

## A GROUP OF TURKISH STUDENTS' ACHIEVEMENT IN THE MATHEMATICS POTENTIAL TEST

### BİR GRUP TÜRK ÖĞRENCİNİN MATEMATİK POTANSİYEL TESTİNDE BAŞARISI

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**Abstract:** In this paper, we elucidate the achievement of a group of Turkish students aged 11-13 year old in the Mathematical Potential Test (MPT) which was developed in the Kassel Project by Profs Blum and Burghers. The MPT has been applied to more than 500 students enrolled various junior high schools (Primary school: grade level 6, 7, and 8) in Ankara and other cities in 1995-96/97 school year. Among others, the scores of the Turkish students in the MPT are compared with those in the UK and Germany. The MPT average score of this group of students from the schools of repute in Turkey is relatively higher than that of both groups of students in the same age in the UK and Germany.

**Key words:** *Mathematical potential test, Kassel Project, Pupil achievement, Comparison of students' scores*

**Özet:** Bu çalışmada 11-13 yaşlarında bir grup Türk öğrencinin Prof Blum ve Burghers'in Kassel Projesinde geliştirdikleri Matematik Potansiyel Testi (MPT)'nindeki başarıları araştırılmaktadır. MPT, 1995-96/97 öğretim yılında Ankara ve diğer kentlerde değişik okullarda okuyan 500'den çok ortaokul (ilköğretim 6., 7. ve 8. sınıflar) öğrencilerine uygulandı. Diğer şeylerin dışında Türk öğrencilerin ortalama başarı puanları İngiliz ve Alman öğrencilerin puanları ile karşılaştırıldı. Türkiye'de oldukça başarılı olarak bilinen okulların MPT'deki ortalama puanları, İngiltere ve Almanya'daki aynı yaş grubundaki öğrencilerin başarı puanlarından göreceli olarak daha yüksektir.

**Anahtar Sözcükler:** *Matematik potansiyel test, Kassel Projesi, Öğrenci başarısı, Öğrenci notlarının karşılaştırılması*

### 1. INTRODUCTION

The evaluation and assessment of pupils and student performance in schools has a long history. However, contemporary models for both the gathering of performance data and the

crossnational comparisons of achievement have only evolved during the past quartercentury [1]. In the last three decades, a crosscultural and comparative study on students achievement and attitudes towards a subject has been an area of research in mathematics education, e.g. [2, 3, 4]. In this respect, the Kassel Project was originally designed to compare the mathematical progress made by secondary school pupils in England, Scotland and Germany. Consequently its purpose was to determine the factors that give rise to enhanced progress and make recommendations for good practice in mathematics teaching and learning in the UK [5].

In this study, we elucidate the achievement of a group of Turkish pupils aged 11-13 year old in the Mathematical Potential Test (MPT). The test was developed in the Kassel Project by Profs Blum and Burghers from the University of Kassel in Germany and the University of Exeter in the United Kingdom, respectively [5]. The MPT has been applied to more than 500 students enrolled various junior high schools in Ankara and other cities in 1995-96/97 school year [6]. Among others, the scores of the students in the MPT are compared with those in the UK and Germany. More specifically, the frequency distribution of each questions are obtained to identify the factors affecting students' achievement, and statistics of grade levels and of schools are then compared to highlight the current situations.

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## **2. BACKGROUND: MATHEMATICS POTENTIAL TEST (MPT)**

The mutual interest in collaborating in the previous/this project stemmed from joint work undertaken by research teams in Exeter, UK and Kassel, Germany, into ways in which England and Germany use applications of mathematics in teaching. These were compared and evaluated in detail [5]. This research was a main resource and motivation for our work in Turkey, since it highlighted the problems in undertaking comparative studies and making justifiable conclusions. The number of countries now involved in the project has continued to increase. With the participation of Turkey, the number of countries joined in the project became 17 last year. The research project is aimed at studying the various aspects of teaching and learning mathematics in lower secondary schools as well as mathematics teacher pre- and in-service education and training [6].

The original test consists of 28 questions while the revised one 26 questions, each allocated a single mark. The initial testing was confirmed to an English / German / Turkish sample. Now it seems to be suitable as an international assessment of potential ability in mathematics for students in the age range 12-15 years. It is worthwhile to emphasise that the MPT was designed to be relatively "content" free, since it was designed as a test of potential, rather than mathematical knowledge [5]. The broad areas covered by the test are displayed in Table 1. The relative weight of number of questions in each area of mathematics varies from topics to topics. The emphases on the topics may not be the same in various schools and the countries, and it may be the main factor for the differences in students' performance in the MPT.

