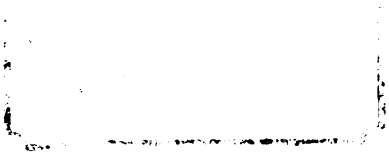

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AN EVALUATION OF THE MATHEMATICS CURRICULUM GIVEN AT THE COLLEGE OF EDUCATION, MECCA, FROM THE PERSPECTIVE OF THE TEACHERS WHO GRADUATED FROM THE COLLEGE IN THE YEARS 1976-1980

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ABSTRACT

AN EVALUATION OF THE MATHEMATICS CURRICULUM GIVEN AT THE COLLEGE OF EDUCATION, MECCA, FROM THE PERSPECTIVE OF THE TEACHERS WHO GRADUATED FROM THE COLLEGE IN THE YEARS 1976-1980

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This study evaluates the mathematics curriculum of the College of Education, Mecca, Saudi Arabia, from the perspective of the mathematics teachers who have already graduated from the College. This is the first study of this nature ever conducted regarding an important specialty program. This study was able to enlist the participation of the entire Saudi graduate teachers who graduated from the College between 1976 and 1980 as teachers of mathematics in intermediate and high-school systems of Saudi Arabia.

Design and Methodology

The following procedure was used to conduct the study:

1. A questionnaire was administered to the entire group of Saudi teachers who had graduated from the College of Education with mathematics as their teaching specialty between the years 1976 and 1980.

2. Through factor analysis, the following twelve dimensions characterizing the mathematics program were developed: Understanding the Objectives of Teaching Mathematics, Understanding Basic Mathematics

to Teach Mathematics, Preparation for Higher Mathematics, College-School Relations, Emphasis on Practical Problems, Preparation for School Teaching, Methods of Teaching Mathematics, Student Teaching, Educational Thought, Curriculum Design, Educational Psychology, and Problems of Teaching Mathematics.

3. With analysis of covariance, eight hypotheses were tested regarding these twelve dimensions.

Conclusions

On the basis of the results, it may be affirmed:

1. A poor relationship between the courses in mathematics at the College of Education, Mecca, and curricula in mathematics for intermediate and high schools of Saudi Arabia.

2. A very positive relationship between the College program of teaching methodology for mathematics and the graduate teachers' effectiveness as teachers of mathematics.

3. Student teaching being a very effective program of the Mecca College of Education.

4. The mathematics curriculum of the College having helped the graduate teachers in a positive manner to teach mathematics at intermediate and high schools in Saudi Arabia.

5. The adequacy of education courses as having a positive effect on the teaching ability of the teachers.

6. The mathematics curriculum's failure to give adequate emphasis to practical problem-solving aspects of mathematics in the mathematics program of the College.

7. The mathematics curriculum's failure to provide for innovations and experimentation in the teaching of mathematics.

8. The mathematics curriculum's failure to prepare teachers of mathematics adequately in the techniques of evaluating and grading.

9. A lack of adequate in-service programs and seminars for the College's past graduates.

بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

In the name of Allah the most merciful and the most beneficient

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This dissertation is the outcome of the moral support, intellectual encouragement, concern, and prayers and devotion of all those who were intimately connected with this work and this investigator. This work would not have attained the measure of academic excellence that has been accorded to it without the direction, painstaking guidance, and encouragement of the Dissertation Committee, comprised of Drs. Ben Bohnhorst, John Lopis, Richard Gardner, and Howard Hickey. I am deeply indebted to each member of the Committee individually for their ever-readiness to discuss and comment on the issues that arose during the preparation of this dissertation, despite their heavy schedules of engagement. It is well-nigh impossible for me to find words to match my deeply felt gratitude to Dr. Ben Bohnhorst, the director of this dissertation, for the enormous amount of time he spent on various aspects of this work in guiding me at every stage of preparation of this work, and to Dr. John Lopis, who guided and directed work on this dissertation in the initial stages of development. Dr. Lopis' loss to me and this work, because of his decision to move from Michigan State University, would have been too much to bear, had it not been for Dr. Bohnhorst's filling in with his direction.

I would be remiss in my duty if I were not to acknowledge the help and cooperation I received from the Registrar's Office of

Umm Al-Qura University, Mecca, the Ministry of Education, the General Presidency of Schools for Girls, and the General Directorate of Education, Western Division, Saudi Arabia, for their timely and ready assistance in contacting the respondents and collecting the data. Completion of this work in record time is a living testimony to the help and cooperation not only of these official bodies, but, above all, also to the participating graduates who took time out of their heavy engagements to respond to the questionnaire with thought and understanding.

Encouragement of my brothers and sisters, patience of my wife, Sana, and even the sacrifice of my children, Rahaf and Bassam, who willingly forewent their precious moments of fun and frolic in consideration of my need for quiet and peace, have always been a source of inspiration for me all through the writing of this dissertation.

My parents (May their souls rest in peace!) have always been a source of strength for me. Their strict discipline and guidance are reflected in the effort that I have been able to generate in the present undertaking. Blessed are those who have had the fortune of having such parents! I hope I have met my obligation and gratitude to them as laid down by God in the Holy Qur'an:

وَٱخْفِضْ لَهُمَا جَنَاحَ ٱلذُّلِّ مِنَ ٱلرَّحْمَةِ وَقُل رَّبِّ ٱرْحَمْهُمَا كَمَا رَبَّيَانِي صَغِيرًا

And lower unto them the wing of submission through mercy, and say: My Lord! Have mercy on them both as they did care for me when I was little!

The Glorious Qur'an, Surah XVII, 24

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CHAPTER I

INTRODUCTION

Saudi Arabia has one of the largest per capita investments in the world. In the fiscal year 1978-79, the government of Saudi Arabia allocated over 15 billion Saudi riyals (U.S.$4.3 billion), 11.6 percent of the total budget,[1] for education, in addition to a little over $2 billion[2] for the Ministry of Education. This allocation works out to roughly $1,000 per child, man, and woman of the population estimated between five and seven million people.[3] This expenditure on education represents a steady increase in the annual educational budget from $3.1 million in 1952-53[4] to over $6 billion in 1978-79. Official statistics show that 1,329,417[5] students, from the kindergarten to the university level, were receiving free education under the Saudi system. That is, the Saudi Treasury spent $6,000 per learner in the 1978-79 fiscal year. By any standard, it is an impressive

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[1] Kingdom of Saudi Arabia, Ministry of Education, Educational Statistics in the Kingdom of Saudi Arabia, 1978-79, p. 380.

[2] Ibid., Table 14-2, p. 380.

[3] Emile A. Kakhleh, The United States and Saudi Arabia: A Policy Analysis (Washingdon, D.C.: American Enterprise Institute for Public Policy Research, 1975), p. 5.

[4] Al-Nadwa [daily newspaper, Mecca], July 17, 1977.

[5] Kingdom of Saudi Arabia, Ministry of Education, Educational Statistics in the Kingdom of Saudi Arabia, op. cit., p. 51.

investment, which very few countries in the world can boast of matching. The Saudi government, in other words, treats education as one of the most important single national concerns. In this connection, it is interesting that

> In September 1957 a government scholarship program indicating considerable official approval of foreign study was announced. Under its terms, the Ministry of Education was to select and send qualified students abroad to study the arts, sciences, and various professions. Upon the completion of their courses, the students were required either to work for the government for a period equal to that of the scholarship or to refund the amounts spent on them. The new program also provided for limited government assistance to Saudis studying abroad at their own expense.[6]

Until November 6, 1957, Saudi Arabia had no facilities for higher education, except for a small College of Islamic Law in Medina for training Islamic judges. On that date, however, the creation of a modern university, the University of Riyadh, was announced. Lipsky recalled:

> It consists so far only of a college of arts and sciences, but colleges of commerce and law are soon to be added, and these are to be followed by medical, agricultural, and engineering schools. It is not known whether the level of instruction offered at this new institution actually represents higher education in the Western sense. The present curriculum of Saudi secondary schools provides inadequate preparation for university-level courses in most fields.[7]

Despite the initial difficulties, the Ministry of Education has always endeavored to make Saudi education consistent with the best available in the world. In pursuit of this objective, four

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[6]George A. Lipsky, Survey of World Cultures: For Saudi Arabia: Its People, Its Society and Its Culture, ed. Thomas Fitzsimmons (New Haven: Hraf Press, 1959), p. 282.

[7]Ibid., p. 280.

additional universities--Islamic University of Medina in 1961, University of Petroleum and Minerals in 1963, King Abdul-Aziz University in 1967-68, and King Faisal University in 1979--have since been inaugurated.[8] Recently, when King Khalid visited Mecca in 1980, he decreed that a university called Umm Al-Qura University be established at Mecca.[9] By a subsequent decree, dated May 5, 1981, a budget of 432 million riyals (U.S.$123.4 million) for this new university was allocated, and since then the University has officially come into existence.

Aims of the Study

In the evolution of modern higher education in Saudi Arabia, the College of Education, Mecca, as one of the oldest colleges of education has, since its inauguration, been striving to improve its curricula and the quality of education for its alumni. In a society like the Saudi one, which is making an enormous effort to bring its population into the twentieth-century world of science and technology, Mecca College of Education is expected to provide at least adequately effective, if not excellent, teachers of science and mathematics.

This study is an attempt to evaluate, with a view to providing a measure of the quality and adequacy of the College's programs, the mathematics curriculum given at the College of Education, Mecca, from the perspective of the teachers who graduated from the College in the years 1976-1980. It is hoped that this examination of the program

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[8]Kingdom of Saudi Arabia, Ministry of Education, Educational Statistics, Vol. XII, pp. 20-21.

[9]Royal Decree No. 96, dated April 26, 1981.

by criteria consistent with established practices of educational evaluation will benefit both the College of Education and the College's mathematics program.

Under the largely centralized Saudi educational system, university education, including colleges of education, and the education for boys and girls, elementary through secondary, is planned, coordinated, and executed through different central agencies, namely, the Ministry of Higher Education, the Ministry of Education, and the General Presidency of Schools for Girls. Administratively and organizationally, the Mecca College of Education is not directly involved in the planning and development of school curricula. The lack of intimate involvement of the College in the programs at intermediate and secondary schools is further compounded by the fact that Mecca College of Education has its own departments of physics, mathematics, chemistry, biology, geography, English, physical education, curriculum and methods of teaching, art education, and education as integral parts of its management and control, and this invests the College with the responsibility of planning and implementing programs in these subjects for teachers who opt for teaching them at the intermediate and high school levels. In fact, this academic constitution of the College would appear to demand the closest possible relationships between the academic subjects taught at intermediate and high schools and those taught at the College of Education.

Until 1974-75, the department of mathematics used to function as a part of the physics department, but in 1975-76 an independent department of mathematics was created, invested with the full

responsibility to plan and administer courses in mathematics for teachers who intended to teach the subject in intermediate and high schools. The department of mathematics, it is hoped, may be better able to discharge its obligation to prepare teachers to teach mathematics effectively, consistent with the program objectives, if it could be provided with systematic feedback about the effectiveness of the program. The aim of this study is to obtain systematic feedback from the alumni of the College regarding its programs for preparing teachers of mathematics.

Need for the Study

Since the inception of the College of Education in 1950, no attempt has been made to evaluate its various programs. And the recent reorganization of the mathematics department into an independent part of the College, invested with the responsibility for designing and teaching programs for teachers of mathematics, makes the need for its programs to be consistent with enabling the teacher to be an effective teacher all the greater. It should, therefore, prove very useful to the department to evaluate its programs from the perspective of whether it is accomplishing its intended objectives.

Purposes of the Study

The purposes of this study are:

1. to gather systematic data on how well the program of mathematics at the College of Education, Mecca, appears to prepare teachers to teach, plan, and implement mathematics education;

2. to develop some initial means of involvement for graduate teachers of mathematics in the preparation of mathematics teachers at the College of Education, Mecca; and
3. to recommend remedies that may appear to be needed, and to point to what may appear to be the current strengths and weaknesses of the program.

An exploratory factor analysis revealed the existence of clusters of items among the attitude questions. Scales were constructed to answer the 12 research questions regarding the mathematics curriculum at the College of Education. Also, to test whether varying groups of subjects in the study responded differently to the questionnaire, the following research hypotheses were analyzed with an analysis of covariance.

Research Questions

1. Did the program enable student teachers to understand the objectives of teaching mathematics?
2. Did the program in mathematics at Mecca College of Education enable them to understand basic mathematics to teach mathematics?
3. Did the program prepare them for higher mathematics?
4. Did the program help them understand the relationships between the school and college curricula?
5. Did the program emphasize the practical, problem-solving nature of mathematics?
6. Did the program prepare the student teachers for teaching mathematics at school?

7. Did the program provide an adequate theoretical introduction to methods of teaching mathematics?
8. Did the program provide adequate student-teaching practice?
9. Did the program relate its teaching to the philosophical objectives of Saudi education?
10. Did the program adequately prepare student teachers to design curricula in mathematics?
11. Did courses in educational psychology at the College of Education help student teachers to teach mathematics better?
12. Did the program acquaint student teachers with the problems of teaching mathematics?

Study Hypotheses

The following eight hypotheses were tested in the study:

1. There is no significant difference in the evaluation of the mathematics curriculum of the College of Education by male and female respondents.
2. There is no significant difference in the evaluation of the mathematics curriculum given by the College of Education, Mecca, by respondents who graduated either with 40 or 60 credit hours in mathematics.
3. There is no significant interaction effect between the sex of the respondent and the type of graduation.
4. There is no significant difference in the evaluation of the mathematics curriculum of the Mecca College of Education by respondents who teach either at the junior or senior high level.

5. There is no significant interaction effect on the evaluation of the mathematics curriculum of the Mecca College of Education between sex of the respondent and the level at which the respondent teaches.
6. There is no significant difference in the evaluation of the mathematics curriculum of the College of Education by respondents with an 80 percent or less teaching responsibility in mathematics and those with a 100 percent teaching duty.
7. There is no significant interaction effect in the evaluation of the College of Education between the sex of the respondent and the percentage of mathematics teaching responsibility.
8. There is no significant difference in the evaluation of the mathematics curriculum by respondents who graduated in different years with mathematics as their specialty from the College of Education, Mecca.

Limitations of the Study

This study was delimited to the teachers of mathematics who graduated from the College of Education, Mecca, during the five academic years 1975-76 through 1979-80. It is recognized that this study suffered from weaknesses inherent in a questionnaire survey. Another limitation of this study was that the 12 foreign student teachers who graduated with mathematics as their main specialty could not be contacted for their feedback, but the rest of the population--that is,

116 graduate teachers--did return the completed questionnaires. In this sense, this study was based on the feedback of the entire population of graduates involved in teaching Mathematics in Saudi Arabia.

Procedure and Organization of the Study

The investigator used a questionnaire (Appendix A) as the primary instrument for the survey. The questionnaire is divided into five parts, consisting of the following categories:

Part I:	General Information	Questions 1-11
Part II:	Adequacy of Professional Courses to Prepare Teachers of Mathematics	Questions 12-26
Part III:	Adequacy of the Courses in Mathematics Given by the College of Education, Mecca, for Teaching Mathematics in Intermediate, Junior and Senior High Schools	Questions 27-48
Part IV:	Relatedness Between the School Mathematics Curriculum Needs and the Courses in Mathematics at the College of Education	Questions 49-52
Part V:	Recommendations	Questions 53-64

The questionnaire was administered to the teachers of mathematics who had graduated from the College of Education, Mecca, during the academic years 1975-76 through 1979-80, with either 40 or 60 credit hours in mathematics. Information supplied by the administration of the College of Education, Mecca, indicated that 128 student teachers had graduated from the College with mathematics as their teaching specialty. A further analysis of the list indicated that of the 128 graduates, 12 were non-Saudi students who had since returned to their

countries. Considering the relatively small number of graduates, the investigator decided to administer the questionnaire to the entire population of 116 Saudi graduate teachers. Fully completed returned questionnaires indicated 100 percent participation of the population. Detailed information about the population, the procedure followed, and the questionnaire is contained in Chapter IV.

As the main focus of this study was the mathematics program given by the College of Education, Mecca, Chapter II includes the relevant historical background on Saudi education in general and the College of Education in particular, with special emphasis on the College's mathematics program and the relationship with school education and the program of intermediate and high school mathematics.

Related research and publications in a wide variety of scholarship and research works are reviewed in Chapter III.

Presented in Chapter IV is a detailed discussion of the questionnaire, the selection of the population, the procedure followed to gather the data, and the method of analyzing the data.

The results of the survey and analysis of the data to test the formulated hypotheses are presented in Chapter V.

Chapter VI concludes the study with a summary of suggestions and recommendations for further study.

CHAPTER II

EDUCATION IN SAUDI ARABIA

The value of this study can be fully realized only in the context of the history, background, and commitment of Saudi education. The Ministry of Education of the Kingdom of Saudi Arabia has set forth a policy statement of the national educational objectives in the following terms:

> The educational policy is the broad lines on which rest the educational process in fulfilling the duty of acquainting the individual with his God and religion and adjusting his conduct in accordance with the teaching of religion, in fulfillment of the needs of society and in achievement of the nation's objectives. It covers the various fields and stages of education, the programs and the curricula, the means of education, the administrative systems, the organs in charge of education and all other related subjects.[1]

Although Saudi education must forge ahead in the world of science and technology, it must never sever its continuity with the past traditions and the moral teachings of Islam--a feature that is a special characteristic not only of Saudi education but also of the entire country. Yet, as Lipsky pointed out,

> Until twenty-five years ago formal education in Saudi Arabia was entirely in the Islamic tradition of religious and classical learning and was available only to a tiny segment of the

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[1] The Educational Policy in the Saudi Arabian Kingdom (Riyadh: Ministry of Education, 1974), p. 5.

