying teacher are other common effective teacher characteristics for Physics and Mathematics teachers. As Korur and Eryılmaz stated that students generally notice that whether the teachers will to teach or not and they approach to the classroom activities in the same way. Our results show that the same characteristics are considered as important for effective teaching by the students.

After collecting the data the reliability analysis was performed by calculating Cronbach alpha and high reliability coefficients were found for both Physics and Mathematics teachers' data as shown in Table 3.10.

Table 3.10 Reliability Coefficients for whole physics and mathematics teachers' data.

	Alpha
Physics Teachers' Data	0.97
Mathematics Teachers' Data	0.98

In addition to this, after the factor analysis, reliability coefficients of sub-dimensions of the items in the questionnaire were calculated. These results are shown in Table 3.11 and Table 3.12 for physics and mathematics teachers' data respectively.

Table 3.11 Reliability Coefficients for sub-dimensions in the questionnaire for physics teachers' data.

	Alpha
I. Factor	0.94
II. Factor	0.94
III. Factor	0.84
IV. Factor	0.89
V. Factor	0.77
VI. Factor	0.67

Table 3.12 Reliability Coefficients for sub-dimensions in the questionnaire for mathematics teachers' data.

	Alpha
I. Factor	0.96
II. Factor	0.95
III. Factor	0.89
IV. Factor	0.79
V. Factor	0.88
VI. Factor	0.83

Fraenkel and Wallen (1996, p.163), suggest that for research purposes a useful rule of thumb is that reliability should be at least 0.70 and preferably higher. By considering this criterion, since the Cronbach-alpha values are around 0.70 or higher, it can be concluded that internal consistency of the instrument is high enough.

3.4 Procedure

At the beginning of the study a literature search was carried out. For the literature review, the list of keywords was determined as given in (see APENDIX E) By using these keywords, Educational Resources Information Center (ERIC), Dissertation Abstracts International (DAI), Social Science Citations Index (SSCI), Science Citation Index (SCI) and internet search

engines were searched. The MS and PhD thesis were also searched from YOK. Photocopies of the obtainable documents were taken from libraries of METU, Bilkent University, Gazi University, Başkent University and TUBİTAK Ulakbim. All coasts of photocopies and transportation were afforded by the researcher.

In this study, survey design was used. Survey research involves researchers asking a large group of people questions about a particular topic and describes characteristics of the population (Fraenkell & Wallen, 1996, p.367). According to Fraenkell and Wallen there are two major types of survey research: cross-sectional and longitudinal (1996, p.368). While the cross-sectional survey collects information- from a sample that has been drawn from a predetermined population- at one point in time, the longitudinal survey collects information at different points in time in order to study changes in time. The major characteristics of this master thesis would be cross sectional survey. This study is designed to collect information about perceptions of high school students' on effectiveness of their physics and mathematics teachers in 2006 spring semester.

To make the data collection faster and to decrease evaluation mistakes, optical answer sheets were used for the data collection. As explained in the Instrument part, three-page photocopy of the questionnaire and an optical answer sheet distributed to each students. Since the same questionnaire photocopies can be used in different classes again and again, the total number of 150 was enough for the questionnaire photocopies. However, for the student

responses it was necessary to spend a new optical answer sheet. As a result nearly 1250 optical answer sheet were used and 1195 of them scanned in the computer. The total coast of the photocopies, optical answer sheets and the scanning process was 70 YTL and afforded by the researcher.

To apply the study in the schools it was necessary to take permission from Ministry of National Education. For this purpose, the researcher contacted to head of the SSME department with an application petition which gives a short description of the study (see APPENDIX C). The application was conveyed to the Graduate School of Art and Science, the presidency of METU and Ministry of National Education in the given order. Finally a cover page was taken from the Directory of the National Education of Ankara Province (see APPENDIX D).

After defining the schools to participate and developing the instrument, the permission for the application of the study in those schools is taken from Ministry of National Education. The researcher went to the schools and he applied the questionnaire personally in each class. If, by chance, a physics or mathematics teacher had the lesson at the application time at particular class, he/she was asked to leave the class in order not to have students affected. Before applying the questionnaire, the researches introduced himself, gave information about the study and explained clearly that names of the classes, students and teachers will definitely remain secret, in addition to the related statement on the questionnaire. He stated that they are not asked to write any personal information about themselves or about their teachers onto the given

forms and these facts are reminded for several times in each class. It is explained that the results of the study will not be used to evaluate their teachers but to draw a conclusion about the student perceptions and data will be accessible only to the researcher. After the explanations about the study and the confidentiality, the researcher distributed the three-page photocopies and the optical answer sheets to the students and gave necessary instruction to fill the answer sheet appropriately, in addition to the written instructions on the photocopies. After all students completed the survey, all forms were gathered in a different envelope for each class. The information about the gender and the year of service of the teachers are taken from the school administrators and this information was written onto envelope of related class.

Finally, optical answer sheets were scanned in computer and data directly entered to the computer. Then statistical analyses were done by using SPSS and MS-Excel software. The data taken from the optical scanner were in MS-WordPad form. First of all, these data were converted to MS-Excel form by using the export data function in MS-Excel software. Secondly, the data are moved to the SPSS. By using Recode function, the characters of A, B, C, D and E were converted to 0, 1, 2, 3 and 4 respectively. However, since some items have negative expressions (items 9, 33, 51, 57, 60, 70), they are recoded in the reverse sequence (i.e. A is to 4, B is to 3, C is to 2, D is to1 and E is to 0). After the missing data analysis (explained in the Data Analysis part), the data is moved to MS-Excel, again, for desired calculations.

3.5 Data Analysis

For the data analysis Excel and SPSS computer programs were used. The missing data analyses were carried out first. The total number of collected optical sheets was 2132, but 37 of them were filled inappropriately (for example, some answer sheets are filled in such a way that the answer marks form some meaningful patterns on the sheet). Therefore, these sheets were excluded for the statistical analysis. In addition to this, 1.5 % of the Physics Teachers' data and 1.9 % of the Mathematics Teachers' data were missing. For this reason, the whole missing data were replaced with the mean score of the related item.

To investigate whether physics and mathematics teachers are considered as effective teachers according to student perceptions, mean scores of the student responses to all items were calculated for each teacher (considering only the classes taught by related teacher).

Sub problems 2 and 4 were "Do physics teachers have specific effective teacher characteristics related to dimensions of effective teaching?" and "Do mathematics teachers have specific effective teacher characteristics related to dimensions of effective teaching?" To investigate these problems, each teacher's mean scores taken from each item were calculated. In this step, the scores are converted into categorical data by considering the mean scores under 1.5 as "Low" (the teacher has the specific characteristics or skills described by this item in a low amount), scores between 1.5 and 2.5 as "Medium" (the teacher has the specific characteristics or skills described by

this item in a medium amount) and the scores over 2.5 as “High” (the teacher has the specific characteristics or skills described by this item in high amount). These conversions are made by considering that numbers under 1.5 can be approximated to 1, numbers between 1.5 and 2.5 can be approximated to 2 and numbers grater than 2.5 can be approximated to 3. As it is explained in the instrument part, in the scale of the questionnaire, 1 means “I don’t agree”, 2 means “I am not sure” and 3 means “I agree”. As a result, numbers and percentages of teachers who have the specific characteristics or skill mentioned by related item and who have not were calculated.