## **3. METHODOLOGY**

In this section, the purpose of the study and the sample of population will be explained very briefly.

### **3.1. The Purpose of the Study**

The purpose of this study is to find out the rate of success of a group of students in Turkey in the MPT. More specifically, the objectives of the study were:

- To find out the rate of success of a selected group of students in Turkey in the MPT with respect to age group or grade level;
- To compare the relative scores of Turkish students with those from the UK and Germany;
- To investigate the errors students do in solving word problems;
- To provide suggestions for practical application of the findings.

### **3.2. The Sample for Pilot Studies in Turkey/ Ankara**

In Turkey, the sample size in the first pilot study is 208 in Ankara and the second was 508 in Antalya. More specifically, the Turkish version of the original MPT was administered in two schools in Ankara; one is private school in the University and the other is state owned special school. The Turkish translation of first and original version of test was applied to a group of students at different grade levels, ie. the grade level 6 (age 12), 7 (age 13) and 8 (age 14) in both schools in Ankara. The revised version of the same test was applied in four schools in different provinces of Turkey, ie. Ankara, Antalya and Tire-Izmir; and the results will be reported latter.

It is important to stress that the sample in the pilot test is not the representative of Turkey in general, but it can be considered as the representative sample of a group of private and public schools. More precisely, there are some

**Table 1. The broad areas of the MPT**

Area of Mathematics	Questions	Area of Mathematics	Questions
Simple calculations with numbers	2, 5	Spatial ability	7, 21
Recognizing structure of number sequences	1, 17, 19, 22	Interpreting graphs in context	6, 23
Applied algebraic calculations	8, 10, 13, 24	Concept of probability	9
Handling proportions	11, 15, 20, 26	Combinatorial reasoning	14, 27
Puzzles on number symbols	28	Recognizing structure	4, 18
Plane figures	3, 12, 16	Logical reasoning	25

requirements fulfilled by the candidates to get the examination for these schools. Therefore the capability and performance of the pupils of these two schools in Ankara are usually higher than the average school in Ankara and the country.

**4. ANALYSIS AND RESULTS**

Results of the Mathematical Potential Test in Turkey (T), England (E) and Germany (G) are displayed in Figs1a, b, c, and 1d. In order to make the group students' performance in the MPT more clear, the relative differences of

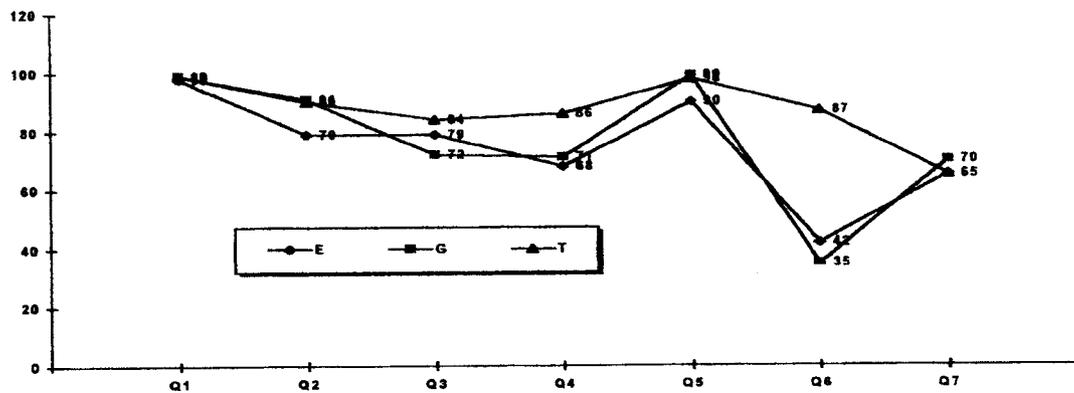


Fig 1a. The percentage (%) of correct answers of pupils from three countries (E: England, G: Germany, T: Turkey) for Questions 1-7 in the MPT