> country's youth. Public education was nonexistent until the 1930's when, with Egyptian advice and personnel, a small government school system was established.[2]

Whatever education existed prior to 1925 was traditional and conducted in the Kuttab or Koranic elementary schools, situated near or in the mosque.

> The curriculum of the kuttab is based on memorization of the Koran, with secondary emphasis on reading and writing. The prestige attached to religious learning is reflected in a strong pressure upon the villager and urban dweller to see that his sons acquire at least some formal knowledge of the Koran. When a pupil is able to recite a certain number of verses, his parents may give a feast in his honor, and a boy who has memorized the entire Koran--a rare feat--is publicly honored in some places.[3]

The limitation of this education was further compounded by the fact that the Arabs were not masters of their own destiny. As Salim Fahd Al-Hamdan pointed out:

> The long rule of the Turks in the Arabian peninsula left nothing to show that they had paid attention to spreading of knowledge. A few primary schools were established, but few attended because the population was suspicious about Turkish as the language of instruction.[4]

After the Turkish yoke was overthrown in 1925, a General Directorate of Education was established that very year.[5] The year marks the

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[2]George A. Lipsky, Survey of World Cultures: For Saudi Arabia: Its People, Its Society, Its Culture, ed. Thomas Fitzsimmons (New Haven: Hraf Press, 1959), p. 277.

[3]Ibid., p. 278.

[4]Salim Fahd Al-Hamdan, "Educational System Charts of Saudi Arabia From 1952 to 1974 With Projections to 1985" (M.S. dissertation, University of Kansas, 1977), p. 5.

[5]Saudi Arabia, Ministry of Education, Primary Education Department, Primary Education Yesterday and Today (Beirut: Muassasat Manturah Liltiba'ah, 1969), p. 23.

beginning of the era of modern education in Saudi Arabia.

Yet,

> From 1926 to 1951, over 82 percent of the total class hours were spent on religious and Arabic language subjects. The other 18 percent were spent on history, geography, arithmetic and geometry. Since the educational system was imitative and narrow, those who could afford it sent their sons to other Arab countries, mostly to Egypt and Lebanon.[6]

In 1953, the Ministry of Education was established to meet the responsibility of developing education.[7] Mohammad Ali Hibshi pointed out that "some profound and significant educational developments took place in the period from 1925 til 1953, the year in which the General Directorate was replaced by the Ministry of Education."[8]

The main function of the Ministry of Education was, and has been, to plan, supervise, and coordinate education for kindergarten to secondary schools. Though a Sharia College, a college of Islamic law had been in existence since 1949, no real institution of higher education was established until 1957. Six new universities--the University of Riyadh (1957); Islamic University, Medina (1961); the University of Petroleum and Minerals, Dhahran (1963); King Abdul-Aziz University, Jeddah, Mecca, and Medina (1967); the Islamic University of Imam Muhammad Ibn Saud, Riyadh (1974); and King Faisal University,

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[6]Al-Hamdan, op. cit., p. 7.

[7]Royal Decree No. 5/3/26/4950, dated 4/1/1373 H.J.

[8]Muhammad Ali Hibshi, "Educational Development: Some Basic Considerations," in Saudi Arabia and Its Place in the World, ed. Dar Al-Shoroug (Jeddah: Ministry of Information, Kingdom of Saudi Arabia, 1981).

Dammam (1975)[9]--were created under the Ministry of Education. By 1975, university education had become so important that a separate Ministry of Higher Education was created that year to coordinate higher education with the active cooperation of the existing universities.[10]

In 1980, when King Khalid visited Mecca, he announced, in response to the demand by the population of the city, the creation of Umm Al-Qura University.[11] An allocation of 432 million riyals (U.S. $123 million) has already been made in the 1981 budget.[12] The Mecca College of Education and the Sharia College of Mecca that became part of King Abdul-Aziz University on its inauguration as the state university in 1971 have since the opening of Umm Al-Qura University been transferred to this new university since its inauguration in 1981. Indeed, the College of Education, the main focus of this study, had its first commencement under the affiliation of the University of Umm Al-Qura in 1981.[13]

Yet education in Saudi Arabia has experienced pressures from two diametrically opposite directions. In this connection, the

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[9]Kingdom of Saudi Arabia, Ministry of Education, Educational Statistics, Vol. 12 (1978-79), pp. 20-21.

[10]Kingdom of Saudi Arabia, Ministry of Education, Progress of Education in Saudi Arabia: A Statistical Review (Riyadh: Ministry of Education, 1979), p. 6.

[11]Royal Decree No. 96, dated April 26, 1981.

[12]Office of Admissions and Registration, Umm Al-Qura University, Commencement Issue (Mecca: 1980-81), p. 13.

[13]Ibid.

Secretary General of King Abdul-Aziz University pointed out that "there are, for instance, those who accept Western technology and thoughts without any questioning, and those who reject them off-hand."[14] But Hibshi pointed out,

> Within this context, given the policy of the Saudi authorities of bringing about desirable developments gradually and in a peaceful manner, much time and patience are necessary to arrive at a formula conducive to development, and acceptable to the Ulema [Islamic religious scholars], who have insight into the real spirit of Islam, without incorporating any of the extreme views mentioned above.[15]

In deference to the wishes of the Ulema, a royal decree in April 1955 ordered all Saudi primary, secondary, and university students back home from abroad, except those studying engineering, law, and medicine.[16] And within two years, when the authorities were able to satisfy those who objected to Saudi students' going abroad for higher education,

> a government scholarship program indicating considerable official approval of foreign study was announced. Under its terms, the Ministry of Education was to select and send qualified students abroad to study the arts, sciences and various professions. Upon the completion of their courses, the students were required either to work for the government for a period equal to that of the scholarship or to refund the amounts spent on them. The new program also provided for limited government assistance to Saudis studying abroad at their own expense.[17]

The trend has persisted since then, and in the 1970's, the universities of the world have seen the greatest influx of Saudi

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[14] Hibshi, op. cit., p. 128.

[15] Ibid.

[16] Lipsky, op. cit., p. 281.

[17] Ibid., p. 282.

students, specializing in subjects ranging from elementary education to nuclear physics. Although no reliable data are available on the exact number of Saudi students studying abroad, the Foreign Students Office of Michigan State University reported in the Fall 1980 Newsletter that the second highest number of foreign students registered for various courses at Michigan State University came from Saudi Arabia--to acquire expertise in various areas of educational endeavors, basically to man the institutions of learning.

Within Saudi Arabia itself, the expansion of education has been enormous. From 1960-61 to 1974-75, intermediate schools have multiplied from 57 for all-male schools to 647 schools for boys and girls--530 for boys and 117 for girls.[18] For the same years, secondary schools increased from 19 for all-male schools to 156 for boys and 26 for girls.[19] This expansion in education places the colleges of education in Saudi Arabia at the center of the educational scene, for schools become grounds for progress and preparation of technologists, scientists, administrators, sociologists, economists, and so on, and the responsibility of the college of education, in this context--to prepare teachers to man the ever-increasing educational complex--becomes all the greater. Since the main concern of this study is to evaluate the mathematics curriculum of the College of Education, Mecca, a detailed background and history of the College seems in order here.

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[18] Al- Hamdan, op. cit., p. 116.

[19] Ibid., p. 117.

The earliest institution of teacher education was founded in Mecca in 1952 as the College of Teacher Training.[20] It was renamed College of Education in 1962 and affiliated to King Abdul-Aziz University in 1971.[21] Mecca College of Education is a premiere teacher training institute in the country. It teaches courses leading to B.A. and B.S. degrees in education. Students earning these degrees must have a minimum of 130 credit hours, which are broken down in the following fasion:

Mandatory university courses	14 credits
Mandatory college of education courses	12 credits
Professional courses	32 credits
Courses in the subjects of teaching (A student can split these 60 hours into 40 for a major like mathematics and 20 for physics as his minor, if he chooses. Alternatively, he could take all 60 hours in mathematics alone.)	60 credits
Electives	12 credits
Total	130 credits

Besides these degrees, the College of Education awards a Special Diploma to those who earn 22 additional credits after meeting the requirements of 130 credit hours for the Bachelor's degree. Students pursuing their Master's degrees need only 20 credits after the completion of the Special Diploma requirement, or 42 credits after the Bachelor's degree. Such students qualify for a Master's in either

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[20] College of Education, Mecca, College of Education in 25 Years, 1952-76 (Mecca: College of Education Press, 1976), p. 21.

[21] King Abdul-Aziz University Catalog, 1979-80, p. 6.

Administration and Educational Planning, Curriculum and Teaching Methods, or Psychology.[22]

Since the College of Education started as an independent college, it has had departments of subjects that a teacher needs to specialize in to teach at intermediate and high schools, in addition to the departments of traditional education subjects. The College of Education is unique in the sense that in addition to the usual departments of education, the departments of geography, chemistry, physics, mathematics, biology, English, psychology, physical education, curriculum and methods of teaching, art education, and education form integral parts of the college. This process of having subject departments under one college of education is, in all likelihood, to continue. Until 1974-75, mathematics used to be a part of the Physics Department in the College of Education, but following that year it has been accorded an independent status and has since been charged with the responsibility of planning, developing, and implementing programs in mathematics for teaching of mathematics at intermediate and secondary schools of Saudi Arabia.

The objectives of the Department of Mathematics, as defined in the schedules of the College of Education, are:

1. to prepare teachers to teach mathematics,
2. to provide mathematics courses needed by other science graduate teachers,
3. to create specialization in mathematics to help interested teacher trainees proceed to qualify for teaching mathematics in colleges of education,

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[22]Ibid., pp. 100-132.

4. to conduct in-service refresher courses, and

5. to acquaint principals of elementary schools with the problems of teaching mathematics of grade-school children.[23]

To qualify as teachers of mathematics for Saudi Arabian schools, student teachers are required to have either 40 credit hours or 60 in mathematics. Those who qualify with 60 hours of credit in mathematics are referred to as pure mathematics teachers, and those who have 40 hours in mathematics are required to choose a minor subject, which in the case of mathematics student teachers is generally physics. Each of these categories of trainees must have 32 hours distributed over the study of the main specialty in the manner shown below:

Course #	Course Name	Credits
141	General Algebra	3
151	Logic and Set Theory	3
101	Calculus I	4
102	Calculus II	4
203	Calculus with Solid Geometry	4
211	Fundamentals of Analysis	4
241	Principles of Algebra	4
261	Principles of Geometry	3
490	Mathematics in Intermediate and High School	3
	Total	32 credits

Students wishing to qualify with 60 credits in mathematics are required additionally to have 28 hours of electives, which should include at least two of the following:

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[23]College of Education, Mecca, op. cit., p. 143.

Group I: Analysis

Group II: Algebra

Group III: Statistics and Probability

Group IV: Applied Mathematics

Mathematics teachers with 40 credits must take 8 elective credits over and above the 32 required. These additional 8 hours have to be in courses 300 and above. Most electives are chosen by both categories of graduates from the following offerings:[24]

Course #	Course Name	Credits
101	Calculus I	4
102	Calculus II	4
141	General Algebra	3
151	Logic and Set Theory	3
170	Mathematics for Physicists I	3
171	Mathematics for Physicists II	3
203	Calculus With Solid Geometry III	4
211	Introduction to Real Analysis	4
221	Electronic Programing	3
231	Principles of Statistics	3
241	Principles of Algebra	3
261	Principles of Geometry	3
272	Mathematics for Physicists III	2
290	Mathematics for Primary Schools	4
304	Ordinary Differential Equations	3
312	Real Analysis I	4
313	Introduction to Complex Analysis	3
321	Methods of Numerical Analysis and Programming	3

[24] King Abdul-Aziz University Catalog, op. cit., p. 159.

Course #	Course Name	Credits
322	Numerical Analysis	3
331	Introduction to Probability	3
332	Statistics I	3
333	Statistics II	3
341	Introduction to Number Theory	3
342	Linear Algebra I	3
343	Abstract Algebra I	3
362	Finite Geometry	3
370	Dynamics	3
371	Statistics	3
405	Partial Differential Equations	3
413	Real Analysis II	4
443	Linear Algebra II	3
444	Abstract Algebra II	3
452	Set Theory	3
461	Introduction to Topology	3
463	Algebraic Geometry	3
464	Differential Geometry	3
470	Physical Mathematics I	2
471	Physical Mathematics II	3
490	Mathematics for Intermediate and Secondary School	3
492	Selected Topics of Mathematics	1-3

To comprehend the relationship between the College of Education curriculum in mathematics and the mathematics curricula for intermediate and high schools of Saudi Arabia, we should understand the organization and constitution of intermediate and secondary education of the country.

The main central body responsible for the education of boys is the Ministry of Education:

> The Ministry of Education has the over all responsibility for the educational policy, curriculum and organisation of boys education below university level. It administers boys schools at the pre-primary, the first and the second levels of general and vocational education including the teacher training at the second level. Recently a post-secondary technical education institute and two centers for the training of mathematics and science teachers also beyond secondary stage have also been set up under the Ministry of Education. Education of the physically or mentally handicapped persons (both sexes) and the adult education are also the direct concern of the Ministry of Education.[25]

Besides, the Ministry of Education, since it replaced the Directorate General of Education in 1953, appoints teachers, develops curricula for various subjects and levels, allocates budgets, and provides for the training of teachers, among other things.

When the Directorate General of Education was created in 1925, its main concern was the education of boys only, and very little of education for girls was included in its provisions. When the Directorate was elevated to the status of a ministry, the practice of concentrating exclusively on the education of boys by the Ministry of Education was carried forward.

As late as 1960, many people held the view that modern education for women was "conducive to the degradation and immorality of women."[26] Indeed, until the end of the 1950s, women were allowed to take their primary, intermediate, or secondary examinations only externally, without the benefit of a formal education. Finally, the approval for education for women came "in 1959 when a royal speech

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[25]Kingdom of Saudi Arabia, Ministry of Education, Progress of Education in Saudi Arabia, op. cit., p. 6.

[26]Hibshi, op. cit., p. 124.

was delivered stating that it had been decided, upon the wishes of the Ulema, to open school for girls under the control of a committee to be responsible to the Mufti [the leader of the Ulema, the Islamic scholars]. In 1960 this committee was replaced by the General Presidency of Schools for Girls to supervise the education of women at all levels."[27] But by 1978-79, 394,478 girls were receiving free education from kindergarten to secondary in 1,829 well-equipped and well-staffed schools.[28]

> The General Presidency for Girls Education is responsible for the education of girls at all levels. The Presidency works in close co-operation with the Ministry of Education and adopts an identical programme of studies with only slight adaptations suited to the special interests of girls education. The vocational education for girls is at present limited to tailoring schools at intermediate level and teacher training schools at the secondary level. At the third level, the colleges of education for girls are supervised by the Presidency. Private schools for girls are also under its supervision.[29]

Despite the minor differences in the objectives of the Ministry of Education and the General Presidency of Schools for Girls, the syllabi and textbooks for all levels in academic subjects, such as physics, mathematics, chemistry, biology, social studies, geography, and history, are the same for boys and girls all through Saudi schools. Men and women graduates of mathematics from the College of Education, Mecca, are required to teach the same syllabi, whether they teach them in a girls' or boys' school.

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[27] Ibid.

[28] Kingdom of Saudi Arabia, Ministry of Education, Educational Statistics in the Kingdom of Saudi Arabia, 1978/79, p. 45.

[29] Kingdom of Saudi Arabia, Ministry of Education, Progress of Education in Saudi Arabia, op. cit., p. 6.

As the main focal point of attention of this study is the mathematics curricula both at intermediate and high schools in Saudi Arabia and at the College of Education, it seems in order to notice that the Curriculum Department of the Ministry of Education, which is responsible for curricula for boys' and girls' schools, recommended, through the Ministerial Decree No. 20/10/29/666/2, in 1973, that the National Committee for the implementation of programs in schools in Saudi Arabia introduce an experimental program in modern mathematics with effect from 1973-74. As an initial step the program was introduced in two Saudi schools: Faisal Secondary School, Riyadh, and Al-Jazira Secondary, also in Riyadh. Later, in 1975, the High Power Political Committee, which supervises the overall social and academic programs in the country, approved that the work must begin toward the implementation of the program of mathematics in all schools in Saudi Arabia. Following that approval, modern mathematics was introduced in King Abdul-Aziz Secondary School, Riyadh, in 1976-77. In 1980-81, all secondary schools in the four major cities--Riyadh, Jeddah, Mecca, and Dammam--were teaching modern mathematics. The High Power Political Committee has further ordered that the full implementation of the program of modern mathematics be completed between the years 1981 and 1989, all through the country. Work to meet this deadline has already begun. A proposed program in modern mathematics for the seventh grade has already been issued by the General Directorate of Research and Curriculum of the Ministry of Education, Riyadh.