CHAPTER 4

RESULTS

4.1 Description of Findings

In this part of the thesis, finding from the data are presented for each sub-problem.

4.1.1. Sub-Problem 1

Sub-Problem 1 was “Are physics teachers considered as effective teachers according to student perceptions?” To investigate this problem, scores of the Physics teachers calculated. The questionnaire was applied to 41 classes. The number of physics teachers working these classes was 30. As explained in the Instrument part, 0 corresponds to ‘strongly disagree’, 1 corresponds to ‘disagree’, 2 corresponds to ‘indecisive’, 3 corresponds to ‘agree’ and 4 corresponds to ‘strongly agree’, in the scale. Therefore, the maximum possible is 4 and minimum possible score is 0. The average scores of 30 physics teachers, taken from classes taught by each teacher, were given in ascending order in Table 4.1.

According to the scores given in Table 4.1, only five (17%) of the teachers have got a score greater than 2.5 and most of the scores of physics teachers are less than 2. So, according to student perceptions, most of the physics teachers can’t be considered as effective. As it is explained in Chapter 3, only the scores equal or grater than 2.5 can be considered as effective teacher scores.

Table 4.1 Average scores of Physics Teachers.

Physics Teacher	Scores of Physics Teachers	Physics Teacher	Scores of Physics Teachers
1	1.14	16	1.95
2	1.39	17	2.02
3	1.44	18	2.06
4	1.48	19	2.19
5	1.53	20	2.22
6	1.73	21	2.27
7	1.78	22	2.35
8	1.79	23	2.42
9	1.79	24	2.44
10	1.80	25	2.48
11	1.81	26	2.59
12	1.83	27	2.59
13	1.88	28	2.80
14	1.88	29	2.80
15	1.92	30	3.11

(Max. Score: 4, Min. Score: 0)

4.1.2 Sub-Problem 2

Sub-problem 2 was “Do physics teachers have specific effective teacher characteristics related to dimensions of effective teaching?” In this part, mean score of each physics teacher was calculated for each item. Data is converted to categorical form by considering scores under 1.5 as “No”, scores between 1.5 and 2.5 as “I am not sure” and scores grater than 2.5 as “Yes”. For each item the numbers and percentages of physics teachers who are believed not to have the specific characteristics, teachers that students are indecisive about him/her and teachers who are believed to have the specific characteristics were calculated and listed in Table 4.2.

Table 4.2 Numbers and percentages of physics teachers who have effective teacher characteristic in low, medium and high amounts.

Item Number	Low n (%)	Medium n (%)	High n (%)
Dimension		**Teaching ağabeylity**	
1	9 (30)	12 (40)	9 (30)
2	8 (26.7)	14 (46.7)	8 (26.7)
3	3 (10)	13 (43.3)	14 (46.7)
4	14 (46.7)	13 (43.3)	3 (10)
5	13 (43.3)	14 (46.7)	3 (10)
6	11 (36.7)	14 (46.7)	5 (16.7)
7	11 (36.7)	12 (40)	11 (36.7)
8	11 (36.7)	19 (63.3)	4 (13.3)
9	5 (16.7)	24 (80)	1 (3.3)
10	11 (36.7)	13 (43.3)	10 (33.3)
11	6 (20)	16 (53.3)	8 (26.7)
12	8 (26.7)	13 (43.3)	9 (30)
13	11 (36.7)	15 (50)	4 (13.3)
14	8 (26.7)	16 (53.3)	6 (20)
15	3 (10)	17 (56.7)	10 (33.3)
16	11 (36.7)	14 (46.7)	9 (30)
17	8 (26.7)	19 (63.3)	3 (10)
18	12 (40)	16 (53.3)	2 (6.7)
19	9 (30)	15 (50)	6 (20)
20	6 (20)	15 (50)	9 (30)
21	11 (36.7)	14 (46.7)	5 (16.7)
22	8 (26.7)	17 (56.7)	5 (16.7)
23	5 (16.7)	20 (66.7)	5 (16.7)
24	3 (10)	21 (70)	6 (20)
25	11 (36.7)	15 (50)	8 (26.7)
26	9 (30)	17 (56.7)	4 (13.3)
27	11 (36.7)	16 (53.3)	11 (36.7)
28	14 (46.7)	14 (46.7)	2 (6.7)
Dimension		**Professional Competence**	
29	2 (6.7)	14 (46.7)	14 (46.7)
30	1 (3.3)	19 (63.3)	10 (33.3)
31	3 (10)	20 (66.7)	11 (36.7)
32	28 (93.3)	1 (3.3)	1 (3.3)
33	0 (0)	10 (33.3)	20 (66.7)

Table 4.2 (Continued)

34	2 (6.7)	16 (53.3)	12 (40)
35	3 (10)	16 (53.3)	11 (36.7)
36	11 (36.7)	17 (56.7)	6 (20)
37	20 (66.7)	10 (33.3)	0 (0)
38	14 (46.7)	15 (50)	1 (3.3)
39	4 (13.3)	19 (63.3)	11 (36.7)
40	11 (36.7)	15 (50)	8 (26.7)
41	2 (6.7)	11 (36.7)	17 (56.7)
Dimension		**Evaluation**	
42	5 (16.7)	18 (60)	11 (36.7)
43	4 (13.3)	19 (63.3)	11 (36.7)
44	11 (36.7)	20 (66.7)	3 (10)
45	18 (60)	11 (36.7)	1 (3.3)
46	5 (16.7)	20 (66.7)	5 (16.7)
47	3 (10)	19 (63.3)	8 (26.7)
48	4 (13.3)	16 (53.3)	10 (33.3)
49	6 (20)	13 (43.3)	11 (36.7)
50	6 (20)	19 (63.3)	5 (16.7)
51	0 (0)	24 (80)	6 (20)
Dimension		**Interpersonal Relationships**	
52	3 (10)	17 (56.7)	10 (33.3)
53	8 (26.7)	16 (53.3)	6 (20)
54	2 (6.7)	16 (53.3)	12 (40)
55	8 (26.7)	18 (60)	4 (13.3)
56	8 (26.7)	15 (50)	11 (36.7)
57	3 (10)	18 (60)	9 (30)
58	4 (13.3)	16 (53.3)	10 (33.3)
59	5 (16.7)	19 (63.3)	6 (20)
60	1 (3.3)	19 (63.3)	10 (33.3)
61	2 (6.7)	21 (70)	11 (36.7)
62	8 (26.7)	19 (63.3)	3 (10)
Dimension		**Personality Traits**	
63	5 (16.7)	18 (60)	11 (36.7)
64	6 (20)	16 (53.3)	8 (26.7)
65	11 (36.7)	19 (63.3)	4 (13.3)
66	1 (3.3)	16 (53.3)	13 (43.3)
67	11 (36.7)	19 (63.3)	4 (13.3)
68	5 (16.7)	17 (56.7)	8 (26.7)
69	9 (30)	16 (53.3)	5 (16.7)
70	0 (0)	11 (36.7)	23 (76.6)
71	10 (33.3)	12 (40)	8 (26.7)

*Percentages are given in parentheses

According to the results we can see that the majority of the physics teachers fail to have specific effective teacher characteristics and skills expressed by the most of the items. Only for twenty three items more than the one third of the teachers has the effective teacher characteristics and skills expressed by related items.