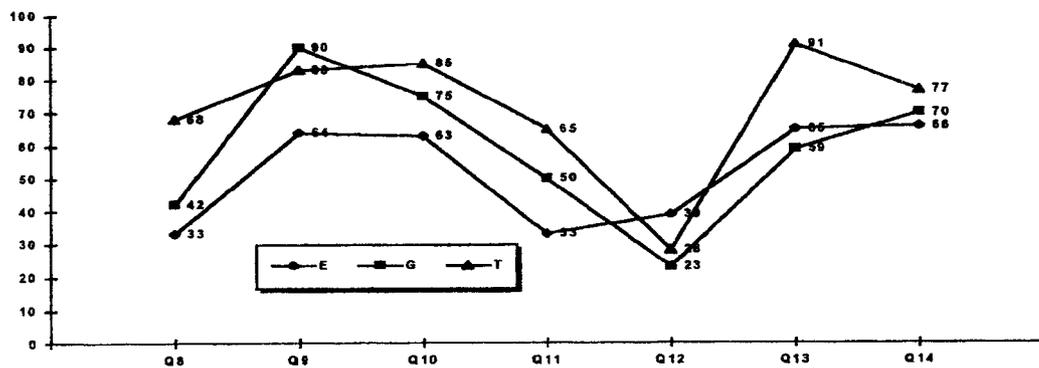


Fig 1b. The percentage (%) of correct answers of pupils from three countries (E: England, G: Germany, T: Turkey) for questions 8-14 in the MPT

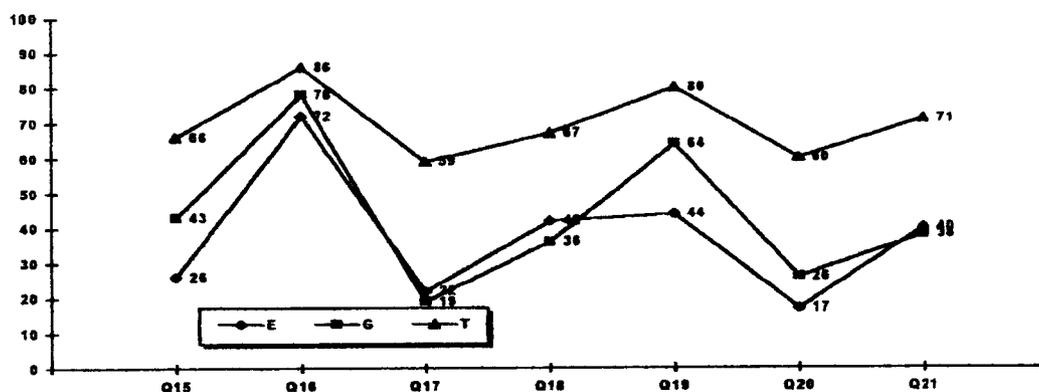


Fig 1c. The percentage (%) of correct answers of pupils from three countries (E: England, G: Germany, T: Turkey) for questions 15-21 in the MPT

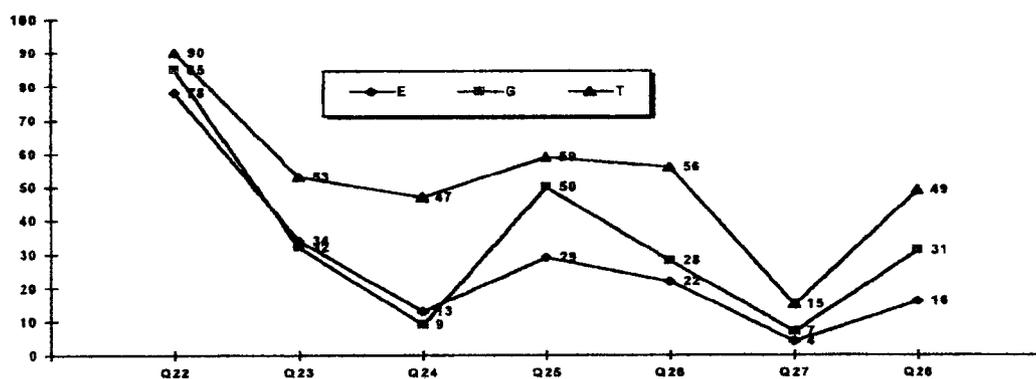


Fig 1d. The percentage (%) of correct answers of pupils from three countries (E: England, G: Germany, T: Turkey) for questions 22-28 in the MPT

pupils' scores are displayed in Appendix A, Figures A1, 2, 3, and 4.

## 5. CONCLUDING REMARKS

There are various ways to compare education systems and difficulties in making decision on the performance of students in school subjects. It is acknowledged that assessment enables us to collect information, to make value judgments, to orient the teaching / learning process, and to make decisions about this process.