With these recent innovations in the curricula of mathematics, the respondents were required to teach the following curricula at various levels from the intermediate to the high school level:[30]

7th Grade (Old):	1.	Algebra
	2.	Geometry
(New):	1.	Groups and Relations
	2.	Euclidian Geometry
	3.	Numbers
	4.	Analytical Geometry
8th Grade (Old):	1.	Algebra
	2.	Geometry
(New):	1.	Groups and Relations
	2.	Euclidian Geometry
	3.	Numbers
	4.	Analytical Geometry
	5.	Arithmetical Measurements
9th Grade (Old):	1.	Arithmetic
	2.	Algebra
	3.	Geometry
(New):	1.	Groups and Relations
	2.	Euclidian Geometry
	3.	Numbers
	4.	Analytical Geometry
	5.	Statistical and Probability Measurements
10th Grade (Old):	1.	Algebra
	2.	Geometry
(New):	1.	Rational and Real Numbers
	2.	Analytical Geometry
	3.	Equations
	4.	Trigonometry
	5.	Solid Geometry
11th Grade (Old):	1.	Algebra and Statistics
	2.	Geometry
	3.	Solid Geometry
	4.	Analytical Geometry and Trigonometry

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[30]Kingdom of Saudi Arabia, Ministry of Education, General Directory of Research and Curriculum (Riyadh: Ministry of Education, 1979).

(New):
1. Matrices
2. Groups
3. Analytical Geometry
4. Vector Analysis
5. Trigonometry
6. Complex Variables
7. Powers and Logarithms
8. Mathematical Deductions
9. Statistics and Probability

12th Grade (Old):
1. Algebra
2. Calculus
3. Analytical, Solid, and Trigonometric Geometry

(New):
1. Analytical Geometry
2. Functions
3. Series
4. Limits
5. Differentiation and Integration

In conclusion, this study seeks to evaluate the mathematics curriculum given by the College of Education, Mecca, with special reference to the curriculum in mathematics that Mecca College of Education graduate teachers are required to teach at intermediate and high schools in Saudi Arabia, from the perspective of whether the College curriculum prepares them adequately to teach mathematics effectively or not.

CHAPTER III

REVIEW OF THE LITERATURE

The purposes of this study, as stated in Chapter I, were to examine the mathematics curricula of the College of Education, Mecca, with a view to understanding how well they prepare the graduate teachers in mathematics to meet the challenges of their profession; to develop some initial means of involvement of such graduates, at least in the mathematics curricula of the College; and finally to identify some strengths and weaknesses of the program of the College of Education in order that some recommendations may be made. In pursuit of these objectives, an extensive search for the related literature through the scholarly publications in the areas of evaluation, teacher education, mathematics education, and education in Saudi Arabia was made. Although the search turned up illuminating material in most of the areas of concentration of this study, very little--indeed, none at all--was found with regard to evaluation of curricula in Saudi institutions of higher education. The latter fact is understandable in light of the fact that modern higher education in Saudi Arabia is still young. It is, however, hoped that the process of scientific evaluation of Saudi higher education will be initiated, in a humble way, by this study.

The context in which this study ought to be viewed is defined in the Recommendations of the Second World Conference of Muslim Education, held on March 15, 1980, under the auspices of King Abdul-Aziz University and Quaid-i-Azam University, and sponsored by the Ministry of Education, Government of Pakistan.

The curriculum recommended is classified into "perennial" and "acquired" categories of knowledge. The former comprises the knowledge of the Quran, the Hadith (the tradition of the Prophet), the life and character of the Prophet, his companions and their early followers, the Unity of God, fundamentals of Islamic jurisprudence, Quranic Arabic, Islamic metaphysics, comparative religion, and Islamic culture. The "acquired" category of knowledge, according to the document, consists of the humanities; social, natural, and applied sciences; and administrative disciplines.[1]

The Recommendations state that "the main job of educators and experts is to establish detailed links between Group-I (Perennial Knowledge) and Group-II (Acquired Knowledge) and then design the curriculum."[2] Furthermore, "all the above branches of acquired sciences should be taught from the Islamic point of view. Islamic schools of Thought should be established in all branches of social studies."[3]

It appears that Saudi education is founded irrevocably on the basic tenets of Islam and Islamic culture, so much so that the social

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[1] Recommendations of the Second World Conference on Muslim Education (Islamabad: Ministry of Education, Government of Pakistan, 1980), pp. 6-7.

[2] Ibid., p. 7.

[3] Ibid.

sciences and the humanities are viewed in the context of the fundamentals of Islam. To most people in the West, the cultural orientation of Islam is not only unfamiliar but it is, if not totally, largely confusing. A paper given at the Annual Meeting of the American Educational Research Association in 1980 by Paul Shaker pointed out that the need for multicultural education "arises from the persistent efforts of the government of Saudi Arabia to supplement the Arabian educational heritage with ideas and technology from America."[4] Shaker concluded:

> There does seem to be a valid multicultural road to educational development, however, which profits all parties concerned and denigrates none of them. An attitude of mutual respect and sharing is not platitudinous; it is the most effective guide to action. As collaboration goes on we must press our analyses to truly symbolic levels. Transfer on less profound planes [is] of use, but should not be programmed to the exclusion of values, attitudes, and unifying concepts.[5]

This very theme was rehearsed in another paper given a year earlier, in 1979, at the annual meeting of the same association, held in San Francisco, California:

> Western educators have a great deal to offer countries such as Saudi Arabia, both in person and through the training of students abroad. There is a need for the developing countries to be understood educationally as they are, with allowances made for cultural differences and limitations in resources. The people of such countries are ready to adopt, as their own, reforms which are designed with care and implemented with sensibility.[6]

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[4]Paul Shaker, "Curriculum Change in the Developing Country: The Case of Saudi Arabia" (paper presented at the Annual Meeting of the American Educational Research Association, Boston, Massachusetts, April 7-11, 1980), p. 2.

[5]Ibid., p. 17.

[6]A. El-Mahdi Abdel-Halim and Paul Shaker, "A Strategy for Promoting Educational Reform in Developing Countries" (paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, California, April 8-12, 1979), p. 18.

As a "trained student abroad," this researcher employed the techniques of evaluation with deep regard and respect for the fundamental values of Saudi culture to assess the curriculum of one of the fundamental subjects of modern technology.

A report published, under the auspices of UNESCO, by the State University of New York, Buffalo, Faculty of Educational Studies, stated that "there are concentrated efforts in Saudi Arabia to improve mathematics, science, and English language instruction, to upgrade the programs of the teacher training institutes, and to provide new schools for programs (such as commercial and agricultural education) which are in high demand."[7]

In an unpublished master's thesis entitled "Proposed Mathematics Curriculum for the Saudi Arabian Intermediate Schools," Al-Ajroush pointed out that the general feature of the mathematics curriculum at all levels of school education "is its narrow scope, consisting basically of three major topics, arithmetic, algebra, and geometry; it contains too much of Euclidian geometry and traditional algebra with no mention of any concepts and principles of modern mathematics, such as sets, mapping, logic, structure of the number system and probability theory."[8]

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[7]Taher A. Razik and Verna Willis, Comparative Analysis of Curriculum Change and Development in the Arab Countries: The Process (Buffalo: State University of New York, Faculty of Educational Studies, 1978), p. 246.

[8]Hamad Ali Al-Ajroush, "Proposed Mathematics Curriculum for the Saudi Arabian Intermediate Schools" (Master's thesis, The University of Wisconsin, 1976), p. 10.

As pointed out in Chapter II, new curricula in mathematics have already been introduced in the Saudi intermediate and high school programs of mathematics since 1979. This emphasis on mathematics in the educational curricula is due to the importance of mathematics in the industry- and technology-oriented societies of the world:

> When one is concerned only with the effect of mathematics on science, the farthest one can go, cognitively, in subordinating mathematics to science is suggested by the following simile. If science is viewed as an industrial establishment, then mathematics is an associated power plant which feeds a certain kind of indispensable energy into the establishment. The counterparts to mathematicians would be the designers, maintenance men, and administrators of the power plant. Of these, the majority need be interested only in the requirements of the power plant itself, and solely a minority need be aware of the actual workings of the establishment itself, let alone be expert in its activities.[9]

What has been hinted at in the preceding quotation regarding the wider implications of the study of mathematics was fully and expertly elaborated in a paper delivered at the Orono campus of the University of Maine in July 1973:

> There is a difference between the Art of Mathematics and the Craft of Mathematics. Only a few of us know the art of mathematics in much the same way as only a few individuals really know and possess the art of poetry. We know very little about how to teach the art but many of us can recognize it. This fact, however, does not relieve the teacher of the responsibility for fostering the art. On the other hand the craft of mathematics can be learned to greater or less degree by all of us. The patrons of our schools demand that the schools teach the craft of mathematics because it has an immediate use in the store and the bank. This does not mean that the people want the mathematics program limited to the craft of mathematics any more than they want the literature program limited to the reading of the newspaper. The craftsmanship aspects of each subject [are]

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[9]Salomon Bochner, The Role of Mathematics in the Rise of Science (Princeton: Princeton University Press, 1966), p. 47.

> taken as a lower bound of what the schools must do. In this the schools should not fail.[10]

Despite the emphasis on the craft of mathematics, the art aspect of mathematics as enunciated in the following statement from the report of the National Advisory Committee on Mathematical Education in the United States, 1975, has not been overlooked in the objectives of mathematics programs in Saudi intermediate and high schools:

> The report . . . indicates an urgent need for research into means of assessing the development of mental attitudes, accurate thought, heuristic procedures in problem-solving, of all these attainments of intelligence which ought to be considered by mathematical pedagogy as learning's final aims.[11]

In one of the most remarkable works by three English headmasters, entitled Teaching Mathematics, the authors, while lamenting the paucity of graduates in pure mathematics for teaching at schools, recommended the following training prerequisites for teacher graduates in mathematics:

1. The colleges must recruit a continual and adequate supply of entrants who have had a sound mathematical education while at school.
2. The mathematical departments of the colleges must devise an imaginative course which will increase the mathematical content of the students' knowledge. In some cases this will mean the introduction of new concepts of mathematics for the students, particularly for those who have learnt their mathematics in the rather arid traditional way. In any case, the course must include some modern mathematics.

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[10] H. Van Engen, "Fostering Mathematical Maturity in the Middle School Classroom" (paper presented at the Orono Conference of Maine University, Orono, July 16-20, 1973), p. 36.

[11] A. Z. Krygowska, "Mathematics Education at the First Level in Post-elementary and Secondary Schools," in New Trends in Mathematics Teaching, Vol. 4 (Paris: UNESCO, 1979), p. 38.

3. The mathematics departments in collaboration with the education department must devise interesting and realistic curriculum courses to show the students the most effective and up-to-date methods of teaching. It is essential that the students when they become teachers themselves are aware of the many developments that have been taking place and do not find refuge in using the methods by which they were taught themselves.

4. The colleges and the schools must come much closer together in the training of teachers. The art of teaching is learned in the classroom and it is in the classroom that exciting developments are taking place. It would seem to be a "sine qua non" that there should be a much greater exchange in teaching personnel between school and college and college and school than there is at present.[12]

As this study attempted to evaluate the mathematics curriculum of the College of Education, Mecca, from the perspective of graduate teachers of this College, it is interesting to note the following view expressed of the evaluation of curriculum:

> It is an illusion to think that one can evaluate a curriculum in any global sense. The curriculum does not exist globally; it exists only in the specifics of a particular instructional setting. Failure to appreciate what might be called the "situation-specific" nature of the curriculum may account for much of the current confusion about questions of evaluation. Attempts to ignore situational variation in curriculums usually lead to the search for a "least common denominator" to be evaluated, which can have constrictive effects on subsequent instruction.
>
> It does make sense, however, to talk about evaluating the activities and products of a given curriculum development project. This may seem like a small difference--between evaluating a curriculum and evaluating a project's work--but it is an important distinction to make. When one attempts to evaluate a "curriculum" per se, one tends to reify it and to lose sight of its situation-specific character. One begins to talk of its effectiveness--as though it had such a quality--and to set up studies to compare the effectiveness of various curriculums. Such studies inevitably encounter difficulties because they assume that curriculum

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[12] A. E. Howard, W. Farmer, and R. A. Blackman, Teaching Mathematics (London: Longmans, Green, & Co., Ltd., 1968), p. 39.

> effectiveness is a quality that can be measured by, say, a set of tests and examinations.[13]

Paul L. Dressel in his work, Handbook of Academic Evaluation, among various approaches to curriculum evaluation suggested:

> Another approach to evaluation of the curriculum might consider its quality--the extent to which it is current in offerings, content, bibliography, and instructional techniques and methodology. Adequacy of faculty preparation in relation to the courses taught is another criterion.[14]

Furthermore, "In this process of evaluation, the opinions of various groups may be sought. Students completing, entering, or considering a program may have views worthy of collection and consideration."[15] In this connection, Mattson added: "The survey of different methods of evaluation involving graduates of programs indicates that the most practical means of gathering data is through feedback from the graduates."[16]

The National Council for Accreditation of Teacher Education adopted the following professional-studies components for teacher education on May 6, 1977:

> Standard: The professional studies component of each curriculum for prospective teachers includes the study of the content to be taught to pupils, and the supplementary knowledge, from the subject matter of the teaching specialty and from allied fields,

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[13]Jeremy Kilpatrick, "Methods and Results of Evaluation With Respect to Mathematics Education," in New Trends in Mathematics Teaching, Vol. 4 (Paris: UNESCO, 1979), p. 169.

[14]Paul L. Dressel, Handbook of Academic Evaluation (San Francisco: Jossey-Bass, Inc., 1976), p. 314.

[15]Ibid., p. 315.

[16]R. Mattson, "An Evaluation of Teacher Educator Program at Montana State University by Graduates of That Program" (Ph.D. dissertation, Montana State University, 1972), p. 33.

that is needed by the teacher for perspective and flexibility in teaching.

Standard: The professional studies component of each curriculum includes the systematic study of teaching and learning theory with appropriate laboratory and clinical experience.

Practicum:

Standard: The professional studies component of each curriculum for prospective teachers includes direct, substantial, quality participation in teaching over an extended period of time in an elementary or secondary school. This practicum should be under the supervision of college personnel who are experienced in, and have continuing experience with, elementary or secondary teaching, and certified, experienced personnel from the cooperating school. Explicit criteria are established and applied for the selection of school supervisors and for the assignment of college personnel.[17]

During the last decade an enormous amount of research regarding teacher education has emerged. Myer and Reid concluded that because of the failure of the teacher education institutions, "few teachers regard their experience with the faculty of an education or teachers' college with such nostalgia or respect."[18] Ruth Lambert, on the other hand, suggested that the development of the basic skills and critical evaluation "will lead to the continual self-evaluation after the period of formal education is finished."[19]

In the 1960s, six California professors concluded, with regard to the quality of teacher training in California, that "the preparation

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[17]National Council for Accreditation of Teacher Education, Standards for Accreditation of Teacher Education (Washington, D.C.: NCATE, 1977), pp. 3-6.

[18]Douglas Myers and Fran Reid, Educating Teachers: Critiques and Proposals (Ontario: The Ontario Institute for Studies in Education, 1974), p. 3.

[19]Ruth L. Lambert, "An Investigation of Attitudes of Selected Recent Graduates in Teacher Education Toward Their Education Preparation for Teaching at the University of Arkansas at Pine Bluff" (Ph.D. dissertation, Michigan State University, 1977), p. 83.

of good teachers is the function of college or university as a whole."[20] Furthermore, they asserted: "We believe uncompromisingly in the critical importance of preparation in subject matter to provide an essential part of the equipment of all teachers."[21]

Cornish arrived at the following strikingly similar recommendations for improving pre-service teacher education programs to the ones this investigator has made:

1. Promote an effective student teaching program.
2. Provide opportunities for classroom observation.
3. Offer a broad liberal arts education.
4. Obtain qualified instructors.
5. Make adequate facilities available.
6. Insure good student-faculty relationships.
7. Maintain a balance in teaching between theory and its practical application.
8. Provide some separate instruction for primary and intermediate grade teachers.
9. Offer a variety of courses in education.[22]

With regard to educational trends in South-East Asia, Paul Chang pointed out that "if the quality of teacher training in the region is to be raised, it is essential that universities should provide effective leadership."[23]

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[20]Ernest L. Boyer, "Campus-Wide Perception of Teachers: An Exercise in Collaboration," The Journal of Teacher Education 21 (September 1965): 271-74.

[21]Ibid.

[22]Robert J. Cornish, "Improving Undergraduate Elementary Training Programs," University of Kansas Bulletin of Education 17 (May 1963): 103.

[23]Paul Chang, "Educational Trends in South-East Asia With Special Reference to Problems of Improving the Quality of Education," International Review of Education Journal 17 (1971-72): 150-63.

Pas G. Ramos, a researcher at the University of the Philippines, recommended ways of making graduate teachers more effective by using continuous reassessment by the college of education:

> One such systematic appraisal of our college is the Self-Study Evaluation. Specifically, the Self-Study Evaluation project aims to find out how the College can make its faculty and programs more relevant to, and consistent with, the significant developments in the New Society.[24]

During the last two decades, the Arab Organization for Education, Culture, and Science has been paying special attention to teacher preparation. The Conference on the Preparation of Arab Teachers, held in Cairo on January 17, 1972, recommended that teacher preparation should consist of the following essential components:

i. general education dealing with the Arab world in particular and contemporary global issues in addition to other subjects;
ii. major fields of specialization in a number of allied educational disciplines;
iii. education fields as theoretical studies in education such as educational psychology, counseling, educational administration, teaching methodology, and supervised student teaching; and
iv. practicum programs where the student teachers focus on the application of the theoretical preparation to practical problems in pedagogy.[25]

The Conference further suggested:

> The academic part of teacher education is not only intended to fill in the teacher in his major subject, but it should also be designed as to train him to continuously acquire

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[24]Pas G. Ramos, "The College of Education and the New Education Reforms," Education Quarterly [College of Education, University of the Philippines] 20 (January-March 1974): 18-30.

[25]Arab Organization for Education, Culture, and Science, Department of Education, A Conference on Preparing Arab Teachers, From January 8 to 17, 1972 (Cairo: Al-Takadom Press, 1973), p. 23.