When we look at the results for the teaching ability dimension of effective teaching, we conclude that very few of the Physics teachers;

- × Stimulate the students' interest in what is being taught (Item 4).
- × Try to keep students' interests alive during the whole lesson (Item 5).
- × Pay attention not to be dependent on his/her notes too much (Item 9).
- × Teach in such an order that students can easily follow the lesson (Item 17).
- × Give homework and assignment in order to support the subjects that were taught (Item 18).
- × Guide students to make observations (Item 28).

On the other hand nearly half of the physics teachers;

- ✓ Emphasize important points (Item 3).

In the professional competence dimension, very few of the teachers;

- × Use computer, slide shower or over herd projector in addition to black board in the lesson (Item 32).
- × Discuss about books on hid/her subject in the class (Item 37).

× Discuss about current developments in his/her subject (Item 38).

According to the result about evaluation dimension very few of the teachers;

× Give feedback about the home works (Item 44).

× Make quizzes (Item 45).

× Ask questions to understand whether the students understood the subject or not (Item 46).

Nearly half of the physics teachers have enough subject matter knowledge (Item 29) and more than half of them;

✓ Are well prepared for the lesson (Item 34).

✓ Love Physics lesson (Item 41).

When we consider the results about interpersonal relationships dimension, it can be seen that very few of the physics teachers;

× Support and encourage students (Item 53).

× Pay attention not to criticize students in front of other students (Item 55).

× Behave friendly to students (Item 59).

In the personality traits dimension, very few of the physics teachers;

× Enjoys teaching (Item 64).

× Is open to criticisms about him/her or about his/her lesson (Item 67).

× Have a good sense of humor (Item 69).

As a positive characteristics, more than three fourth of the physics teachers are;

- ✓ Orderly people (Item 70).

4.1.3 Sub-Problem 3

Sub-problem 3 was "Are mathematics teachers considered as effective teachers according to student perceptions?" The score of each mathematics teacher was calculated to investigate the sub-problem 3. The number of mathematics teachers working in the 41 classes was 33. By taking the average of all student responses from the classes taught by each mathematics teacher, the mathematics teachers' scores were obtained. The mean scores of mathematics teachers are given in ascending order in Table 4.3.

Table 4.3 Average scores of Mathematics Teachers.

Math. Teacher	Scores of Mathematics Teachers	Math. Teacher	Scores of Mathematics Teachers
1	0.92	18	2.32
2	1.02	19	2.33
3	1.21	20	2.34
4	1.34	21	2.36
5	1.41	22	2.46
6	1.49	23	2.46
7	1.65	24	2.49
8	1.8	25	2.5
9	1.81	26	2.55
10	1.81	27	2.56
11	1.94	28	2.65
12	1.95	29	2.79
13	2.04	30	3.11
14	2.15	31	3.18
15	2.25	32	3.19
16	2.27	33	3.33
17	2.27		

(Max. Score: 4, Min. Score:0)

According to the average scores of Mathematics teachers, as given in the Table 4.3, only nine (27%) of the mathematics teachers have got a score grater than 2.5. On the other hand, more than the one third of the mathematics teachers have got scores lower than 2. As it is seen form the results, most of the mathematics teachers fails to be considered as effective, according to student perceptions.

4.1.4 Sub-Problem 4

Sub-problem 4 was "Do mathematics teachers have specific effective teacher characteristics related to dimensions of effective teaching?" For each item the numbers and percentages of mathematics teachers who are believed not to have the specific characteristics, teachers that students are indecisive about him/her and teachers who are believed to have the specific characteristics were calculated and listed in the Table 4.4.

It can be seen, from the results, that the percentages of the mathematics teachers who are believed to have effective teacher characteristics and skills are grater than the percentages of physics teachers. However, still, for most of the items, majority of the mathematics teachers seems not to have the specific effective teacher characteristics or skills expressed by these items. For twenty one items only less than the 10 % of the mathematics teachers have the specific effective teacher characteristics or skills mentioned in these items.

Table 4.4 Numbers and percentages of mathematics teachers who have effective teacher characteristic in low, medium and high amounts.

Item Number	Low n (%)	Medium n (%)	High n (%)
Dimension		**Teaching Ability**	
1	7 (21.2)	12 (36.4)	14 (42.4)
2	6 (18)	13 (39.4)	14 (42.4)
3	3 (9.1)	9 (27.3)	21 (63.6)
4	6 (18)	17 (51.5)	10 (30.3)
5	8 (24.2)	16 (48.5)	9 (27.3)
6	7 (21.2)	15 (45.5)	13 (30.3)
7	6 (18)	12 (36.4)	15 (45.5)
8	5 (15)	14 (42.4)	14 (42.4)
9	16 (48.5)	14 (42.4)	3 (9.1)
10	4 (12)	10 (30.3)	19 (57.5)
11	5 (15)	12 (36.4)	16 (48.5)
12	7 (21.2)	12 (36.4)	14 (42.4)
13	14 (42.4)	14 (42.4)	5 (15)
14	5 (15)	15 (45.5)	13 (39.4)
15	3 (9.1)	8 (24.2)	22 (66.6)
16	4 (12)	13 (30.3)	18 (54.5)
17	6 (18)	17 (51.5)	10 (30.3)
18	4 (12)	13 (30.3)	18 (54.5)
19	8 (24.2)	16 (48.5)	9 (27.3)
20	5 (15)	17 (51.5)	13 (30.3)
21	8 (24.2)	16 (48.5)	9 (27.3)
22	12 (36.4)	13 (39.4)	8 (24.2)
23	6 (18)	10 (30.3)	17 (51.5)
24	4 (12)	9 (27.3)	20 (60)
25	5 (15)	18 (54.5)	10 (30.3)
26	7 (21.2)	19 (57.5)	7 (21.2)
27	5 (15)	16 (48.5)	12 (36.4)
28	13 (39.4)	15 (45.5)	5 (15)
Dimension		**Professional Competence**	
29	6 (18)	7 (21.2)	20 (60)
30	4 (12)	8 (24.2)	21 (63.6)
31	7 (21.2)	10 (30.3)	16 (48.5)
32	32 (97)	1 (3.03)	0 (0)
33	2 (6.1)	13 (39.4)	18 (54.5)