The MPT was piloted, revised and tested several times in England and Germany, and the preliminary testing gave some interesting

results. The test has been used in a number of constructing schools in each country. In Britain, the sample size was 540, all of whom were in comprehensive schools. In Germany, the sample size was 302, roughly divided in proportion to the numbers of pupils in three main types of schools. In Turkey, the sample size in the first pilot study is 208 and the test was administrated in two schools; one is private school in the University and the other is state owned special school. It is worthwhile to stress that these two schools are not a random sample of being a good representative of junior high school in Turkey. However, they can be considered as a sample of selected group of qualified schools in Turkey. Because, there are some requirements and entrance examination for both schools. As

expected, the capability and performance of the pupils of these two schools are usually higher than the average school in Ankara and the country. It is interesting to notice that the MPT average score of this group of students who are from the schools of repute in Turkey is relatively higher than that of both groups of students in the same age in the UK and Germany. The situation might be completely different when we take into account the scores of students in other junior high schools and students either rural areas or different regions of Turkey. Therefore, we cannot generalise the results we have got in this study, and have to continue to investigate the achievement and performance of Turkish students in such mathematics achievement and potential tests. However, differences in relative performance in countries and/or within the same country may be related to one or more of a number of factors, such as emphases in intended curricula or widely used textbooks, strengths or weaknesses in curriculum implementation, and the grade level at which topics are introduced.

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### APPENDIX A: THE RELATIVE DIFFERENCE BETWEEN THE PERCENTAGE OF CORRECT ANSWERS

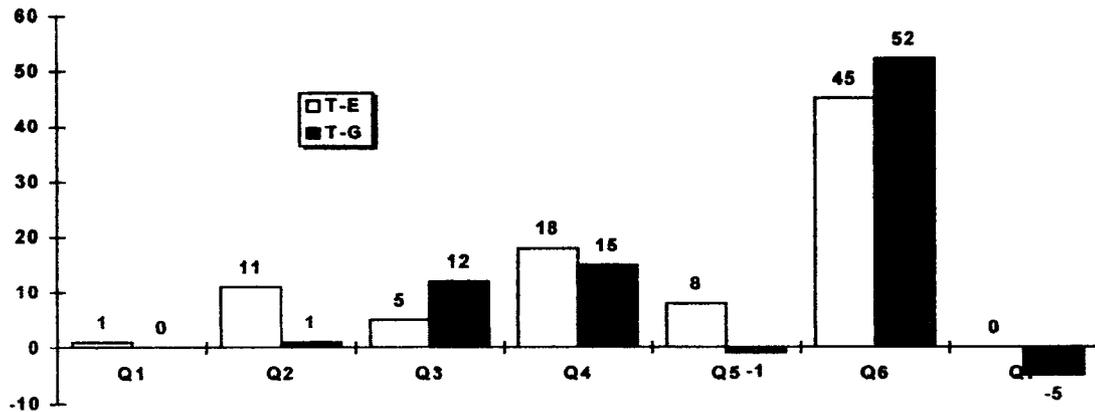


Fig A1. The relative differences between the percentage (%) of correct answers of pupils from two countries (T-E: Turkish-English; T-G: Turkish-German) for questions in the MPT

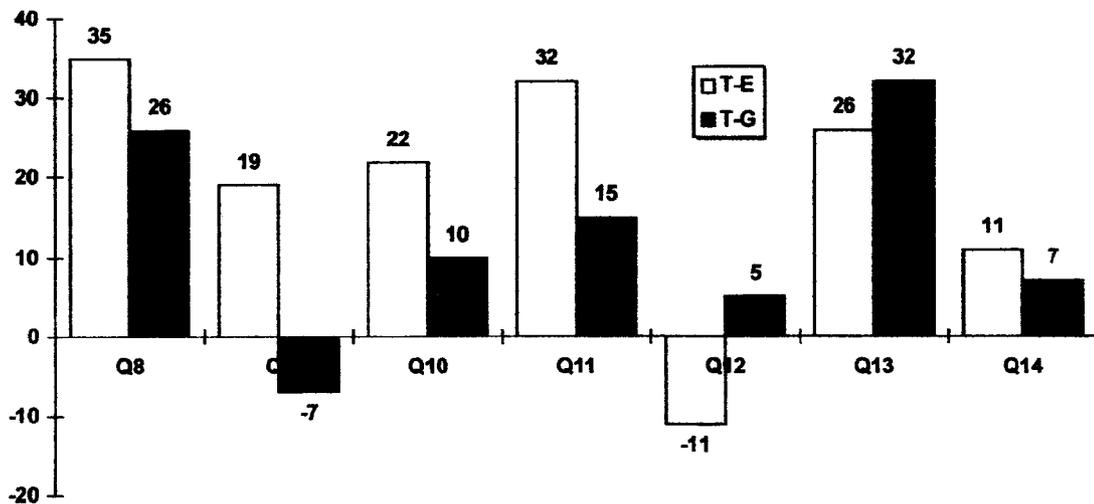


Fig A2. The relative differences between the percentage (%) of correct answers of pupils from two countries (T-E: Turkish-English; T-G: Turkish-German) for questions in the MPT