> knowledge in his major field. A teacher in a rapidly changing world should face children with up-to-date knowledge in his subject.[26]

A resolution to improve the teacher education programs in Arab countries, adopted by the cultural wing of the Arab League Secretariate, recommended:

> It is important to carry out a follow-up study of graduate teachers from colleges and institutions by observing them directly at work, by evaluating their cultural impact on the community at large. . . . The ultimate objective is to improve the existing standards of teaching by staffing the faculty with well-qualified teachers.[27]

Al-Roushad and Abdulatif, in a paper presented at the First International Conference on Islamic Education, stated:

> It is vitally important for the Education Colleges and the Ministry of Education to jointly follow up their university graduates. This follow-up activity can be conducted in various ways such as:
>
> 1. to establish a sub-office to follow up the university graduates in every college. This sub-office will supply the graduates with the documentation and literature necessary for their professions.
> 2. to set up a seminar for graduates in each college annually: the graduates will select the agenda for each seminar by themselves.
> 3. every college of education should seek the help of its graduates in conducting various research studies, especially field researches.[28]

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[26]Ibid., p. 129.

[27]Arab League, General Secretariate, Cultural Department, Collection of the Arab League Council Resolutions on Cultural Affairs to be executed by the Arab countries, 1946-66). (Typewritten.)

[28]Mohammad Al-Roushad and Ahmad Abdulatif, "The Colleges of Education's Role in Teacher Preparation" (paper presented at the First International Conference on Islamic Education, March 31-April 7, 1977) (Jeddah: King Abdul-Aziz University Press, 1977), p. 15.

With regard to the evaluation of the teacher preparation programs offered by teacher education institutions at various levels, the Conference recommended the following:

A. There is a need for continuous review and evaluation of programs and techniques of preparing teachers in order to meet the demands of development in Arab societies and to improve the existing programs and techniques.
B. Evaluation should include all aspects of educational process such as planning, curriculum development, preparation of textbooks, and the development of faculties for teacher preparation. For this kind of evaluation the staff should be specialized in its techniques.
C. This Organization the Arab League will facilitate regular contacts among the representatives of Arab countries for study and exchange of experiences in regard to teacher preparation.
D. The follow-up of teacher gradutes from colleges and institutions of education should be through visits, meetings, and questionnaires that should be answered by the graduates, institution directors, teacher educators in order to improve teacher education programs and to help improve the efficiency of graduate teachers.[29]

Studies regarding the adequacy of professional courses in education in the United States indicate a sharply divided opinion. Some studies deplore the total ineffectiveness of the professional courses in content, organization, and instructional techniques, whereas others favor strongly their inclusion in the teacher preparation programs.

Lemons, a critic of education courses, concluded that "there is a distressing gap between what is taught in the education courses and the real world of teaching. There is unnecessary overlapping and duplication."[30]

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[29]Arab Organization for Education, Culture, and Science, op. cit., p. 27.

[30]Lawrence A. Lemons, "Education Courses," NEA Journal 54 (October 1965): 26-27.

Peter Renshow asserted that the "relationship between academic and professional studies is extremely tenuous."[31] Based on his study of the effect of secondary education courses on student attitudes, Hansen concluded:

> Individual courses do not appear to produce immediate attitudinal change; courses that deal with specific areas, such as psychology, may not contribute to attitude change in areas unrelated to the specific course content.[32]

Walter Borg, too, appeared to have reached similar conclusions, as is evident in the following remark:

> There appeared to be two important deficiencies in the typical methods course. One was that these courses tended to deal with generalities rather than identifying specific behaviors that teachers could employ to bring about specific outcomes. The second deficiency was that most of the courses were taught primarily using lecture and discussion techniques.[33]

Graff's study indicated that the "courses judged to be of little or no value were History of Education and Philosophy of Education."[34]

Goodlad came up with almost an identical conclusion:

> When the first course in education is a general "eclectic" introduction to teaching or a so-called "social foundations" course, it is almost universally disliked by students. . . .

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[31]Tyrell Burgess et al., Dear Lord James: A Critique of Teacher Education (England: Penguin Books, Ltd., 1971), p. 87.

[32]Thomas Charles Hansen, "An Evaluative Study of the Effect of Secondary Teacher Education Courses on Student Attitudes," Dissertation Abstracts 37, 1-2 (1976): 234-A.

[33]Walter R. Borg, Moving Toward Effective Teacher Education--One Man's Perspective (Logan: Utah State University Press, 1975), p. 7.

[34]Paul Graff, "Follow-Up Study of Graduates and Their Opinions of the Secondary Teacher Education Program of the University of Iowa, 1970-76" (Ph.D. dissertation, University of Iowa, 1976), p. 184.

> It seems that the first course is a troublesome one, no matter what its substance.[35]

Nash and others proposed a solution to the unpopularity and inadequacy of the foundational courses in the following recommendation:

> Foundational studies will justify their place in teacher training programs when they are vigorously cross-disciplinary; when they are unifying in terms of fostering composite models of human behavior, needs, motivation, and learning; when they are as concerned with exploring, and helping people to develop workable theories as they have traditionally been with building esoteric theories that too often are merely espoused but not practiced; when they can provide more vital and provocative explanatory constructs, as well as a variety of experimental efforts to demonstrate the tactical implications of those constructs; when they become more "full-bodied," as concerned with the personal meaning of information as they are with intellectual inquiry and analysis; and when they abdicate their historical disengagement from the affairs of the socio-political/educational world and begin to advocate a larger, normative social vision.[36]

Ralph Preston surveyed the attitudes of 108 out of 175 graduates from the school of education in an eastern university, regarding the education and academic courses, and reached an interesting conclusion based on the survey:

> Most students did not label all education courses as inferior, only a minority of education courses were judged to be inferior. Moreover, in answer to the question "Do you believe you could teach as well without any courses in Education as with them?" 82 percent responded with "No," 12 percent with "Yes," and 6 percent "undecided."[37]

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[35]John I. Goodlad, "An Analysis of Professional Laboratory Experience in the Education of Teachers," The Journal of Teacher Education 16 (September 1965): 363-70.

[36]Robert J. Nash and others, "The Foundations of Education: A Suicidal Syndrome?" Teacher College Record 92 (February 1977): 299-310.

[37]Ralph C. Preston, "Education Graduates View Education and Academic Courses," School and Society 92 (Summer 1964): 233-37.

Hardingham reported that "most of them [student teachers] consider formal college courses a necessity in the preparation program."[38]

Bruce Joyce and others concluded that "between 1973 and 1975 more professional courses were added than dropped and clinical experience has been added steadily over the last several years."[39]

The following represents a typical evaluation of teacher education in Asia:

1. The contents of the science and the mathematics courses are mostly descriptive in nature and somewhat disconnected. Outdated materials are sometimes included.
2. There are unnecessary duplications in the contents of some professional courses.
3. In many courses, the content outlines consist of lists of topics taken directly from textbooks, and seem to have very little relationship to the main objectives--the courses of study. Most of the science curriculums give emphasis to development of the scientific attitude and the scientific methods in solving problems as part of the objectives; the general practice, however, seems to deviate from these important aims.
4. The curriculums are mostly prescribed and crowded with too many requirements. Individual planning with each student is almost non-existent. Each quarter a student is required to take 20-28 credits for undergraduate level and 15-18 credits for graduate level. Individual work or independent study is rather limited since students spend almost all of their time during a week in listening to lectures.
5. Facilities for the teaching-learning process are inadequate. Owing to limited budgets, textbooks, laboratory apparatus and teaching aids are not sufficient in most schools.
6. Thai textbooks are very limited in number. Most of good textbooks are in English and are not much used because of the language barrier.

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[38]Robert J. Hardingham, "The Cooperating School in Teacher Education: Source of Theory or Practice?" Technical Report No. 13 (Iowa University, June 1977), p. 2. ERIC ED 147 101.

[39]Bruce R. Joyce and others, "Preservice Teacher Education" (Washington, D.C.: Office of Education, Department of Health, Education and Welfare, 1977), p. 21. ERIC ED 146 120.

7. The shortage of qualified instructors in specialized fields, especially in the sciences, mathematics, and languages is a serious problem.
8. In most institutions instruction is mainly by the lecture method. Facts and concepts are usually verbally explained. The inquiry method and active participation on the part of students are seldom used in general learning situations.
9. Generally speaking, students entering teacher training institutions are not among the best ones. This usually is the main problem in upgrading the programs.
10. The upsurge of students in evening classes in various institutions increases the teaching loads of instructors. It does not permit them enough time for thorough preparation of their lessons, trial of new techniques, or careful evaluation of their own work and students' achievement.
11. Continuity from one level to another seems to be lacking in many of the programs. In some programs integration between formal course work and practical work is to be desired.[40]

The problem with regard to teacher education in Arab countries is summed up in a paper given by Al-Roushad and Abdulatif at the Conference on Islamic Education held in Saudi Arabia in April 1977:

> It is noticeable that the programs of the colleges of education are so overloaded that the situation makes students suffer and complain. This situation is due to the constant competition among the subject teachers and teacher educators; each group thinks that their field of work is the only core of teacher preparation. We believe, therefore, that the time has come when a balance among the three essential cores of teacher preparation must be initiated: (1) preparation in general education subjects; (2) preparation in a specialized field; and (3) professional preparation-training.[41]

Although these studies throw a flood of light on teacher preparation in general, none of the studies has examined a specific

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[40] De Lamiama Saradatta and Poj Sapianchaiy, "Curriculum Evaluation in Teacher Education in Thailand" (paper presented at the Conference on Curriculum Evaluation Teacher Education in S.E. Asia Organized by the Internal Council on Education for Teaching [ICET] and the Faculty of Education, University of Malaya [FEUM], August 3-7, 1970) (Malaysia: Malaya Publishing & Printing Co., 1970), pp. 87-88.

[41] Al-Roushad and Abdulatif, op. cit., p. 15.

curriculum in depth as does this study. The reason for this lack of scholarly interest in subject curricula is to be found in the fact that most colleges of education do not treat the teaching of such academic subjects as mathematics, physics, chemistry, biology, psychology, literature, etc., as one of their immediate and primary concerns. But the institution of the King Abdul-Aziz College of Education provides an excellent opportunity for a study of subject curricula, designed and executed by the College itself.

CHAPTER IV

PROCEDURE AND METHODOLOGY

This survey research attempted to evaluate the mathematics curriculum given by the College of Education, Mecca, for teachers intending to teach mathematics in the intermediate and high-school systems of Saudi Arabia from the perspective of teachers who were graduated from the College of Education with mathematics as their specialty.

The study employed a combination of largely statistical and, in part, descriptive methods to analyze the data collected from the research questionnaire. Presented in this chapter, therefore, are the research questions and hypotheses, a description of the population, the sample used and the research questionnaire--its validity and reliability, the details of the procedure adopted to gather the data, and the techniques and procedures used for data analysis, the details of which are presented at greater length in the following chapter.

Based on the clusters of attitude questions, determined by an exploratory analysis and checked for reliability, scales were constructed to answer the following 12 research questions and test the following research hypotheses:

Research Questions

1. Did the program enable student teachers to understand the objectives of teaching mathematics?

2. Did the program in mathematics at Mecca College of Education enable them to understand basic mathematics to teach mathematics?
3. Did the program prepare them for higher mathematics?
4. Did the program help them understand the relationships between the school and college curricula?
5. Did the program emphasize the practical, problem-solving nature of mathematics?
6. Did the program prepare the student teachers for teaching mathematics at school?
7. Did the program provide an adequate theoretical introduction to methods of teaching mathematics?
8. Did the program provide adequate student-teaching practice?
9. Did the program relate its teaching to the philosophical objectives of Saudi education?
10. Did the program adequately prepare student teachers to design curricula in mathematics?
11. Did courses in educational psychology at the College of Education help student teachers to teach mathematics better?
12. Did the program acquaint student teachers with the problems of teaching mathematics?

Research Hypotheses

The following eight null hypotheses were tested:

1. There is no significant difference in the evaluation of the mathematics curriculum of the College of Education by male and female respondents.
2. There is no significant difference in the evaluation of the mathematics curriculum given by the College of Education, Mecca, by respondents who graduated either with 40 or 60 credit hours in mathematics.
3. There is no significant interaction effect between the sex of the respondent and the type of graduation.
4. There is no significant difference in the evaluation of the mathematics curriculum of the Mecca College of Education by respondents who teach either at the junior or senior high level.
5. There is no significant interaction effect on the evaluation of the mathematics curriculum of the Mecca College of Education between sex of the respondent and the level at which the respondent teaches.
6. There is no significant difference in the evaluation of the mathematics curriculum of the College of Education by respondents with an 80 percent or less teaching responsibility in mathematics and those with a 100 percent teaching duty.
7. There is no significant interaction effect in the evaluation of the College of Education between the sex of the respondent and the percentage of mathematics teaching responsibility.

8. There is no significant difference in the evaluation of the mathematics curriculum by respondents who graduated in different years with mathematics as their specialty from the College of Education, Mecca.

Population of the Study

The population of this study comprised teachers who were graduated from the College of Education, Mecca, in the years 1975-76 to 1979-80 with mathematics as their specialty to teach mathematics in the intermediate and high-school systems in Saudi Arabia.

The College of Education prepares two categories of mathematics teachers--those who have 40 credit hours in mathematics and 20 in a minor specialty, mostly physics, and those who take 60 hours in mathematics. For the purpose of this study, both categories of graduates were included in the population.

The administration of the College of Education, Mecca, supplied the researcher with the numbers, names, and sex of the graduate population for each of the five years separately. It was found that 128 graduate teachers had completed their degree courses as mathematics teachers either with 40 or 60 hours in mathematics. Furthermore, a close inspection of the information collected from the administration revealed that of the total population of 128, 12 were non-Saudi students who had since gone back to their countries, presumably to teach. As the accessible population turned out to be relatively small, it was decided to administer the questionnaire to the entire population of 116 who could easily be reached. As Table 1 clarifies, all

Table 1.--Mathematics graduates of Mecca College of Education, 1976 through 1980.

Year	40-hr. Math/20-hr. Physics Curriculum				60-hr. Math Curriculum				Total	
	Male		Female		Male		Female			
	Total Grad.[a]	Total Resp.[b]	Total Grad.	Total Resp.	Total Grad.	Total Resp.	Total Grad.	Total Resp.	Total Grad.	Total Resp.
1975/76	16	15	--	--	--	--	--	--	16	15
1976/77	23	22	--	--	--	--	--	--	23	22
1977/78	13	12	4	3	5	5	9	9	31	29
1978/79	4	3	8	6	6	6	7	7	25	22
1979/80	8	7	7	6	8	6	10	9	33	28
Total	64	59	19	15	19	17	26	25	128	116

[a]Total graduated.

[b]Total responded.

respondents returned the completed questionnaires. It may well be assumed that this study was based on a 100 percent participation of the population.

The Survey Instrument

A research questionnaire was developed for the purpose of collecting research data. The development of the questionnaire involved several steps. First, a comprehensive review of the literature related to educational evaluation was undertaken to acquire a sound background and knowledge in the construction of a questionnaire relevant to the study. Second, based on the knowledge and background acquired, factors involved in the evaluation of the mathematics curriculum taught by the College of Education, Mecca, vis-à-vis effective mathematics teaching in intermediate and high schools of Saudi Arabia were identified to construct the questionnaire based on them. Third, the questionnaire was presented for review to the researcher's doctoral committee, and in light of their comments and suggestions, the questionnaire was revised and improved. Fourth, the approved and revised version was typed and made ready for administration to the population, and finally, the researcher had the questionnaire translated into Arabic by a qualified translator. The accuracy of the translation was certified by A. Eldamatty. (See Appendix A.)

The questionnaire is divided into five parts and has a total of 64 items, including Item 64 for subjective comments. The first part of the questionnaire contains 11 items concerning such variables as the respondent's sex, year of graduation, credit hours in

mathematics, the grade point average for the entire degree course as well as in mathematics, part- or full-time teaching responsibility in mathematics, the level at which the respondents were teaching, and the percentage of teaching responsibility devoted to mathematics. These variables formed bases for the eight hypotheses and the relationship of the independent variables to the dependent ones.

The second part of the questionnaire contains 15 items, intended to evaluate the adequacy of the professional courses that every graduate is required to take. It employs a scale of one to five, ranging from very positive to totally negative. In preparing this part of the questionnaire, care was exercised that every relevant course taken by the teachers was listed for graduates' evaluation.

The third part consists of 22 items on the adequacy of the courses in mathematics given by the College of Education for teachers of mathematics at intermediate and high schools. Items 27 and 28 direct the respondents to evaluate concept-development and objectives-awareness-development capability of the mathematics curriculum of the College of Education. Items 29 through 36 seek to evaluate the individual items in the mathematics curriculum as they relate to their capability to enhance the teacher's ability to teach school mathematics.

Items 37 through 41 relate to the objectives of the mathematics curriculum, as stated by the Department of Mathematics of the College of Education, Mecca, and seek to elicit the respondents' views of whether those objectives are accomplished by the course.

Items 42 through 48 seek answers to the questions of whether research opportunities in curriculum planning, evaluation of courses, and so on, were or were not available.

The fourth part of the questionnaire contains four items, 49 through 52, regarding the relationship between the College of Education mathematics curriculum and the curricula at intermediate and high schools.

The fifth part, containing Items 53 through 64, presents recommendations that the respondents are directed to evaluate on a scale of one to five, ranging from very positive to totally negative. Also, this part includes Item 64, which makes it possible for the respondents to write in their subjective suggestions for the improvement of the mathematics curriculum of the College of Education.