Table 4.4 (Continued)			
34	3 (9.1)	14 (42.4)	16 (48.5)
35	6 (18)	10 (30.3)	17 (51.5)
36	5 (15)	18 (54.5)	10 (30.3)
37	17 (51.5)	15 (45.5)	1 (3.03)
38	12 (36.4)	19 (57.5)	2 (6.1)
39	3 (9.1)	23 (69.6)	7 (21.2)
40	6 (18)	12 (36.4)	15 (45.5)
41	1 (3.03)	13 (39.4)	19 (57.5)
Dimension		**Evaluation**	
42	5 (15)	14 (42.4)	14 (42.4)
43	4 (12)	19 (57.5)	10 (30.3)
44	6 (18)	19 (57.5)	8 (24.2)
45	10 (30.3)	20 (60)	3 (9.1)
46	4 (12)	19 (57.5)	10 (30.3)
47	5 (15)	19 (57.5)	9 (27.3)
48	2 (6.1)	17 (51.5)	14 (42.4)
49	5 (15)	16 (48.5)	12 (36.4)
50	7 (21.2)	16 (48.5)	10 (30.3)
51	3 (9.1)	23 (69.6)	7 (21.2)
Dimension		**Interpersonsl Characteristics**	
52	3 (9.1)	17 (51.5)	13 (39.4)
53	7 (21.2)	18 (54.5)	8 (24.2)
54	14 (42.4)	18 (54.5)	1 (3.03)
55	5 (15)	20 (60)	8 (24.2)
56	4 (12)	16 (48.5)	13 (39.4)
57	4 (12)	18 (54.5)	13 (30.3)
58	7 (21.2)	14 (42.4)	12 (36.4)
59	6 (18)	16 (48.5)	13 (30.3)
60	2 (6.1)	22 (66.6)	9 (27.3)
61	6 (18)	15 (45.5)	12 (36.4)
62	9 (27.3)	16 (48.5)	8 (24.2)
Dimension		**Personality Traits**	
63	5 (15)	16 (48.5)	12 (36.4)
64	6 (18)	13 (39.4)	14 (42.4)
65	7 (21.2)	13 (39.4)	13 (39.4)
66	4 (12)	7 (21.2)	22 (66.6)
67	7 (21.2)	17 (51.5)	9 (27.3)
68	7 (21.2)	16 (48.5)	10 (30.3)
69	13 (30.3)	14 (42.4)	8 (24.2)
70	2 (6.1)	14 (42.4)	17 (51.5)
71	6 (18)	13 (39.4)	14 (42.4)

*Percentages are given in parentheses

According to the results about teaching ability dimension, we can say that very few of the mathematics teachers;

- × Stimulate the students' interest in what is being taught (Item 4).
- × Pay attention not to be dependent on his/her notes too much (Item 9).
- × Help students to organize their thoughts about a problem or a concept (Item 26).
- × Guide students to make observations (Item 28).

On the other hand more than the half of the mathematics teachers;

- ✓ Emphasize important points (Item 3).
- ✓ Use the lesson time effectively (Item 10).
- ✓ Are open to students' questions (Item 17).
- ✓ Consider the student questions and repeat explaining points that are not understood (Item 16).
- ✓ Give homework and assignment in order to support the subjects that were taught (Item 18).
- ✓ Teach subjects in different ways (Instruction, question-answer, problem solving, group discussion etc.) (Item 23).
- ✓ Show different ways of solutions (Item 24).

When we look at the results about the professional competence dimension, very few of the mathematics teachers;

- × Use computer, slide shower or over herd projector in addition to black board in the lesson (Item 32).
- × Discuss about books on hid/her subject in the class (Item 37).

× Discuss about current developments in his/her subject (Item 38).

× Guide students to helpful resources (Item 39).

In this dimension, more than half of the mathematics teachers;

✓ Have enough subject matter knowledge (Item 29).

✓ Are good at using mathematical and geometrical concepts (Item 30).

✓ Are well prepared for the lesson (Item 33).

✓ Answer students' questions easily (Item 35).

When we look at the results about the evaluation dimension, it can be seen that only less than one third of the mathematics teachers;

× Give feedback about the home works (Item 44).

× Make quizzes (Item 45).

× Ask questions to understand whether the students understood the subject or not (Item 46).

× Evaluate students' success objectively (Item 47).

In the interpersonal relationships dimension very few of the mathematics teachers,

× Pay attention not to criticize students in front of other students (Item53).

× Support and encourage students (Item55).

× Show personal interest to the students (Item 62).

More over, more than half of the mathematics teachers;

- × Are not accessible to students (Item 54).
- × Show more interest to some students than others (Item 60).

Finally, in the personality traits dimension, less than one third of the mathematics teachers;

- × Are open to criticisms about him/her or about his/her lesson (Item 67).
- × Have a good sense of humor (Item 69).

On the other hand, more than the half of the mathematics teachers;

- ✓ Are self confident (Item 66).
- ✓ Are well prepared for the lesson (Item 70).

CHAPTER 5

CONCLUSION, DISCUSSIONS AND RECOMMENDATIONS

Purpose of this study was to investigate the high school students' perceptions on effectiveness of their Physics and Mathematics, to find out strengths and weaknesses of physics and mathematics teachers from the aspect of effective teaching characteristics or skills in order to help further research on teacher factor in Turkish education system.

To sum up the results of the study, in this chapter, firstly conclusions were presented, then internal and external validity considerations were mentioned and finally possible implications and recommendations were offered.

5.1 Internal Validity of the Study

The internal validity of a study refers to extend to which the study is free from extraneous variables that may affect the results of the study. There are mainly four kinds of internal validity threats for the survey studies: mortality, location, instrumentation and instrument decay.

Mortality threat arises when the results differ seriously because of subjects who are lost, for whatever reason, from those who remain. For this study, this threat was prevented by doing missing data analysis. The questionnaire was applied to 1237 students but 1195 of the students' data were included in the

study. During the missing data analysis, the data containing missing values were replaced with mean of series.

Location threat results the possibility that results are affected by the characteristics of settings or location in which the study is conducted. In this study, this threat is minimized by administrating the instrument in class environment. It is observed by the researches personally, during the data collection process. During the application of the questionnaire, researcher made sure that any of the physics or mathematics teachers didn't present in the classes.

Instrumentation threat results from the variations in the way of data collection. Since the researcher was the only data collector in this study, this threat was also minimized. Instrument decay can occur if the interviewers get tired or are in a hurry, in the interview surveys. Since the data gathered by optic answer sheets and the whole data collection process was completed in less than one lesson hour, this threat had no effect on the results of the study.