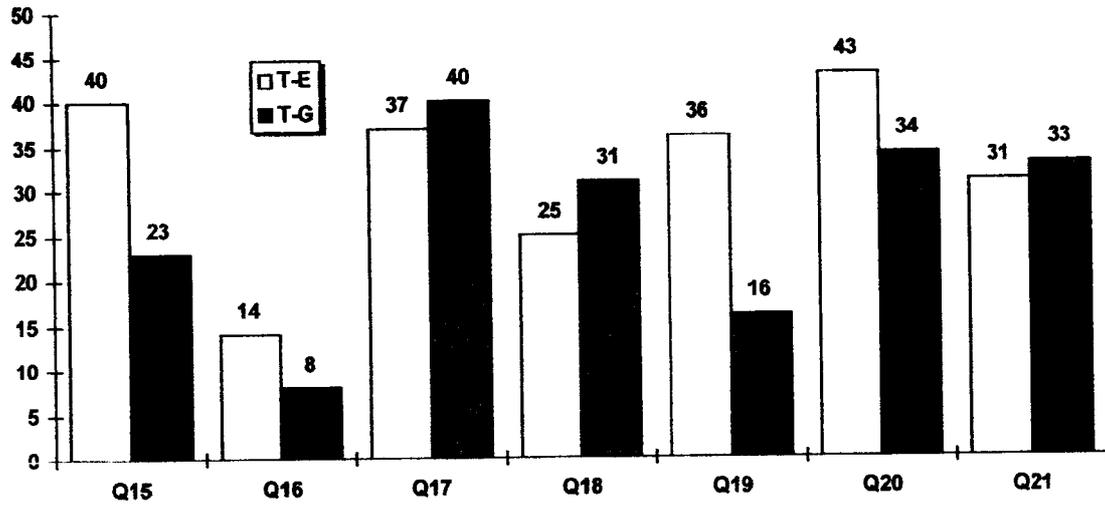


Fig A3. The relative differences between the percentage (%) of correct answers of pupils from two countries (T-E: Turkish-English; T-G: Turkish-German) for questions in the MPT

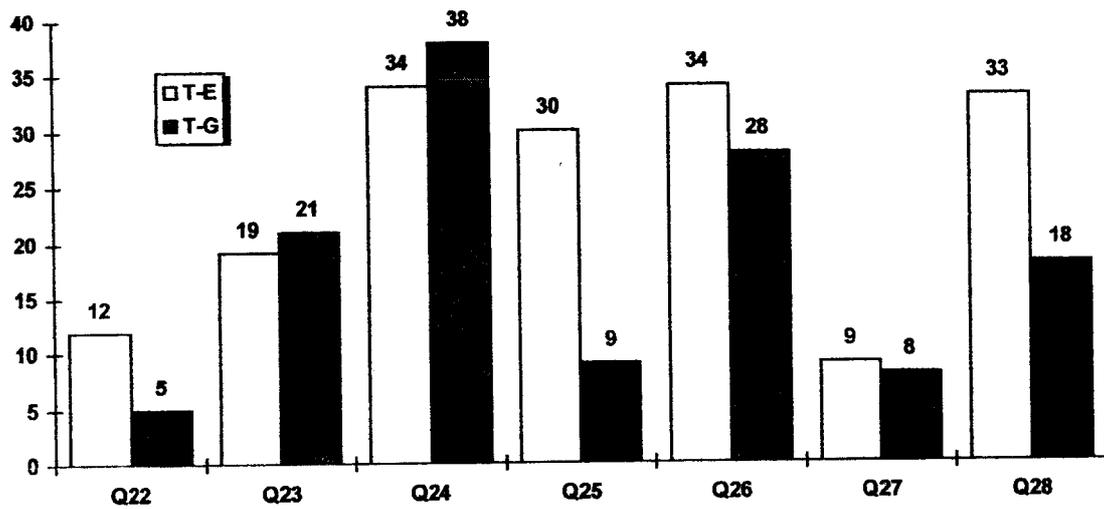


Fig A4. The relative differences between the percentage (%) of correct answers of pupils from two countries (T-E: Turkish-English; T-G: Turkish-German) for questions in the MPT