Validity of the Research Instrument

Assuming that the validity of an instrument consists of its ability to measure what it set out to measure, the researcher took the following steps to insure the validity of the instrument. First, before and during the development of the questionnaire, the most reliable current publications on the validity of survey instruments were extensively consulted by the researcher. Second, members of the researcher's doctoral committee were constantly sought for advice all through the process of development of the instrument. Third, a tentative draft of the questionnaire was submitted to some English-speaking graduate students at Michigan State University for their comments. Fourth, the revised instrument, in light of the valuable

suggestions and comments emanating from step 3, was administered, at different times, to different groups of Saudi and non-Saudi students studying at Michigan State University. It was observed that the test respondents experienced no difficulty with regard to the language and meaning of the items. Fifth, the process was repeated with the Arabic translation of the questionnaire in Saudi Arabia, before the questionnaires were distributed to the population. Sixth, based on the comments by the members of the researcher's doctoral committee and the graduate students to whom the questionnaire was submitted for review and on the observation of the results of the various administrations to ensure the validity of the instrument, the researcher revised the questionnaire thoroughly to meet the standards of clarity and accuracy. Whereas no statistical tests were performed to test the validity of the instrument, content validity was assumed to exist after these extensive review procedures. In the final version, the instrument was submitted to ten graduate students (five males and five females) at King Abdul-Aziz University for their approval. On their approval, the questionnaire was administered to the population.

Reliability of the Research Instrument

Reliability is defined as obtaining the same result again if the instrument is administered to the same population on two different occasions. Validity and reliability are closely related: validity cannot rise above a certain point if the measure is inconsistent to some degree.

To determine the reliability of the questionnaire by the method of internal consistency of items, the instrument was divided

into 11 subscales. The variables with a factor loading of ± .40 and those that appeared to have a logical relation with the other variables of the set were used to compute Cronbach's Alpha and Standard Item Alpha of reliability, based on the Statistical Package for the Social Sciences reliability program. The following coefficients of reliability were obtained for the clusters of responses listed for each scale in Table 2.

Table 2.--Subscales, clusters, and coefficients of reliability.

Scale	Clusters	Coefficient of Reliability
Understanding the objectives of teaching mathematics	A28,A39,A40,A41, A43,A45,A48,A49	.80
Understanding basic mathematics to teach mathematics	A27,A29,A30,A31, A32,A33,A35	.80
Preparation for higher mathematics	A37,A38,A42, A44,A47	.72
College-school relations	A53,A54,A56,A58	.67
Emphasis on practical problems	A55,A60,A61	.64
Preparation for school teaching	A36,A38,A50,A51,A52	.65
Methods of teaching mathematics	A19,A25	.77
Student teaching	A18,A20,A26	.59
Educational thought	A12,A13,A14	.64
Educational psychology	A12,A16,A23	.54
Problems of teaching mathematics	A44,A45,A46	.65

Table 2 indicates that there was a high correlation among the responses of the population to questions that have close logical

relationships among one another. One can conclude, based on these results of the internal reliability of items, that the research questionnaire has an acceptable level of reliability for the purposes of this study.

Data Collection

The registrar's office of the College of Education supplied the researcher with a list of teachers who had been graduated with mathematics as their main teaching specialty in the years 1975-76 through 1979-80.

Then the Ministry of Education and the General Presidency of Schools for Girls, Saudi Arabia, were contacted for information regarding the current location of the male and female graduate teachers who had earned their degrees as mathematics teachers from the College of Education in the years 1976 through 1980.

Male Graduate Teachers

The researcher was able to contact each individual male teacher and deliver the questionnaire personally. In most cases, he was able to collect the completed questionnaire personally, and when, for reasons of logistics, the completed questionnaire could not be collected personally, the individual divisional offices concerned undertook to collect the teachers' sealed responses and deliver them to the researcher.

Female Graduate Teachers

In the case of female graduates, the General Presidency of Schools for Girls, which oversees the education of females from

the elementary to the university level, made available the services of one of its representative female assistants to help locate the 40 female graduates, deliver the questionnaires, and collect the completed sealed responses from the entire female population.

Graduates Studying Abroad

It was found that four members of the population had proceeded abroad for higher degrees in education. The questionnaires were mailed to each one of them, after ascertaining their addresses. Within a short time, all of them returned the completed questionnaires to the researcher. Thus, 100 percent participation of the population was achieved for the purposes of this study.

Data Analysis

The responses were coded and the results keypunched for computer processing. The Statistical Package for the Social Sciences (SPSS)[1] was used for various computational procedures employed.

Besides simple frequencies, an exploratory factor analysis was undertaken to determine the existence of any clusters of items among the attitude questions asked. Clusters found were used to construct scales to answer the 12 research questions regarding the quality of the mathematics program at the College of Education, Mecca. After a reliability check of the scales was performed, the scales were used to test the research hypotheses based on the analysis of covariance.

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[1]Norman Nie, H. Hull, C. Hadulai, Jean G. Jenkins, Karin Steinbrenner, and Dale Bent, Statistical Package for the Social Sciences (New York: McGraw-Hill Book Co., 1975).

Summary

This chapter contained a discussion of the procedure and methodology used to evaluate the curriculum of mathematics given by the College of Education, Mecca, for teachers of mathematics at intermediate and high schools of Saudi Arabia, from the perspective of the mathematics graduate of the College of Education. In addition, 12 research questions were identified, which the researcher sought to answer, and eight research hypotheses were stated, which the investigator attempted to test. Described in detail were the population for the study, the sample who responded to the questionnaire, which in itself was fully analytically described, how the respondents were located, and the procedures adopted to administer and analyze the data.

CHAPTER V

ANALYSIS AND INTERPRETATION OF THE DATA

The purpose of this chapter is to analyze and interpret the data derived from the responses of teachers who graduated from the College of Education, Mecca, with mathematics as their teaching specialty, in the years 1975-76 through 1979-80. A simple frequency analysis of the responses of the population to the questions contained in the questionnaire (see Appendix A) and an exploratory factor analysis, with a factor loading of ± .40 and higher, were used to test the following eight research hypotheses:

1. There is no significant difference in the evaluation of the mathematics curriculum of the College of Education by male and female respondents.
2. There is no significant difference in the evaluation of the mathematics curriculum given by the College of Education, Mecca, by respondents who graduated either with 40 or 60 credit hours in mathematics.
3. There is no significant interaction effect between the sex of the respondent and the type of graduation.
4. There is no significant difference in the evaluation of the mathematics curriculum of the Mecca College of Education by respondents who teach either at the junior or senior high level.

5. There is no significant interaction effect on the evaluation of the mathematics curriculum of the Mecca College of Education between sex of the respondent and the level at which the respondent teaches.
6. There is no significant difference in the evaluation of the mathematics curriculum of the College of Education by respondents with an 80 percent or less teaching responsibility in mathematics and those with a 100 percent teaching duty.
7. There is no significant interaction effect in the evaluation of the College of Education between the sex of the respondent and the percentage of mathematics teaching responsibility.
8. There is no significant difference in the evaluation of the mathematics curriculum by respondents who graduated in different years with mathematics as their specialty from the College of Education, Mecca.

Factor analysis was used to determine groups of variables with a common factor to explore the following 12 research questions regarding the mathematics curriculum of the College of Education, Mecca:

1. Did the program enable student teachers to understand the objectives of teaching mathematics?
2. Did the program in mathematics at Mecca College of Education enable them to understand basic mathematics to teach mathematics?

3. Did the program prepare them for higher mathematics?
4. Did the program help them understand the relationships between the school and college curricula?
5. Did the program emphasize the practical, problem-solving nature of mathematics?
6. Did the program prepare the student teachers for teaching mathematics at school?
7. Did the program provide an adequate theoretical introduction to methods of teaching mathematics?
8. Did the program provide adequate student-teaching practice?
9. Did the program relate its teaching to the philosophical objectives of Saudi education?
10. Did the program adequately prepare student teachers to design curricula in mathematics?
11. Did courses in educational psychology at the College of Education help student teachers to teach mathematics better?
12. Did the program acquaint student teachers with the problems of teaching mathematics?

Tabulation and Analysis of the Survey Results

In Appendix B, the frequencies of responses to all questions of the survey instrument are presented, with the exception of item Q10, which reads "List the subject or subjects, other than mathematics, that you teach," since the entire population had no response to this question. A summary of the results, as listed in Appendix B, follows.

Personal Background

See Table B-1.1, Appendix B, for background information on the respondents. Of the 116 respondents who returned the questionnaire, 76 were men and 40 were women.

There appears to be no significant pattern of enrollment of students for mathematics, as represented by the number of teachers graduating during the five academic years, 1975-76 through 1979-80, except that the enrollment of women teachers specializing in mathematics began to rise since 1977-78, when they first started enrolling, until 1979-80, when their number rose to 17 against the 16 men enrolled for the program, as Table 3 clarifies.

Table 3.--Enrollment of males and females in mathematics department of Mecca College of Education, 1975-76 through 1979-80.

Year	Males	Females
1975-76	16	--
1976-77	23	--
1977-78	18	13
1978-79	10	15
1979-80	16	17
Total	83	45

Table 3 further indicates that the Saudi teachers who graduated from the College of Education, Mecca, with mathematics as their teaching specialty were 16 in 1975-76, 23 in 1976-77, 31 in 1977-78, 25 in 1978-79, and 33 in 1979-80.

A significant majority of the graduates, namely 74 out of 116, comprising 63.8 percent of the total number of respondents, graduated with 40 credits as compared with only 42 individuals, constituting 36.2 percent of the total, who graduated with 60 credits in mathematics. This suggests that the majority of the teachers received academic training to teach a subject other than mathematics.

Academic Performance

See Table B-1.2, Appendix B, for complete information on academic performance of respondents. Frequency analysis of the overall GPA of the respondents indicated that 53.5 percent of the respondents had their GPA between 2.51 and 3.5, with the 2.01 to 2.5 range following a close second, totalling 44.8 percent. Only two teacher graduates entered the profession with a grade point average between 3.51 and 4.0. Twelve graduates (10.3 percent) had only passing grades on their transcripts. However, the comparison with their grade point average in mathematics indicated that the graduates had a better average in their specialty than their overall average.

Working Situation

Table B-1.3, Appendix B, contains information on the respondents' working situation. Of the 116 respondents, 83 were teaching at the middle-school level, 28 at the high-school level, and only 1 at the junior-college level. Four respondents were studying for advanced degrees in the United States. In other words, 96.6 percent of those responding stated that they were working as full-time teachers, and the rest were studying abroad.

Of those currently teaching in Saudi Arabia, all but one were required to teach mathematics. Thirteen, or 11.2 percent, indicated that in addition to teaching, they had administrative responsibilities. A vast majority (75.9 percent) indicated a 100 percent responsibility in teaching mathematics, with some 21.4 percent indicating they had only 80 percent or less mathematics-teaching responsibility.

Education Curriculum

Table B-2, Appendix B, is a tabulation of the evaluation of education curricula at the College of Education, Mecca, by the respondents. On the whole, the evaluation was positive to mixed. The least positive evaluation of a mean of 3.2 on a scale of 1 (very positive) to 5 (very negative) was elicited in response to Q21, which reads as "Education in Saudi Arabia," and the most positive ratings were registered with regard to the two courses in student teaching (Q20 and Q26).

Mathematics Curriculum

In Table B-3, Appendix B, responses to questions Q27 through Q48, dealing with the various aspects of the mathematics curriculum, are presented. The graduates, responding to these questions, were directed to indicate how well the curriculum of the College of Education prepared them to teach certain courses at the schools (Q29-Q36) and to function as effective teachers. Of the first two fundamental questions, Q27 (the courses in mathematics were valuable in helping me understand the basics of mathematics) and Q28 (to understand the objective of teaching mathematics in school), the former

was answered in a more positive manner than the latter, with mean ratings of 2.1 and 3.2, respectively. They considered themselves most prepared to teach algebra, its having the most positive rating (mean = 1.7), whereas they considered themselves least prepared for arithmetic, its having the least positive rating (mean = 2.5). Ratings of global aspects of mathematics curriculum at the College of Education again were generally positive, with values ranging from 2.3 (competently trained in the methods of teaching mathematics) to 3.3 (insights into developing curricula at school). Finally, with respect to research and practical experience in curriculum planning, assessment of courses in mathematics, etc., the most positive rating of 2.7 was recorded in answer to the question, "The program provided me with enough research opportunity into the problems of teaching mathematics," whereas the least positive was in response to the question about ". . . enough opportunity . . . textbook writing," with a mean equal to 3.9.

College-School Relationships

Finally, responses to the questions concerning the relationship between what is being taught at the College of Education and how much of it is of practical use in the Saudi school setting are presented in Table B-4, Appendix B. It is in this group of questions, Q49 through Q63, that the most negative ratings were encountered. In fact, the two most negative ratings were with regard to the relationship between the school and college curricula, in response to questions Q53 (College program ought to have a closer bearing on teaching mathematics at school), with a mean = 4.8, and Q54 (There should be closer

contact between school and the department of mathematics), with a mean = 4.8. The most positive rating was in response to question Q49 (There is a high correlation between objectives of mathematics curriculum at school and the course objectives for mathematics at the College of Education), with a mean = 3.2.

Open-Ended Responses

Of the 116 graduate teachers, 88 chose to respond to the open-ended Question 64, eliciting their personal suggestions and recommendations. Their answers may be summarized as follows:

1. Thirty-one graduates suggested that more emphasis be given to mathematics courses and that education courses be reduced.

2. Seventeen teacher graduates complained that the College of Education does not have a lab for students to experiment in. They suggested the provision of one such laboratory.

3. Nineteen respondents suggested that the College of Education should teach courses relevant to intermediate and high-school curricula during the last two years of their schooling at the College of Education.

4. Thirty respondents complained of the nonavailability of books other than the textbooks in the College library. They suggested that the latest material in the subject of their specialization be made available in the library. These same 30 graduates suggested that the prospective teachers at the College of Education

should have access to standard and current books on the subject in addition to the class notes.

5. Thirty-two respondents suggested that more emphasis be given to those courses of mathematics that have a close and immediate bearing on the subjects they have to teach at school.

6. Thirty-five respondents demanded better-qualified instructors.

7. Thirty-nine teachers repeated the charge that there is little relationship between the courses taught by the College and the curricula at school.

8. Twenty-three respondents recommended that work load in mathematics for graduating teachers be increased considerably. They made a specific mention of course 490 (Mathematics for Intermediate and High School), which has a direct bearing on courses taught at the intermediate and high-school levels.

9. Forty-two respondents recommended the improvement of supervision of student teachers.

10. Forty-four participants in this study recommended the immediate establishment of a well-equipped media center to aid the practicing teachers.

11. A particularly pointed recommendation was made by 18 women teachers--that they should be taught by a "live" woman instructor instead of being taught by a male instructor over a closed-circuit TV network.

Exploratory Factor Analysis and Reliability

As a second step of data analysis, an exploratory factor analysis was undertaken to determine the existence of any groups of variables that might be converted into useful evaluation scales with regard to the mathematics program at the Mecca College of Education.

The results of the factor analysis are presented in Appendix C. As may be noted from Table C-3, Appendix C, some 17 factors were extracted initially. A rotated factor matrix is presented in Table C-4 of the same appendix.

Initially, variables with a factor loading of ± .40 and higher, and/or the variables that appeared to have a logical relationship with the other variables of the set, were selected and grouped together (see the starred factor loading in Table C-4). Next, Cronbach's Alpha and Standardized Item Alpha, using the Reliability Program of SPSS, were computed for each set of variables ("scale") selected from the factors in the previous step. Each scale with a reliability index of .50 or more was characterized as a dimension for further analysis.

The results of the reliability analyses are presented in Appendix D. Each dimension, together with the results of the reliability analysis, is described as follows:

Dimension 1 consists of the following variables (see starred factor loadings on Factor 1 in Appendix Table C-4 and Table D-1, Appendix D).

A28 Understand objectives of teaching math
A39 Competent to critically assess programs
A40 Able to construct adequate tests
A41 Competent in methods of teaching math
A43 Assessment of math courses
A45 Problems of teaching math
A48 Evaluation and grading
A49 High correlation between college and school

The scale resulting from this analysis was summarized and labeled as "Understanding the Objectives of Teaching Mathematics." With an alpha = .79795, the scale was considered sufficiently reliable for further analyses.

Dimension 2 consists of variables with high factor loadings on Factor 2 and Factor 7 (see starred factor loadings in Table C-4 and Table D-2). These two factors were combined because they dealt inherently with basic mathematics. The following variables made up this dimension, which was summarized and labeled as "Understanding Basic Mathematics to Teach Mathematics":

A27 Understand basic math to teach math
A29 Algebra
A30 Geometry
A31 Trigonometry
A32 Calculus
A33 Arithmetic
A35 Analytical Geometry

With a reliability coefficient of alpha = .80242, this scale was also considered reliable for further analysis.

Dimension 3 consists of the following variables (see starred factor loadings on factor 3 in Table C-4 and Table D-3).

A37 Prepared for higher studies in math
A38 Insight to develop math curricula
A42 Curriculum planning in math
A44 Concept development in math
A47 Math textbook writing

As a result of the reliability analysis (alpha = .72138), Dimension 3 merited inclusion for future analyses and was summarized and labeled as "Preparation for Higher Mathematics."

Dimension 4 deals with the relationship between the college program and its application to the intermediate and high schools. This dimension consists of the following variables (see starred factor loadings on Factor 4 in Table C-4 and Table D-4).