5.2 External Validity of the Study

Since the subjects were randomly selected from the accessible population, generalization of the findings of this study has not any limitation. Therefore, the result and conclusions of the study can easily be generalized to target population.

5.3 Conclusion

The sample of the study was randomized, stratified and large enough since more than the 15% of both regular high schools and Anatolian lycees are involved in the study. So there is no limitation of this study to the accessible population. Therefore, conclusions presented in this part can be adjusted to the target population. The conclusions about physics and mathematic teachers are given separately.

The student perceptions on effectiveness of their physics teachers are analyzed in two different ways. According to overall average scores of each physics teacher, (see 4.1.1 in Chapter 4), most of the physics teacher can't be considered as effective, since their average score is less than 2.5.

In the second way of analysis (see 4.1.2 in Chapter 4), numbers and percentages of physics teachers who are believed to have specific effective teacher characteristics foe each item. According to the results, although there are teachers who possess searched characteristics for different dimension, in almost all dimensions of the effective teaching, great majority of the physics teachers are found to be ineffective by the students. For example, most of the teachers have problems about attracting student attention on to the subject, about emphasizing the important points, about making the lesson exciting for the students, about organizing the lesson and most of them are too much dependent to their notes while they are presenting their lesson and do not show interest to the students.

When we look at the individual scores of mathematics teachers, we see that although their scores are seems to be better than the physics teachers, most of the mathematics teachers can't be considered as effective.

As a result of the second analysis, we can conclude that there are teachers who possess some of the effective teacher characteristics but for most of the items, majority of the mathematics teachers don't have the searched characteristics or skills. For example, most of them have problems about having students' attention alive during the lesson period, about making the lesson exciting for the students and most of them don't show interest towards students and are not open to criticisms.

5.4 Discussions

When we look at the individual scores of physics and mathematics teachers we see that most of the teachers are considered ineffective by students. We can conclude that the deficiencies in teacher education programs in Turkish universities, some of which are lack of courses focused on high school curriculums and history of mathematics or physics and insufficiency of practice teaching courses (Eryılmaz, 1999; Eryılamz & İlaslan, 1999; Ubuz, 2002), affect teachers' efficiencies during their career. However, teachers claim that there are varied factors affecting their effectiveness like heavy load of curriculum, university entrance examination, students' knowledge level, crowdedness of classrooms or insufficiency of school settings (Azar, 1998; Bereketoğlu, 2002).

In Turkey, per-service teachers and inexperienced physics and mathematics teachers complain about the insufficiency of physics and mathematics courses at high school level and practice teaching activities in university education. Most of these teachers and teacher candidates state that they are not self confident about their content based knowledge (Azar, 1998; Eryılmaz, 1999; Eryılmaz & İlaslan, 1999; Ubuz, 2002). However, when we look at our study's results about professional competence, we see that most of the physics and mathematics teachers do not have any problems in content based knowledge. On the other hand, in our study, most of the physics and mathematics teachers found to be ineffective in teaching ability and interpersonal relationships. Here, the explanation of this difference comes from Azar's (1998) findings. He reported that while teachers with experiences less than 6 years complains about their insufficient knowledge of subject matter, more experienced teachers do not mention shortage of subject matter knowledge as a problem. Teachers who have more than six years of teaching experience, mostly, claims that they have problems in motivating students and in relationships with students (Azar, 1998).

Results of our study support Azar's (1998) findings. Since our teacher sample consisted of experienced teachers, teachers' scores on items about subject matter knowledge are not low. On the other hand, both physics and mathematics teachers have problems in the dimension of teaching ability and interpersonal relationships. For example, most of the teachers are evaluated as ineffective in motivating students, attracting students' attention to the subject

matter, making lessons exciting, encouraging students for active participation and evaluating students' success objectively.

Therefore by considering the findings of the previous studies and our results, we can conclude that most of the physics and mathematics teachers overcome their insufficient subject matter knowledge and alienation from high school level knowledge through their teaching career. However, their teaching ability and relations with students remain insufficient. Teachers learn their subject matter after five or six years in teaching, but they have problems in transmitting their knowledge to students.

In order to overcome these problems in physics and mathematics education, courses focused on the strategies about ways of starting to lessons, organization of lesson presentations, examples and demonstrations used to make concept easy to understand, must be increased or revised in teacher education programs. Some elective courses examining the interests of young people and ways of creating analogies which are related those interest areas and appropriate to use in lessons, should be added to curriculum of these institutions in teacher education programs. In addition to pure physics and mathematics subject matter courses, some courses focused on current high school curriculums must be taught in teacher education programs. In addition to this, in-service courses can be prepared for currently enrolled physics and mathematics teachers to increase their effectiveness in related teaching dimensions.

As stated by Knox and Mogan (1985), paying attention not to criticize students in front of other students, supporting and encouraging students and showing personal interest to the students are important effective teacher characteristics in terms of personality traits. However, our results show that both physics and mathematics teachers do not have these characteristics. To increase effectiveness of teachers in these dimensions, coureses about class managements and educational psycholohy can be increased or revised in teacher education instutions. In-service courses focusing on these aspects of education cen be prepared as well.

Our findings revealed that most of the teachers do not give examples from daily life during the mathematics lesson, do not use instructional technology (overhead projector, computer etc.) do not discuss about books concentrated on their professions in the class or current developments about the subject matter. As reported by Bereketoğlu (2002), teachers cannot demonstrate such characteristics because of heavy load of curriculum, insufficiency of school setting and students' motivation for preparing for university entrance examination.

5.5 Recommendations for Further Research

This study has suggested some topics for future studies like:

1. Perceptions of students from different grade levels on effectiveness of their teachers can be investigated.

2. In addition to questionnaire, interviews with the students and teachers can be added to such studies.
3. After the first data analysis of students' perceptions, teachers with high student ratings and teachers with low student rating can be determined and by video-taping their lessons, some important facts about effective and ineffective teacher traits can be identified.

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APPENDIX A

Fizik ve Matematik Öğretmenleri Hakkında Öğrenci Görüşü Anketi

Uzman Görüş Formu

Fizik ve Matematik Öğretmenleri Hakkında Öğrenci Görüşü Anketi, lise öğrencilerinin fizik ve matematik öğretmenlerinin yeterliliği hakkındaki görüşlerini incelemek üzere hazırlanmıştır. Anket toplam 64 maddeden oluşmaktadır. İlk 25 madde öğretmenin öğretmenlik yeteneği, bunları takip eden 12 madde (26-37) alanındaki bilgi ve yeteneği, sonraki 12 madde (38-49) ölçme-değerlendirme, daha sonraki 8 madde (50-57) sosyal ilişkiler, son 7 madde ise kişisel karakter gibi boyutlar üzerinde yoğunlaşmıştır. Bu form Fizik ve Matematik Öğretmenleri Hakkında Öğrenci Görüşü Anketi'nin geçerliliğini incelemek üzere hazırlanmış maddelerden oluşmaktadır. Maddelere yanıtlarınızı "Evet", "Hayır" veya "Kısmen" kutucuklarını işaretleyerek belirtiniz. Yorum kutucuğuna sorunlu buluğunuz anket maddelerinin numaralarını yazabilirsiniz. Ayrıca anketteki maddeler üzerinde düzeltmelerinizi veya yorumlarınızı belirtebilirsiniz. Katkılarınızdan dolayı teşekkürler.