A53 College program closer to teaching in schools
A54 More contacts between schools and college
A56 More relevance for needs of schools
A58 College to offer in-service refresher

With alpha = .66551, the scale demonstrated an acceptable level of reliability and was considered for further analyses under the label "College-School Relations."

Dimension 5 consists of only three variables (see starred factor loadings on Factor 5 in Table C-4 and Table D-5).

A55 More seminars between college and schools
A60 Greater emphasis on practical problems
A61 More experiments with new teaching methods

This dimension deals with another aspect of college-school relationships, namely the degree of mutual cooperation. Again, with alpha = .63967, it was considered valuable for further analysis and was labeled as "Emphasis on Practical Problems."

Dimension 6 consists of the following variables (see starred factor loadings on Factor 6 in Table C-4 and Table D-6).

A36 Modern mathematics
A38 Insight to develop math curricula
A50 Half material taught never used in school
A51 College ignores difference in schools
A52 College does not prepare adequately

At first sight, there appeared to be a lack of correlation between the variables making up this factor, but on closer examination, it was summarized and labeled as "Preparation for School Teaching." A reliability alpha = .65407 was considered indeed sufficient for further analyses.

Dimension 7 consists of only two variables (see starred factor loadings on Factor 8 in Table C-4), both, Q19 (Methods of teaching math [1]) and Q25 (Methods of teaching math [2]), dealing with the methods of teaching mathematics. A reliability could not be computed, but a scale consisting of these two items was constructed in view of the high intercorrelation of r = .767 for the two items (see starred correlation in Table C-2).

Dimension 8 consisted initially of three variables (see starred factor loading on Factor 9 in Table C-4 and Table D-7).

A18 Education media
A20 Student teaching [1]
A26 Student teaching [2]

However, a substantial increase in reliability of the scale, as well as an increased degree of coherence in the scale, i.e., a change of alpha from .58935 to .755, was detected if item A18 was deleted. It was decided to use only items A20 and A26 for a scale labeled "Student Teaching."

Dimension 9 initially consisted of three items (see starred factor loadings on Factor 10 in Table C-4 and Table D-8).

A12 Introduction to education and psychology
A13 Social and philosophical foundation of education
A14 Development of educational thought

However, deletion of the first of these items increased both the degree of reliability from .637 to .723 and the internal consistency of the scale. Hence the decision was made to reduce the scale to all but two items, labeling it as "Education Thought."

Dimension 10 initially consisted of three items (see starred factor loadings on Factor 11 in Table C-4 and Table D-9).

A17 Principles of curriculum
A24 Curriculum design
A62 Better preparation for test and evaluation

From the results of the reliability analysis, it was noted that only by dropping item A62 would a reasonable level of reliability be established for this scale, and some measure of consistency of the items would be achieved, resulting in a scale labeled as "Curriculum Design."

Dimension 11 consists of three items dealing with different aspects of educational psychology (see starred factor loadings on Factor 12 in Table C-4 and Table D-10).

A12 Introduction to education and psychology
A16 Educational psychology (childhood and adolescence)
A23 Introduction to counseling and mental hygiene

The reliability for the scale resulting from the analysis was alpha = .54327, being sufficiently high to be included for further analysis. This factor was labeled "Educational Psychology."

Factor 13 included three items (see starred factor loadings in Table C-4 and Table D-11) with high factor loadings. The reliability for this group of items was close to zero; hence it was dropped from further consideration.

Dimension 12 consists of three variables (see starred factor loadings on Factor 14 in Table C-4 and Table D-12):

A44 Concept development in math
A45 Problems of teaching
A46 Mathematics in general

They were summarized under the label "Problems of Teaching Mathematics," and with a reliability coefficient, alpha = .65382, this scale was treated as significant for further analysis.

Finally, questions associated with the following three factors didn't demonstrate sufficient reliability to form a scale or dimension:

Factor 15 consisted of three items with high factor loadings (see Table C-4 and Table D-13). The reliability determined for this group of items was close to zero. Thus, the factor was dropped out of any further consideration.

Factor 16 was based on three items with high factor loadings (see Table C-4 and Table D-14). Even though the degree of reliability was moderately high (alpha = .50), the items did not show any internal coherence. The factor was dropped out of further consideration.

Factor 17 was made up of three items with high factor loadings (see Table C-4 and Table D-15). Again, as was the case with Factors 13 and 15, because of a very low degree of reliability, the items were excluded from any further analysis.

In summary, it may be noted that the original 52 questions dealing with the different aspects of the mathematics curriculum of the College of Education at Mecca resulted in 12 usable scales, dealing with the following 12 dimensions of the program:

1. Understanding the Objectives of Teaching Mathematics
2. Understanding Basic Mathematics to Teach Mathematics

3. Preparation for Higher Mathematics
4. College-School Relations
5. Emphasis on Practical Problems
6. Preparation for School Teaching
7. Methods of Teaching Mathematics
8. Student Teaching
9. Educational Thought
10. Curriculum Design
11. Educational Psychology
12. Problems of Teaching Mathematics

From the exploratory factor and the reliability analyses, 12 scales (see Appendix D) encompassing the 12 dimensions were constructed in the following manner. Each scale was treated as consisting of the mean response over the items that contributed to the corresponding dimension; for example, for Dimension 1, "Understand the Objectives of Teaching Mathematics," consisting of variables A28, A39, A40, A41, A43, A45, A48, and A49, the mean response of a given respondent was computed as (A28 + A39 + A40 + A41 + A43 + A45 + A48 + A49)/8. No adjustment had to be made for missing data, as all respondents answered all questions. Similar computations were made for the other 11 dimensions.

In Table 4, means and standard deviations are presented for each of these 12 dimensions. The results presented in Table 4 may be summarized as follows: The two practical activities--method of teaching mathematics (D07) and student teaching (D08)--received the most positive ratings, whereas the college-school relationship (D04) and the emphasis on practical problems (D05) were rated most negatively.

"Preparation for Higher Mathematics" (D03) was rated at the negative end of "uncertainty" (i.e., m = 3.35), and the remaining dimensions were evaluated between positive and uncertain.

Table 4.--Means[a] and standard deviations of the 12 dimensions.

Dimension	Cases	Mean	Standard Deviation
D01	116	2.7985	.6884
D02	116	2.0714	.6713
D03	116	3.3517	.6738
D04	116	4.7802	.3599
D05	116	4.2678	.5904
D06	116	3.3034	.7158
D07	116	1.3276	.6760
D08	116	1.2371	.5426
D09	116	2.7672	1.0288
D10	116	2.1897	.8960
D11	116	2.3132	.8527
D12	116	2.8736	.8278

[a]1 = very positive to 5 = very negative.

In Table 5, intercorrelations between the 12 dimensions represented by the 12 factors evaluating the mathematics curriculum at Mecca College of Education are presented. From Table 5, it is clear that most correlations were not statistically significant. Of the statistically significant relationships found, even the most significant one between D01 and D12 (r = .58) represented a relatively low percentage ($.58^2$ = 34 percent) of variance from one variable to

Table 5.--Pearson correlations between 12 scales developed from factor analysis (N = 116).

	D01	D02	D03	D04	D05	D06	D07	D08	D09	D10	D11
D02	.35										
D03	.46	.19									
D04	-.06	-.28	.08								
D05	-.08	-.31	.08	.34							
D06	.36	.29	.50	.01	.08						
D07	.01	.32	-.00	-.09	-.13	.02					
D08	.03	.22	-.14	-.14	-.21	-.08	.49				
D09	-.04	-.15	-.07	-.05	.01	-.04	.01	.02			
D10	.05	.03	.05	-.08	-.00	.04	.12	.05	.09		
D11	.16	.15	.20	-.01	-.19	.22	.05	.14	.24	.27	
D12	.58	.28	.53	-.12	-.08	.29	.06	.04	-.13	.09	.07

Note: With n = 100, r = ±.1946 is significant at the = .05 level
r = ±.2540 is significant at the = .01 level.

another. Thus, it led to the conclusion that on the whole, the 12 scales arrived at through the above process of exploratory factor and reliability analyses were dealing with relatively independent and different aspects of the curriculum under study.

Testing of Hypotheses

Each of the 12 factors encompassing the dimensions of the curriculum embodied in the questionnaire was used to test the eight hypotheses presented at the beginning of this chapter. In all cases, an analysis-of-covariance design was used. For example, the overall GPA and the mathematics GPA were used as covariates, to the extent that the relative academic success of the program might influence the attitudes of the respondents toward both the college curriculum and the respondents' present work setting. The independent variables to be treated in the analyses were determined by the following hypotheses to be tested:

1. Sex of the respondent
2. Whether the respondent graduated from a 40- or 60-hour program
3. Interaction between the sex of the respondent and the type of program
4. Whether the respondent teaches at the junior- or senior-high-school level
5. Interaction between the sex of the respondent and the school level
6. Percentage of mathematics teaching duty

7. Interaction between the sex of the respondent and the percentage of mathematics teaching
8. The year the respondent graduated from Mecca College of Education, or the years he/she had been teaching. This hypothesis was dealt with separately for male and female teachers, as there were no women graduates until 1977-78, although men teachers have been enrolling in the mathematics program since 1952.

An overview of the results is presented in Table 6, indicating that, in general, there was little difference between different groups of respondents in regard to their evaluation of the mathematics curriculum.

Analysis of Variance

The complete results for the analyses of covariance are presented in Appendix E, whereas below only significant and near-significant results ($p < .10$) are mentioned in detail.

Each of the 60 analyses of covariance presented in Appendix E consists of two sections: (a) the results of the covariance proper and (b) the table of cell means.

The analysis of covariance itself gives the dependent variable (i.e., one of the 12 scales or dimensions of evaluating the mathematics curriculum at Mecca College of Education) and the independent variables (derived from the hypotheses to be tested, i.e., sex of the respondent, type of program the respondent graduated from, percentage

Table 6.--Overview of results of testing the hypotheses.

		Hypothesis 1 Sex	Hypothesis 2 Program Type	Hypothesis 3 Sex x Program	Hypothesis 4 School Type	Hypothesis 5 Sex x School	Hypothesis 6 % Math Teach.	Hypothesis 7 Sex x % Math	Hypothesis 8 $Year_M$	Hypothesis 8 $Year_F$
D01	F	<1	<1	<1	<1	<1	3.14	5.03	<1	1.42
	p[a]	-	-	-	-	-	.08	.03	-	.26
D02	F	<1	1.15	<1	1.62	<1	2.21	<1	2.31	<1
	p	-	.29	-	.21	-	.14	-	.07	-
D03	F	3.69	<1	<1	<1	<1	1.24	<1	<1	<1
	p	.06	-	-	-	-	.27	-	-	-
D04	F	<1	1.59	<1	1.76	<1	1.39	<1	1.62	1.81
	p	-	.21	-	.19	-	.24	-	.18	.18
D05	F	2.05	<1	<1	1.00	<1	1.35	<1	<1	<1
	p	.16	-	-	.32	-	.25	-	-	-
D06	F	<1	1.85	<1	<1	<1	<1	<1	<1	<1
	p	-	.18	-	-	-	-	-	-	-
D07	F	<1	<1	7.51	1.46	2.88	<1	<1	1.12	<1
	p	-	-	.01	.23	.09	-	-	.36	-
D08	F	<1	<1	3.08	<1	3.99	<1	1.08	2.09	<1
	p	-	-	.08	-	.05	-	.30	.09	-
D09	F	<1	<1	<1	<1	<1	<1	1.83	<1	1.06
	p	-	-	-	-	-	-	.18	-	.36
D10	F	2.15	1.26	<1	1.98	<1	3.60	<1	<1	1.16
	p	.15	.26	-	.16	-	.06	-	-	.33
D11	F	<1	1.15	<1	<1	<1	<1	<1	<1	1.89
	p	-	.29	-	-	-	-	-	-	.17
D12	F	1.23	<1	<1	<1	<1	1.68	<1	<1	<1
	p	.27	-	-	-	-	.20	-	-	-

[a]For F < 1, the ANOVA is not significant; hence no p is given in those instances.

of teaching mathematics, and whether the respondent teaches at a middle or high school).

In the case of the independent variable "year graduated from Mecca College of Education," a separate analysis was performed for male and female teachers because men teachers have been graduated since the 1975-76 school year, whereas women teachers have been graduated only since the end of the 1977-78 school year.

The covariates for all analyses were the general GPA and the specific mathematics GPA.

The kind of ANCOVA performed by the SPSS-program "ANOVA"[1] considered and adjusted for the covariates first, next for the individual factors, and finally for the interaction effects.

The second section of Appendix E presents cell means and frequencies for the entire population, as well as broken down for the categories of the factors used in the ANCOVAs and the interaction effects.

In the following discussion, each dimension is considered individually.

Dimension 1: "Understanding the Objectives of Teaching Mathematics." The complete results of the ANCOVAs are presented in Tables E-1 through E-5 in Appendix E. As noted in Table 4, the overall rating of this aspect was 2.8 on a scale of 1 (very positive) to 3 (uncertain) to 5 (very negative). In other words, the respondents as a whole were "uncertain" if the course made them aware of

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[1] Nie et al., op. cit., pp. 410-33.

the objectives of teaching mathematics. It may be noted from Table 6, as well as from the results presented in Table E-3, that the only significant differences appeared to be between the respondents who taught either 80 or 100 percent mathematics: Those who had a 100 percent mathematics teaching duty evaluated their understanding of the objectives somewhat more negatively. With regard to the interaction effect between the sex of the respondent and the percentage teaching duty, a statistically significant difference was noted. Men teachers as a group rated understanding of the objectives more positively, with a mean of 2.9, than women teachers with 80 percent teaching duty ($m = 3.3$), while women teachers with a 100 percent teaching duty gave a considerably more positive rating response with a mean of 2.6.

Dimension 2: "Understanding Basic Mathematics to Teach Mathematics." The complete results of the ANCOVAs are presented in Tables E-6 through E-10. As may be noted from Table 4, the overall rating of this dimension was moderately positive, with a mean of 2.07. With regard to different hypotheses to be tested, it may be added that no statistically significant differences were found between different groupings of respondents, except for a quasi-significant relationship with regard to the year of graduation for men students. In particular, the two classes graduating in 1978-79 and 1979-80 rated it somewhat more positively than the group graduating earlier (see Table E-9).

Dimension 3: "Preparation for Higher Mathematics." The complete results of the ANCOVAs are presented in Tables E-11 through E-15. As may be noted from Table 4, the overall rating of this dimension was 3.35, or tending to be negative without being definitely negative. Relevant to the different hypotheses to be tested, only one quasi-significant difference was found between men and women teachers (see Table E-11). Women teachers appeared to rate their preparation for higher mathematics more negatively than did men teachers.

Dimension 4: "College-School Relationships." The complete results of the ANCOVAs are presented in Tables E-16 through E-20. As may be noted from Table 4, the overall group rating of this aspect as well as the one represented by Factor 5 was most negative, with a mean = 4.78. In other words, the need for an improved college-school relationship and cooperation was seen as most desirable by the group as a whole. No statistically significant differences were found in any of the analyses of covariance.

Dimension 5: "Emphasis on Practical Problems." The complete results of the ANCOVAs are presented in Tables E-21 through E-25. The negative rating of this aspect was much the same as that of Dimension 4, with a mean = 4.37. All groupings rated the current emphasis on practical problems equally negatively.

Dimension 6: "Preparation for School Teaching." The complete ANCOVAs for this dimension are presented in Tables E-26 through E-30. The overall rating of the group was 3.3, which tended to be negative

without being definitely negative. Again, as was the case with the previous two factors, there were no statistically significant differences in ratings between various groups of respondents. All rated themselves as being more or less prepared.

Dimension 7: "Methods of Teaching Mathematics." The complete ANCOVAs for this dimension are presented in Tables E-31 through E-35. As may be noted from Table 4, the overall rating for this dimension by all respondents was 1.33, nearly "very positive." Statistically significant group differences were found with respect to the interaction of the sex of the respondent and whether the graduate had 40 or 60 credit hours in mathematics. As may be noted from Table E-31, women teachers who took a 40-hour course and men teachers who took the 60-hour program rated this dimension of the curriculum as practically "very good," whereas the other two groups, i.e., men teachers who had had the 40-hour program and women teachers with 60 hours in mathematics, rated Methods of Teaching Math somewhat less positively, but somewhere between positive and very positive. Another tendency, though not completely statistically significant, was found in the interaction between the sex of the respondent and the level at which the respondent was teaching (see Table E-32). Although the men teachers on the whole rated this dimension of the curriculum the same way as the whole group, female teachers teaching at the middle-school level rated the methods of teaching mathematics better than the group average, and those teaching at the senior-high level, below the group average.

Dimension 8: "Student Teaching." Complete results of the ANCOVAs are presented in Tables E-36 through E-40. As may be noted from Table 4, the overall group rating of this dimension was again very positive, with a value of 1.24. In terms of the group differences, the same results as the above may be noted in the interaction effect between the sex of the respondent and the 40- versus 60-hour program. As may be seen from Table E-36, the women teachers with the 40-hour program and the men teachers graduating with 60 hours in mathematics rated the student-teaching courses as better than did the other two groups of teachers. The same relationship may be noted in the interaction effect between sex and level of teaching (see Table E-37): Women junior-high-school teachers and men senior-high-school teachers rated the student-teaching experience as better than did men junior-high teachers and women senior-high teachers. Finally, a tendency, yet not firmly statistically significant, was found for the men teachers, graduating in different years from Mecca College of Education. Thas is, more recent graduates tended to rate the experience more positively than earlier graduates (see Table E-39).

Dimension 9: "Educational Thought." Complete results of the ANCOVAs regarding this aspect are presented in Tables E-41 through E-45. As may be noted from Table 4, the overall rating of this dimension was 2.77. No statistically significant differences were found across different groups of respondents.

Dimension 10: "Curriculum Design." Complete ANCOVAs are presented in Tables E-46 through E-50. As may be noted from Table 4,

the overall rating for this dimension was 2.19, a fairly high positive rating for the whole group. It may be seen from Table E-48 that there was a tendency for respondents with an 80 percent teaching responsibility in mathematics to evaluate this dimension somewhat more positively than for respondents with a 100 percent teaching duty in mathematics.

Dimension 11: "Educational Psychology." Complete ANCOVAs are presented in Tables E-51 through E-55. As may be noted from Table 4, the overall rating for this dimension was 2.31. No statistically significant differences were found in terms of various groupings of respondents.

Dimension 12: "Problems of Teaching Mathematics." Complete ANCOVAs are presented in Tables E-56 through E-60. As may be noted from Table 4, the overall rating for this dimension was 2.87, a moderately positive rating. No statistically significant differences were found for different groupings of respondents.

Summary of the Results

With regard to the eight hypotheses proposed at the beginning of this chapter, the overview, as presented in Table 6, is summarized as follows:

Hypothesis 1: No statistically significant differences were found between men and women teachers in the way they evaluate the program.

Only one tendency was found with regard to the Preparation for Higher Mathematics. That is, the women teachers tended to evaluate this aspect of the curriculum more negatively than did the men teachers.

Hypothesis 2: No statistically significant differences were found between graduates with 40 hours in mathematics and those with 60 hours with regard to this hypothesis.

No statistically significant differences in the evaluation of any dimension of the program were found.

Hypothesis 3: No statistically significant interaction effects were found between the sex of the respondent and his/her having graduated with a 40- or 60-hour program.

On one dimension--Methods of Mathematics Teaching--a statistically significant relationship was observed: women teachers who took a 40-hour course and men teachers who took the 60-hour program rated this dimension of the curriculum as practically "very good," whereas the other two groups, i.e., men teachers who had had the 40-hour program and women teachers with 60 hours in mathematics, rated Methods of Teaching Math somewhat less positively, but somewhere between positive and very positive.

Hypothesis 4: No statistically significant differences were found between respondents teaching at the junior- and senior-high level.

No statistically significant differences were found for any of the dimensions evaluated.

Hypothesis 5: No statistically significant interaction effects of the sex of the respondent and his/her teaching at the junior- or senior-high-school levels were found.

Only on two dimensions, 7 and 8, were statistically significant relationships observed: (a) the women teachers with the 40-hour program and the men teachers graduating with 60 hours in mathematics rated the

student-teaching courses as better than did the other two groups of teachers, and (b) men teachers on the whole rated this dimension of the curriculum the same way as the whole group, but female teachers teaching at the middle-school level tended to rate the methods of teaching mathematics better than the group average, and those teaching at the senior-high level, below the group average.

Hypothesis 6: No statistically significant differences were found between respondents with a 100 percent teaching duty in mathematics and respondents with an 80 percent or less teaching responsibility.

No statistically significant differences in the evaluation of any dimension of the program were found.

Hypothesis 7: No statistically significant effects of the sex of the respondent on the percentage of mathematics teaching responsibility were found.

On only one dimension was a statistically significant relationship observed: men teachers as a group rated understanding of the objectives more positively, with a mean of 2.9, than women teachers with 80 percent teaching duty ($m = 3.3$), while women teachers with a 100 percent teaching duty gave a considerably more positive rating response with a mean of 2.6.

Hypothesis 8: No statistically significant differences in response for the respondents who graduated in different years from the College of Education, Mecca, were found.

No statistically significant differences in any of the dimensions evaluated were found regarding the women respondents, who were graduated between 1977-78 and 1979-80.

The men respondents who were graduated between 1975-76 and 1979-80 revealed a tendency toward differences in their responses with respect to Dimension 2, Understanding Basic Mathematics, and Dimension 8, Student Teaching. In either case, more recent graduates tended to evaluate this aspect statistically more positively.

The suggestions made by some respondents with regard to the open-ended Question 64 have been examined in the context of the conclusions and recommendations in Chapter VI.

CHAPTER VI

CONCLUSIONS AND SUGGESTIONS

The primary objective of this study has been to evaluate the mathematics curriculum given by the College of Education, Mecca, from the perspective of the teachers who graduated from the College in the years 1976 through 1980. Yet as a result of the survey, a number of corollary conclusions can be drawn from the data. These conclusions in the context of the purpose of the study are significantly relevant.

Data collected on the enrollment figures reveal that during the academic years 1975-76 through 1979-80, 116 Saudi teachers were graduated to teach mathematics from the College of Education, Mecca. In terms of the need of the country to develop its industrial and technological potential, 116 graduates over five years is a poor number.

An interesting trend the figures reveal is that more and more women teachers have since 1977-78 been enrolling to qualify to teach mathematics in Saudi intermediate and high schools. The trend is particularly significant as women's education started late in the country. This study cannot offer any explanation for the lack of interest in mathematics among the prospective Saudi teachers, but an investigation into the causes is worth the while of another study in

view of the importance of mathematics to modern science and technology.

Another significant conclusion from the enrollment and graduation figures drawn is that a majority of mathematics teachers prefer the 40-hour program to the 60 hours in mathematics, possibly to qualify to teach an additional subject.

No meaningful conclusion could be drawn from the academic performance of the graduates, except that it is lamentable that only 10.3% of the graduates could reach excellence in grades and that most graduates do better in mathematics than in the education courses.

A striking fact that emerges out of the working situation is that of 116 graduates only 5 graduates appeared to have made headway toward higher degrees. Of these five, only one has been teaching at the junior-college level. If it is desired that there be a continuity between school and college education, a mobility of teachers of much greater magnitude from the high-school level to the university is also most desirable. Furthermore, it is encouraging to note that 96.6% of the Saudi graduates were still teaching mathematics as full-time teachers in Saudi schools.

On the whole, the education curriculum has been rated positively by the respondents. Among the most positively rated courses are Q15 (Developmental Psychology), Q16 (Educational Psychology), Q18 (Educational Media), Q19 (Methods of Teaching Math [1]), Q20 (Student Teaching [1]), Q25 (Methods of Teaching Math [2]), and Q26 (Student Teaching [2]). These courses have provided a good support to the beginning teachers in the initial years of their profession. These

courses should be further strengthened and weaknesses, if any, be eliminated.

On the other hand, the most negatively rated education program was Q21 (Education in Saudi Arabia). The response to this question is perhaps understandable. The history of ancient Saudi education may have little bearing on modern education in Saudi Arabia.

Q12 (Introduction to Education and Psychology), Q13 (Social and Philosophical Foundations of Education), Q14 (Development of Educational Thought), Q17 (Principles of Curriculum), Q22 (Educational Administration and Planning), Q23 (Introduction to Counseling and Mental Hygiene), and Q24 (Curriculum Design) were rated from fairly positive to definitely positive.

A careful analysis of these rating results reveals that the courses that have a direct bearing on the classroom performance of the teachers have been rated very positively, and the programs that have a less immediate effect on the teacher's ability to teach tend to elicit fairly positive to definitely positive responses. The compelling conclusion is that the education courses should carry a greater measure of programs that are an immediate help to the student teachers than those the teachers would need when they have become well advanced in their careers.

Responses to questions on the mathematics curriculum render themselves into two basic groupings: questions dealing with the components of mathematics and the global aspects of mathematics. The mathematics curriculum has been rated largely positively by the respondents. In other words, on the whole the teacher graduates were

satisfied with the content and emphasis of the mathematics program insofar as it prepares them to teach effectively.

Among the most positively rated contents of the mathematics curriculum were Q29 (Algebra), Q32 (Calculus), Q35 (Analytical Geometry), and Q36 (Modern Mathematics). Courses in these subjects, it appears, have been designed and executed with care and imagination.

On the other hand, Q27 (Understand Basic Math to Teach Math), Q30 (Geometry), A31 (Trigonometry), Q33 (Arithmetic), and Q34 (Statistics) have been rated fairly positive to definitely positive.

The most negatively rated component of the mathematics curriculum was Q28 (Understand the Objectives of Teaching Math), with a mean = 3.233 on a scale of 1 (very positive) to 5 (very negative). The content courses are, on the whole, satisfactory from the standpoint of their enabling the teachers to teach well; yet programs in the basics of mathematics, Geometry, Trigonometry, Arithmetic, and Statistics need strengthening, and the strength of the very positively rated content subjects needs to be constantly reinforced. Such abstract contents as understanding the objectives of teaching mathematics need more emphasis in the content curriculum.

The second part of the mathematics curriculum dealing with the global aspects of mathematics has been rated from fairly positive to generally positive. Respondents were fairly positive about the curriculum's ability to prepare them for higher studies in mathematics, to make them competent to assess programs critically, to assess mathematics courses, to do research in mathematics in general, and to prepare

them to evaluate the work of the pupils and grade them. Respondents felt negative with regard to Q38 (Insight to Develop Math Curricula), Q42 (Curriculum Planning in Math), Q44 (Concept Development in Math), and Q47 (Math Textbook Writing). It appears that the programs in the mathematics curriculum that deal with the actual, immediate classroom needs are generally rated positively. In other words, most respondents show very positive feelings about those segments of the curriculum that have a direct bearing on their function as teachers in class.

The relationship between the college and school curricula in mathematics was rated highly negatively, if Q53, Q54, Q56, and Q58 are read together.

Based on the responses to Questions 49 through 63, the following conclusions can be drawn:

1. There is little relationship between the courses in mathematics at the College of Education, Mecca, and curricula in mathematics in intermediate and high schools.

2. The mathematics curriculum does not account for the specific needs of the intermediate and high school mathematics.

3. The mathematics curriculum of the College does not prepare prospective teachers of mathematics as adequately as it ought to.

4. There is a very poor relationship between the College program and what it takes to teach in schools in Saudi Arabia.

5. Contacts with regard to the common objective, that is, to teach school mathematics effectively and consistently with the

objectives, are very poor between schools and the College of Education.

6. Seminars on topics of common interest between the intermediate and high schools and the College of Education are almost unheard of.

7. Even though the College mathematics courses have been rated positively, there appears to be a need to have a closer relevance to the needs of the schools.

8. Teachers already teaching are not allowed sufficient say in the supervision of practice teaching.

9. The College of Education does not offer adequate in-service programs for its past graduates.

10. Present programs of the College of Education need improvement urgently and immediately.

11. The mathematics curriculum does not give due emphasis to practical problem-solving aspects of mathematics in the mathematics program of the College.

12. The College programs do not encourage innovation and experimentation in the teaching of mathematics.

13. The College of Education mathematics curriculum prepares teachers of mathematics poorly in the techniques of evaluating and grading.

14. Little emphasis is given to abstract mathematical concepts.

15. Based on the complete results of the ANCOVAs, it may be concluded that the teacher graduates were fairly well satisfied with understanding the objectives of teaching mathematics (Dimension 1).

Even so, this part of the mathematics curriculum could be improved to increase its effectiveness even further.

16. The rating of Dimension 2 (Understanding Mathematics to Teach Mathematics), through the complete ANCOVA results, is moderately positive with a mean = 2.7. It can be concluded that although this aspect of the curriculum is rated positive, there is plenty of scope for improvement.

17. The ANCOVAs of the results of Dimension 3 (Preparation for Higher Mathematics) indicate that the respondents rate Dimension 3 more negatively, with a mean = 3.35. Furthermore, the results support the conclusion that the mathematics curriculum does not prepare the student sufficiently well to proceed for higher studies in mathematics. This conclusion is further supported by the fact that only five graduate respondents have continued their studies beyond their first degree programs at the College of Education.

18. Dimension 4 (College-School Relations) is one of the most negatively rated dimensions of this study. It is clear that the respondents believe that there is hardly any correlation between the courses in mathematics given by the College of Education and the curricula of mathematics executed at the intermediate and high-school levels of Saudi schools. This conclusion is further supported by the fact that administratively the College of Education and intermediate and high-school education are controlled and managed by two different ministries, creating an administrative distance between the two segments of Saudi education.

19. Dimension 5 (Emphasis on Practical Problem Solving), like Dimension 4, is one of the most negatively rated dimensions, with a mean = 4.37 on a scale of 1 (very positive) to 5 (very negative). All respondents believe that the emphasis on the problem-solving aspect of the mathematics curriculum is minimal, and the improvement of this aspect the respondents indicated is most desirable.

20. With a mean = 3.3, Dimension 6 (Preparation for School Teaching) is rated at the negative end of "uncertainty." Most respondents appear to say that they consider themselves to be somewhat prepared.

21. One of the most positive ratings is accorded to Dimension 7 (Methods of Teaching Math) by the graduate mathematics teachers of the College of Education, with a rating mean = 1.33. In the rating of this dimension, differences across the sex of the respondents and the type of program in mathematics (40 or 60 credits) were reflected in the opinions of the population. Women graduate teachers with 40 credit hours in mathematics and men graduates with 60 credit hours rated this dimension of the curriculum as very positive, whereas men graduates with 40 hours in mathematics and women respondents with 60 hours rated this dimension between positive and very positive. A somewhat significant interaction effect is observed with regard to the sex of the respondents. Women teachers teaching at the middle-school level rated methods of teaching mathematics better than the group average, and those women teachers teaching at the senior-high level, below the population average. It appears that the women teachers who are called upon to teach at a high level feel handicapped in acquiring the necessary

confidence because of the indirect closed-circuit TV system of learning. It may be concluded that, on the whole, the methods of teaching mathematics of the curriculum of the College of Education accomplish their objectives very well.

22. Student teaching, which this study identifies as Dimension 8, has received one of the most positive endorsements from the population. Differences across the sex of the respondents and the type of mathematics are identical to those noted in conclusion 21. The conclusion that student teaching is one of the strongest features of the curriculum of the College of Education becomes one of the most logical.

23. The respondent population has expressed an uncertain to a negative reservation about Educational Thought (Dimension 9), giving rise to the conclusion that educational thought in the present form and design contributes less than optimally to the enhancement of the teachers' efficiency and effectiveness in the classroom.

24. Dimension 10 (Curriculum Design) receives a quasi-positive rating from the whole population. Respondents with an 80% teaching responsibility in mathematics evaluate this dimension somewhat more positively than do respondents with a 100% teaching duty in mathematics. The respondents, in other words, indicate that the mathematics curriculum of the College of Education could prepare them even better in the techniques of curriculum designing than the curriculum does at present.

25. Educational Psychology (Dimension 11) is rated as quasi-positive, with a mean rating of 2.31. Although the attitude of the

graduate teachers toward this dimension is positive, it is clearly written in the dimension of the mean of this component of the curriculum that its positive contribution toward better preparation of the teacher could be improved.

26. Dimension 12, concerning problems of teaching mathematics, has been assessed as fairly positive in preparing teachers to deal with the problems of teaching mathematics, but it is far from totally satisfactory. Improvement of this aspect of the curriculum would appear to be desirable.

Suggestions

Based on the conclusions derived from the simple frequency analyses and factorial analyses, the following suggestions can be made for the improvement and further investigation of the mathematics curriculum of the College of Education:

1. Efforts should be made to attract more and better students to qualify as mathematics teachers by offering attractive stipends and salaries comparable to what they get in industry and private enterprise as pure mathematics graduates.

2. The trend of women teachers' going in for mathematics should be encouraged and reinforced because under the Saudi system only women teachers can teach in girls' schools.

3. Women respondents suggested that provision should be made for "live" women instructors for them, instead of the current practice of providing male instruction on a closed-circuit TV.

4. On the whole, education curricula are satisfactory, but they could be made more effective as an aid to better teaching.

5. Courses such as "Saudi Education" that have little relevance to teaching should be reduced or altered, or form part of an allied subject matter.

6. The courses that have a direct bearing on student teachers' ability to teach should be reinforced and enhanced.

7. The courses in mathematics have proven very successful in preparing graduate teachers to teach their specialty. They should generally be reinforced and kept up to date in content and their relationship with the school curricula. Special attention should be paid to the content and teaching of the basics of mathematics, geometry, trigonometry, and arithmetic.

9. Courses dealing with developing insight into mathematics curricula at school, curriculum planning, concept developing in mathematics, and mathematics textbook writing should be carefully examined and researched to determine why they generally fail to accomplish their objectives.

9. There is an urgent need to have a closer relationship between the college curricula in mathematics and the curricula in mathematics taught at the intermediate and high-school levels in Saudi Arabia. This aspect is in an immediate need of research investigation, as the relationship was very poorly rated by the respondents.

10. Specific parts of the mathematics curriculum of the College should deal separately with the courses at the two levels, namely intermediate and high school.

11. There should be more contacts, through seminars and conferences, between the intermediate and high-school teachers of mathematics and the college teachers teaching the courses in mathematics.

12. School teachers should be more deeply involved in the supervision of student teaching than has been possible so far. For instance, in the evaluation of the student teacher, during his/her assignment to a school for practice, a significant weight should be attached to the regular teacher's observation and assessment.

13. The mathematics curriculum of the College of Education should make an adequate allowance for the practical problem-solving aspect of the programs at school.

14. Fundamental mathematical concepts should be given an adequate weight in the program and emphasis of the mathematics curriculum.

15. It was found that the courses in mathematics do not motivate prospective teachers sufficiently strongly to pursue higher studies in the subject. This weakness of the curriculum should be investigated and remedies found.