Mehmet Hamdi KURAL

GENEL	**EVET**	**HAYIR**	**KISMEN**
1. Anketin başlığı uygundur.			
2. Çalışmanın amacı belirtilmiştir.			
3. Katılımcılara kişisel bilgilerin gizli kalacağı belirtilmiştir.			
4. Anketin tamamı yeterince kısadır.			
5. Anketin görünümü çekicidir.			
6.Anketteki her bir madde kolay anlaşılır.			
7. Anketteki her bir madde yeterince kısadır.			
8. Anketteki terimler katılımcıların anlayabileceği terimlerdir.			
9. Anketteki her bir madde ifadesi Açık ve belirlidir.			
10. Anketteki maddeler yönlendirme içermeyen tarafsız ifadelerden oluşur.			
11. Anketteki maddeler dilbilgisi kurallarına uygundur			
İlk 25 Madde için			
12. Öğretmenin öğretmenlik yeteneği boyutuyla ilgilidir. (*Öğretmenlik Yeteneği:* Öğrencilerin öğrenmelerini sağlayıcı, kolaylaştırıcı davranış, aktivite ve sözel ifadelere sahip olma)			
26.-37. Maddeler için			
13. Öğretmenin alanındaki bilgi ve yeteneği boyutuyla ilgilidir. (*Alan bilgisi ve yeteneği:* Fizik eğitiminde kullanılan teorik ve pratik Fizik bilgisi ve aynı zamanda mesleğe karşı olumlu tutuma sahip olma.)			
37.-49. Maddeler için			
14. Öğretmenin değerlendirme alışkanlıkları boyutuyla ilgilidir. (*Değerlendirme Alışkanlıkları:* Öğrencilerin dersteki performansları ile ilgi öğretmenden alınan geribildirimin niteliği ve miktarı.)			
50.-57. Maddeler için			
15. Öğretmenin sosyal ilişkileri boyutuyla ilgilidir. (*Öğretmenin sosyal ilişkileri:* Öğretmenin çevresindeki kişilerle arasındaki karşılıklı ilgi ve iletişimin niteliği)			

APPENDIX A (Continued)

Fizik ve Matematik Öğretmenleri Hakkında Öğrenci Görüşü Anketi

Uzman Görüş Formu

58.-64. Maddeler için	**EVET**	**HAYIR**	**KISMEN**
16. Öğretmenin kişisel karakteri ile ilgilidir. (*Öğretmenin kişisel karakteri:* Öğretmenlik, fizik ya da sosyal ilişkiler boyutuyla doğrudan ilişkili olmayan fakat etkili olması muhtemel olan tutum, duygusal eğilim ve kişilik özelliklerinin tümü.			

APPENDIX B

Fizik ve Matematik Öğretmenleri Hakkında Öğrenci Görüşü Anketi

Bu çalışmanın amacı, Lise 1. sınıf öğrencilerinin Fizik ve Matematik öğretmenleri hakkındaki görüşlerini incelemektir. Lütfen fizik/matematik öğretmenlerinizin yeterlilikleri hakkındaki görüşlerinizi aşağıdaki anketi ve optik formu kullanarak belirtiniz. Optik formdaki değerlendirmenizi yaparken, "Kesinlikle katılmıyorum" için A'yı, "Katılmıyorum" için B'yi, "Kararsızım" için C'yi, "Katılıyorum" için D'yi ve "Kesinlikle katılıyorum" için E'yi işaretleyiniz.

(DİKKAT: Sizin veya Öğretmenlerinizin adı-soyadı, okul adı, sınıf şube adı gibi bilgiler **kesinlikle istenilmemektedir** ve bu çalışmada sözü edilmeyecektir. Okulların, sınıfların, öğretmenlerin ve öğrencilerin adları **kesinlikle gizli kalacaktır**. Tüm okullardan alınan anket sonuçları bir veri havuzunda toplanacaktır.**)**

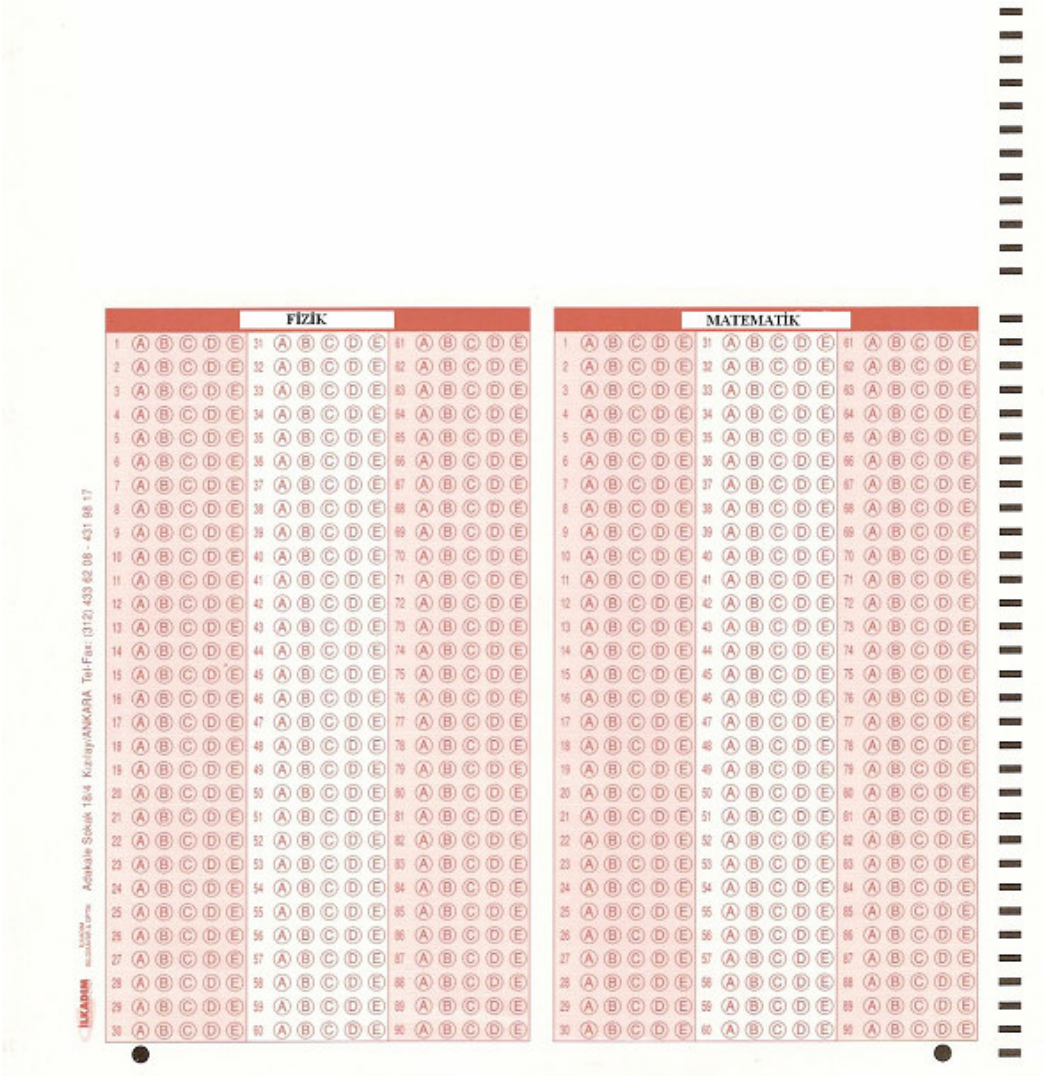
Fizik/Matematik öğretmenimiz(in)...

1. Ders anlatımı Açıktır.
2. Dersin konusu ve amacı hakkında Açıklayıcı bilgi verir.
3. Önemli noktaları vurgular.
4. Öğrencilerin ilgisini konu üzerine çeker.
5. Ders süresi boyunca öğrencilerin ilgisini canlı tutmaya çalışır.
6. Sınıfta öğrenme için elverişli bir ortam sağlar.
7. Sınıfta disiplini sağlamakta başarılıdır.
8. Sınıf içi problem durumları ile başa çıkabilir.
9. Konuyu anlatırken notlarına çok bağlı kalır.
10. Ders süresini etkili biçimde kullanır.
11. Ders konularını bir bütünlük içinde anlatır.
12. Bilgilerini öğrencilere aktarmakta başarılıdır.
13. Deneysel örnekler ya da gösterilerle anlamayı kolaylaştırır.
14. Öğrenciler konuyla ilgili zorluk çektiklerinde özel olarak yardım eder.
15. Öğrencilerin sorularına Açıktır.
16. Öğrencilerin sorularını dikkate alarak, anlaşılmayan konuları tekrar anlatır.
17. Dersi takip etmeyi kolaylaştıracak bir düzen içinde anlatır.
18. Ders sonunda konuyu pekiştirici ödevler verir.
19. Konu üzerinde yapılan tartışmalarda aktif olmaları için öğrencileri teşvik eder.
20. Anlatımını öğrencilerin seviyesine indirger.
21. Değişik öğrenme hızına sahip öğrencilere aynı sınıfta ders anlatmakta başarılıdır.
22. Dersi günlük hayattan örneklerle ilginç ve eğlenceli bir hale getirir.
23. Konuları birden fazla farklı yollarla (Düz anlatım, soru-cevap, problem çözme, grup tartışması v.b.) anlatır.
24. Farklı çözüm yolları gösterir.
25. Öğrencileri, olayların yorumunu yapmaya ve mantıklı düşünmeye yönlendirecek sorular sorar.
26. Öğrencilerin bir olay ya da problem hakkındaki düşüncelerini bir araya getirmelerine yardımcı olur.
27. Öğrencilerin derse katılımını sağlar.
28. Öğrencileri gözlem yapmaya yönlendirir.
29. Konu bilgisine yeterince sahiptir.
30. Matematik ve geometri konularına hakimdir.
31. Grafikleri, denklemleri, diyagramları en yararlı biçimde kullana bilir.
32. Derste tahtanın yanında tepegöz, slayt gösterici, bilgisayar gibi materyallerden yararlanır.
33. Derse hazırlıksız gelir.
34. Kavramların öğrenilmesine önem verir.
35. Öğrencilerin dersle ilgili sorularını kolayca cevaplar.

36. Öğrencilerin sorularına mantıklı yaklaşıp cevabını bilmediği soruları araştırıp öğrencilere Açıklar.
37. Kendi alanında okuduğu kitaplarla ilgili konuşmalar yapar.
38. Kendi alanındaki yeni gelişmelerden sınıfta bahseder.
39. Öğrencileri dersle ilgili yararlı kaynaklara yönlendirir.
40. İyi bir Fizik/Matematik öğretmeni modeli oluşturur.
41. Fizik/Matematik dersini sever.
42. Öğrencilerin kendilerini geliştirmeleri için önerilerde bulunur.
43. Öğrencilerin derste gösterdikleri performans hakkında yapıcı yorumlarda bulunur.
44. Yaptığımız ödevlerle ilgili dönüt verir.
45. Ara sınavlar yapar.
46. Konuyu anlayıp anlamadığımızı kontrol etmek için sıkça sorular sorar.
47. Öğrencilerin başarılarını değerlendirirken tarafsız davranır.
48. Not verirken adaletli davranır.
49. Yaptığı sınavlardaki sorular derste işlenilen konuları İyi yansıtır.
50. Öğrencilerin dersle ilgili beklentilerini önemser.
51. Öğrencilerden gerçek üstü beklentileri vardır.
52. Öğrencilerin hatalarını düzeltirken onları küçük düşürmez.
53. Öğrencileri diğer öğrencilerin yanında eleştirmez.
54. Öğrencilerin yakalaşmaya çekindikleri bir öğretmendir.
55. Öğrencileri destekler ve cesaretlendirir.
56. Öğrencilerin isimlerini çabuk öğrenir.
57. Sınıfta karşılıklı saygı havası oluşturur.
58. Sabırlı ve hoşgörülüdür.
59. Öğrencilere karşı arkadaşça davranır.
60. Bazı öğrencilerle daha fazla ilgilenip, sınıfın tamamını düşünmez.
61. Öğrencileri dikkatlice dinler.
62. Öğrencilerle kişisel olarak ilgilenir.
63. İstekli ve heveslidir.
64. Öğretmekten zevk alır.
65. Dinamik ve enerjik bir insandır.
66. Kendine güveni vardır.
67. Derse ve kendisine yönelik eleştirilere Açıktır.
68. Açık fikirli ve önyargısızdır.
69. İyi bir espri anlayışına sahiptir.
70. Düzensiz bir kişidir.
71. Genel olarak çok etkili ve başarılı bir öğretmen olduğunu düşünüyorum.

APPENDIX B (Continued)

Optical Answer Sheet



APPENDIX C

Petition for Permission

ODTÜ ORTA ÖĞRETİM FEN VE MATEMATİK ALANLARI EĞİTİMİ BÖLÜMÜ BAŞKANLIĞI'NA,

ANKARA

Bölümünüzdeki Yüksek Lisans çalışmamın tez aşamasının bir parçası olan Fizik Öğretmeni Etkinliği Değerlendirme Anketi'ni (Ek-2), 2005-2006 Eğitim Öğretim Yılı 2.Döneminde, Ek-3'de belirtilen okullarda uygulamak istiyorum. Gereğini bilgilerinize sunarım.

06.09.05

Mehmet Hamdi KURAL

Öğrenci No: 1015049

Orman Genel Müdürlüğü Lojm.
76/3 Beştepe / Ankara
e-mail: mhkural@yahoo.com

Ekler: 1) Çalışmanın içeriği, önemi ve uygulaması hakkında bilgi
2) Fizik Öğretmeni Etkinliği Değerlendirme Anketi
3) Anketin uygulanacağı okulların listesi

ÇALIŞMANIN AMACI

Bu çalışmanın amacı Ankara'daki normal lise ve Anadolu liselerindeki öğrencilerin fizik öğretmenlerinin etkinlikleri hakkındaki görüşlerini incelemek ve öğretmen cinsiyeti, okul türü, öğretmenin hizmet süresi gibi faktörlerin öğrencilerin görüşleri üzerinde etkili olup olmadığını tespit etmektir.

ÇALIŞMANIN GİZLİLİĞİ

Bu çalışmada kesinlikle öğretmenler kişisel olarak değerlendirilmeyecek, öğretmenlerin adları sorulmayacak ve Açıklanmayacaktır. Araştırmanın objektif olması bakımından öğrencilerin isimleri istenmeyecektir.

ÇALIŞMANIN ÖNEMİ

Bu çalışmanın, Türkiye'deki öğretmen probleminin anlaşılması, fizik öğretmeni yetiştirme programlarındaki ve öğretmen denetim mekanizmalarındaki eksik ve kusurların fark edilmesi konularında yardımcı olması beklenmektedir. Bunun sonucu olarak öğretmen eğitimi ve öğretmenlerin değerlendirmesi alanlarında yeni çalışmalara öncelik etmesi beklenmektedir. Bu çalışmanın sonuçlarının yorumlanması sonucu, öğretmen performansının değerlendirilmesinde öğrenci görüşlerinin öneminin Milli Eğitim Bakanlığı tarafından fark edilip, denetim mekanizmalarının düzenlenmesinde göz önüne alınması ve gerekli görülürse bazı hizmet içi eğitim etkinlikleri oluşturarak eğitimde İyileştirmeye gidilmesi umulmaktadır.

UYGULAMA

Bu çalışmada ölçüm aracı olarak Fizik Öğretmeni Etkinliği Değerlendirme Anketi kullanılacaktır. Anket 54 soruluk soru formu ve optik cevap formundan oluşmaktadır ve toplam uygulama süresi 20-25 dakikadır. Anket, araştırmacının kendisi tarafından, yalnızca okullar bünyesindeki Lise 1.sınıfı öğrencilerine uygulanacaktır. Formlara öğrenci veya öğretmen ismi yazılmayacaktır. Anketin uygulandığı sınıfı okutan fizik öğretmenin cinsiyet ve hizmet süresi bilgileri, öğretmenin kendisinden ya da okul idaresinden edinilecektir. Edinilen bu bilgiler ilgili sınıftan toplanan anket formlarının konulacağı zarfın üzerine yazılacaktır.

APPENDIX D

Official Permission Papers

T.C.
MİLLİ EĞİTİM BAKANLIĞI
Araştırma, Planlama ve Koordinasyon Kurulu Başkanlığı

Sayı : B.08.0.APK.0.13.05.01-01/ 5 2 5 10.2005
Konu : Araştırma İzni

ANKARA VALİLİĞİNE
(İl Millî Eğitim Müdürlüğü)

İlgi : Ankara Valiliği İl Milli Eğitim Müdürlüğü'nün 07.10.2005 tarih ve 11113 sayılı yazısı.

Orta Doğu Teknik Üniversitesi İlköğretim Fen ve Matematik Alanlar Eğitimi Anabilim Dalı Yüksek Lisans programı öğrencisi Mehmet Hamdi KURAL'ın "Fizik Öğretmenlerinin Yeterliliği Hakkındaki Görüşleri" konulu araştırma anketini ekteki İlköğretim Okullarında uygulama izin talebi incelenmiştir.

Orta Doğu Teknik Üniversitesi tarafından kabul edilen ve ekte gönderilen 3 sayfa 54 sorudan oluşan anketin araştırmacı tarafından uygulanmasında Bakanlığımızca sakınca görülmemektedir.

Bilgilerinizi ve gereğini rica ederim.

Cevdet CENGİZ
Bakan a.
Müsteşar Yardımcısı

EKLER :
EK – 1 Anket (3 Sayfa)
EK – 2 Uygulama Yapılacak Okullar Listesi (1 Sayfa)

1593

T.C.
ANKARA VALİLİĞİ
Milli Eğitim Müdürlüğü

BÖLÜM : Kültür
SAYI : B.08.4.MEM.4.06.00.11.070/ 3716
KONU : Araştırma izni.

11.11.2005

..... KAYMAKAMLIĞINA
(İlçe Milli Eğitim Müdürlüğü)

Orta Doğu Teknik Üniversitesi Fen ve Matematik Alanları Eğitimi Anabilim Dalı Yüksek Lisans Programı öğrencisi Mehmet Hamdi KURAL'ın "Fizik Öğretmenlerinin Yeterliliği Hakkındaki Görüşleri" konulu 3 sayfa 54 sorudan oluşan tez anketini –ek listede isimleri- belirtilen ilçeniz okullarında eğitim-öğretimi aksatmamak şartıyla uygulamasına izin verildiğine ilişkin Bakanlığımız; Araştırma, Planlama ve Koordinasyon Kurulu Başkanlığı'nın 25.10.2005 tarih ve 01/6205 sayılı yazısı ilişikte gönderilmiştir.

Bakanlık emri gereğince işlem yapılmasını rica ederim.

Erol ORTAKAYA
Vali a.
Milli Eğitim Müdür Yardımcısı

EKLER.
EKİ. 1- Bakanlık Emri
2- Anket (3 sayfa)
3- Okul Listesi (1 adet)

DAĞITIM
Gereği.
-Çankaya-Yenimahalle-Keçiören-
- Mamak-Etimesgut-Sincan İlçe Kay.

APPENDIX E

Key word List

Effective Teaching

Effective Teacher

Effective Teacher Characteristics

Effective Physics Teacher

Effective Mathematics Teacher

Teacher Characteristics

Teacher Effectiveness

Teacher Quality

Student Ratings

Student Perceptions

Evaluation of Teachers

Assessment of Teachers