16. The methods of teaching mathematics have received one of the most positive endorsements. Efforts should be made to maintain the high level of their effectiveness by regular feedback and research.

17. Student teaching, as one of the most effective programs of the mathematics department, should, like the methods of teaching mathematics, be maintained not only at the current levels of efficiency but also should be improved and reinforced.

18. Curriculum designing should be given greater emphasis in the programs of the mathematics department of the College of Education as, it is hoped, more and more teachers, by reason of

their efficiency and commitment to their profession, would get involved in the mathematics curriculum at schools in Saudi Arabia.

It is hoped that these conclusions and suggestions will inspire future researchers to pursue similar investigations with regard to other specialties provided by the College of Education, Mecca, and to examine what effect the administrative division between the College of Education and schools in Saudi Arabia has on the effective use of the College's resources in the preparation of teachers of mathematics, how well focused the College mathematics curriculum is with regard to the curricula at intermediate and high schools in Saudi Arabia, what specific kinds of contact between the College and its alumni would best serve the interest of continuing education of mathematics teachers, and such other problems as content evaluation of mathematics by experts.

APPENDICES

APPENDIX A

ARABIC AND ENGLISH VERSIONS OF THE COVER LETTER AND QUESTIONNAIRE

MICHIGAN STATE UNIVERSITY

COLLEGE OF ARTS AND LETTERS
DEPARTMENT OF LINGUISTICS AND
ORIENTAL AND AFRICAN LANGUAGES
WELLS HALL

EAST LANSING • MICHIGAN • 48824

May 2, 1981

To whom it may concern:

We hereby certify that Mr. Abdulwahab Zefar has translated into the Arabic language the English version of the questionnaire used as a tool in his research for his doctoral dissertation entitled "An Evaluation of Mathematics Curriculum Given at the College of Education, Mecca, From the Perspective of the Teachers Who Graduated From the College in the Years 1975-1980."

We hereby verify that the translation is honest, accurate, and valid. The cover letter as well as the questionnaire was translated into Arabic in the same format, except that it follows the standard writing style for the Arabic language.

We do wish him the best of luck.

Abdulghaffar Eldamatty
Abdul Eldamatty
Instructor of Arabic

Michigan State University
Department of Linguistics and Oriental
and African Languages
A615 Wells Hall
East Lansing, Michigan 48824

بســـــم الله الرحمن الرحيم

الاخوة والاخوات مدرسى الرياضيات

السلام عليكم ورحمة الله وبركاته وبعد :

يخطو التعليم فى المملكة خطوات جبارة فى طريق النمو بشكله الكمى والنوعى فى جميع مراحل واشكال التعليم .. ان هذا التقدم يتطلب الكثير من الجهد والوقت والمال . ولكى يكون المردود والعائد العلمى لهذه الجهود مؤتيا ثماره بشكل فعال يجب ان نفتح المجال للبحث العلمى لكى يدلى برأيه ويأخذ دوره فى عملية البناء والتخطيط.

ان المدرس هو حجر الزاوية فى نجاح العملية التعليمية ،ولاشك ان مدرس الرياضيات يحتل مكانة بارزة فى بناء المنهج المدرسى وتنفيذه ، ونجاحه فى اداء دوره يتوقف على المنهج والاسلوب الذى اتبع فى اعداده كمدرس لمادة الرياضيات وتزويده بوسائل المعرفة والتقنية الحديثة التى اكتشفت فى هذا المجال . ان منهج اعداد مدرسى الرياضيات يفتقر الى البحث والتقويم والتحسين للرفع من مستوى وكفاءة المدرس ومن اداء وفعالية المنهج والمحتوى التعليمى لكى يناسب الاكتشافات العلمية الحديثة فى هذا المجال .. ومساهمتكم وتعاونكم وامانتكم فى الاجابة على هذا الاستفتاء يسهل مهمتى كباحث فى الحصول على المعلومات المطلوبة لبحثه ويبرهن على مشاركتكم المشكورة فى البناء والتطوير الذى هو هدف هذه الدراسة .

ان الاستفتاء الذى بين يديكم يتكون من خمسة أجزاء :

الجزء الأول : معلومات عامة .. هذه المعلومات لن تستخدم الا لخدمة أهداف الدراسة وبالتالى لاداعى لذكر اسمك عند الاجابة عليه .

الجزء الثانى: فعالية المواد التربوية فى اعداد مدرسى الرياضيات .

الجزء الثالث : فعالية المواد الرياضية المقدمة فى كلية التربية فى اعداد مدرسى الرياضيات للتدريس فى المرحلتين المتوسطة والثانوية .

الجزء الرابع : العلاقة بين احتياجات المدارس فيما يتعلق بتدريس مناهج الرياضيات وبين البرامج الدراسية فى قسم الرياضيات بكلية التربية / مكة .

الجزء الخامس : توصيات ومقترحات لتحسين وتطوير منهج اعداد مدرسى الرياضيات.

يرجى من كل أخ وأخت قراءة المعلومات والتأكد من فهمها جيدا حتى تكون الاجابة سديدة وتخدم الغرض الاساسى من البحث .

مع خالص شكرى وتقديرى لكل الاخوة والاخوات المساهمين فى الاجابة على الاستفتاء .

الباحث

عبد الوهاب أحمد ظفر

مبتعث جامعة أم القرى بمكة

كلية التربية / مكة المكرمة

معلومات عامـــــــــــــــة

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الاسئلة ١ ـ ١١

تعليمات :

الرجاء الاجابة على الاسئلة التالية بوضع علامة (x) فى الفراغ المواجه للاجابة التى تختارها والتى تنطبق عليك .

١ ـ ما جنســـــك ؟

ـــــــ ذكر ـــــــ أنثى.

٢ ـ متى تخرجت من كلية التربية بمكة ؟

ـــ ١٣٩٦/٩٥هـ ـــ ١٣٩٧/٩٦هـ ـــ ١٣٩٨/٩٧هـ ـــ١٣٩٩/٩٨هـ ـــ ١٤٠٠/٩٩هـ ـــ

٣ ـ كم كان عدد الساعات اللازمة لاعتماد تخرجك فى الرياضيات .

ـــــ ٦٠ ساعة معتمدة ـــــ ٤٠ ساعة معتمدة

٤ ـ ماذا كان المعدل العام لدرجاتك ؟

ـــ ٤ر٠٠ ـــ ٣ر٥٠ ـــ ٣ر٠٠ ـــ ٢ر٥٠ ـــ ٢ر٠٠

٥ ـ ماذا كان معدل درجاتك فى مادة التخصص ؟

ـــ ٤ر٠٠ ـــ ٣ر٥٠ ـــ ٣ر٠٠ ـــ ٢ر٥٠ ـــ ٢ر٠٠

٦ ـ هل تعمل الآن كمدرس متفرغ ؟

ـــــ نعم ـــــ لا.

٧ ـ هل عملك الحالى يتطلب منك تدريس الرياضيات ؟

ـــــ نعم ـــــ لا.

٨ ـ ما المرحلة المدرسية التى تقوم بتدريسها؟

ـــــ المرحلة المتوسطة ـــــ المرحلة الثانوية .

٩ ـ ما هى النسبة المئوية التى تمثل الوقت الذى تخصصه لتدريس الرياضيات؟

ـــــ ١٠٠ ٪ ـــــ ٨٠ ٪ ـــــ ٦٠ ٪ ـــ أقل من ٥٠ ٪ ـــ لاشىء

١٠ ـ ما هى المادة (أو المواد) الاخرى التى تقوم بتدريسها بالاضافة الى مادة الرياضيات ؟

ـــــ (١) ـــــ (٢) ـــــ (٣)

١١ ـ هل انت مكلف بأعمال ادارية فى المدرسة بالاضافة الى عملك كمدرس ؟

ـــــ نعم ـــــ لا .

الجـــــــزء الأول

الاسئلـــــة ١٢ – ٢٦

فعالية المواد التربوية فى اعداد مدرسي الرياضيات .

تعليمات :

فى هذا الجزء تجد عددا من المواد والمقررات التربوية التى درستها فى كلية التربية والتى خصصت لاعدادك كمدرس لمادة الرياضيات فى مراحل التعليم العام . المرجو أن تضع دائرة حول الرقم الذى يعكس فى اعتقادك أهمية وقيمة كل مادة من حيث مساهمتها فى اعدادك لمادة الرياضيات .

	مفيد جدا	مفيد	غير مفيد	ذو فائدة محدودة	ليس له فائدة بالمرة
١٢– المدخل الى التربية وعلم النفس .	١	٢	٣	٤	٥
١٣– الاسس الاجتماعية والفلسفية للتربية .	١	٢	٣	٤	٥
١٤– تطور الفكر التربوى .	١	٢	٣	٤	٥
١٥– علم النفس التكوينى (طفولة ومراهقة) .	١	٢	٣	٤	٥
١٦– علم النفس التربوى .	١	٢	٣	٤	٥
١٧– أسس المناهج .	١	٢	٣	٤	٥
١٨– وسائل تعليمية .	١	٢	٣	٤	٥
١٩– طرق تدريس الرياضيات(١)	١	٢	٣	٤	٥
٢٠– تربية عملية (١)	١	٢	٣	٤	٥
٢١– التعليم فى المملكة العربية السعودية .	١	٢	٣	٤	٥
٢٢– الادارة التربوية والتخطيط .	١	٢	٣	٤	٥
٢٣– مقدمة فى الارشاد والصحة النفسية .	١	٢	٣	٤	٥

	مفيد جدا	مفيد	غير متأكد	ذو فائدة محدودة	ليس له فائدة بالمرة
٢٤- تنظيمات المناهج .	١	٢	٣	٤	٥
٢٥- طرق تدريس الرياضيات (٢).	١	٢	٣	٤	٥
٢٦- تربية عملية (٢).	١	٢	٣	٤	٥

الجـــــزء الثانـــــى

الاسئلـــــة ٢٧ – ٤٨

فعالية المواد الرياضية المقدمة في كلية التربية بمكة فى اعداد مدرسى الرياضيات للتدريس فى المرحلتين المتوسطة والثانوية .

تعليمات :

فى هذا الجزء تجد عددا من العبارات التى تصف أهمية وقيمة المواد والمقررات الرياضية التى درستها فى كلية التربية بمكة فى اعدادك كمدرس لمادة الرياضيات فى مراحل التعليم العام. المرجو ان تضع دائرة حول الرقم الذى يوافق اعتقادك نحو مضمون كل عبارة .

	أوافق تماما	أوافق	غير متأكد	لا أوافق	لا أوافق مطلقا
٢٧- موادالرياضيات التى درستها كانت مفيدة ونافعة فى فهم الاساسيات اللازمة لتدريس الرياضيات فى المدارس .	١	٢	٣	٤	٥
٢٨- برامج الدراسة فى قسم الرياضيات بكلية التربية بمكة كانت معدة بطريقة تعيننى على فهم أهداف تدريس الرياضيات فى المدارس.	١	٢	٣	٤	٥
برامج الدراسة فى قسم الرياضيات بكلية التربية بمكة جعلتنى كفوا الى حد كبير فى تدريس المواد التالية :					
٢٩- الجبر .	١	٢	٣	٤	٥
٣٠- الهندسة .	١	٢	٣	٤	٥
٣١- حساب المثلثات .					
٣٢- التفاضل والتكامل .	١	٢	٣	٤	٥
٣٣- الحساب .	١	٢	٣	٤	٥
٣٤- الاحصاء .	١	٢	٣	٤	٥
٣٥- الهندسة التحليلية .	١	٢	٣	٤	٥
٣٦- الرياضيات المعاصرة	١	٢	٣	٤	٥

	أوافق تماما	أوافق	غير متأكد	لا أوافق	لا أوافق مطلقا
٣٧- برامج الدراسة التى درستها فى قسم الرياضيات بكلية التربية تمكننى بدرجة كافية من متابعة الدراسات العليا فى هذا التخصص .	١	٢	٣	٤	٥
٣٨- برامج الدراسة التى درستها فى قسم الرياضيات بكلية التربية اوجدت فى نفسى القدرة على تطوير مناهج الرياضيات فى مختلف مراحل التعليم .	١	٢	٣	٤	٥
٣٩- برامج الدراسة فى قسم الرياضيات بكلية التربية اعطتنى القدرة على تقييم مناهج الرياضيات وبرامجها فى المدارس .	١	٢	٣	٤	٥
٤٠- برامج الدراسة فى قسم الرياضيات بكلية التربية مكنتنى من وضع امتحانات فعالة لتقييم تحصيل الطلاب فى الرياضيات .	١	٢	٣	٤	٥
٤١- برامج الدراسة قى قسم الرياضيات بكلية التربية زودتنى بالتدريب الكافى فى طرق تدريس الرياضيات	١	٢	٣	٤	٥
برامج الدراسة فى قسم الرياضيات بكلية التربية زودتنى بفرص كافية للبحث فى المجالات التالية :					

	أوافق تماما	أوافق	غير متأكد	لا أوافق	لا أوافق مطلقا
٤٢- تخطيط مناهج الرياضيات	١	٢	٣	٤	٥
٤٣- تقييم المقررات الدراسية للرياضيات .	١	٢	٣	٤	٥
٤٤- تطور مفاهيم الرياضيات	١	٢	٣	٤	٥
٤٥- مشاكل تدريس الرياضيات	١	٢	٣	٤	٥
٤٦- الرياضيات العامة	١	٢	٣	٤	٥
٤٧- تأليف الكتب الدراسية في مادة الرياضيات .	١	٢	٣	٤	٥
٤٨- التقييم والمدرجات	١	٢	٣	٤	٥

الجزء الثالث
الاسئلة ٤٩ – ٥٢

العلاقة بين احتياجات المدارس فيما يتعلق بتدريس مناهج الرياضيات وبين البرامج الدراسية فى قسم الرياضيات بكلية التربية .

تعليمات :

ضع دائرة حول الرقم الذى يعكس اعتقادك نحو كل من العبارات التالية والتى تصف العلاقة بين احتياجات المدارس فيما يتعلق بتدريس مناهج الرياضيات والبرامج الدراسية المقدمة فى قسم الرياضيات بكلية التربية بمكة .

	أوافق تماما	أوافق	غير متأكد	لا أوافق	لا أوافق مطلقا
٤٩– هناك علاقة متبادلة وقوية بين اهداف تدريس الرياضيات فى المدارس واهداف برامج الرياضيات فى كلية التربية .	١	٢	٣	٤	٥
٥٠– ٥٠ ٪ من مواد قسم الرياضيات فى كلية التربية لايستفيد منها المدرس فى تدريس الرياضيات داخل الفصل الدراسى .	١	٢	٣	٤	٥
٥١– مناهج قسم الرياضيات فى كلية التربية لاتأخذ فى الاعتبار الاختلاف بين المرحلتين المتوسطة والثانوية فى تدريس الرياضيات	١	٢	٣	٤	٥
٥٢– مواد قسم الرياضيات فى كلية التربية لاتعد المدرس بما فيه الكفاية لتدريس الرياضيات المعاصرة فى المدارس .	١	٢	٣	٤	٥

الجـــزء الرابـــع

الاسئلة ٥٣ - ٦٤

التوصـــــــــيـــات

تعليمات :

ضع دائرة حول الرقم الذى يعكس درجة موافقتك نحو كل عبارة من العبارات التالية والتى تصف اقتراحات تتعلق ببرنامج قسم الرياضيات فى كلية التربية بمكـــــــــة .

	أوافق تماما	أوافق	غير متأكد	لا أوافق	لا أوافق مطلقا
٥٣- برنامج قسم الرياضيات فى كلية التربية يجب ان يكون على اتصال وثيق بتدريس الرياضيات فى المدارس .	١	٢	٣	٤	٥
٥٤- يجب ان يكون هناك اتصال وثيق بين مدارس المملكة وقسم الرياضيات فى كلية التربية لتنسيق التعاون بينهما فى اعداد برامج التأهيل والتدريس فى المدارس	١	٢	٣	٤	٥
٥٥- يجب ان تكون هناك حلقات دراسية تضم طلبة المدارس ومدرسى الرياضيات واساتذة الرياضيات فى كلية التربية لبحث موضوع مادة الرياضيات ووسائل تطويرها	١	٢	٣	٤	٥
٥٦- مواد قسم الرياضيات فى كلية التربية يجب ان تكون وثيقة الصلة الى حد كبير باحتياجات تدريس الرياضيات فى المدارس .	١	٢	٣	٤	٥

	أوافق تماما	أوافق	غير متأكد	لا أوافق	لا أوافق مطلقا
٥٧- ينبغى ان يزيد الاهتمام بالتربية العملية لطلاب قسم الرياضيات فى الكلية .	١	٢	٣	٤	٥
٥٨- ينبغى ان تعقد كلية التربية دورات تدريبية لمدرسى الرياضيات مرة كل سنتين لتجديد معلوماتهم وتحسين مستوى ادائهم .	١	٢	٣	٤	٥
٥٩ برنامج كلية التربية الحالى لاعداد مدرسى الرياضيات لايحتاج الى أى تحسين او تطوير .	١	٢	٣	٤	٥
٦٠- برنامج كلية التربية الحالى لاعداد مدرسى الرياضيات يجب ان يركز أكثر على المشاكل الواقعية فى تدريس الرياضيات فى المدارس بدلا من التركيز على الرياضيات المجردة .	١	٢	٣	٤	٥
٦١- يجب ان يعطى مدرسى الرياضيات حرية كبيرة كى يستخدموا طرق البحث والتجريب فيما يتعلق بوسائل التدريس الحديثة .	١	٢	٣	٤	٥
٦٢- مدرسوا الرياضيات المتدربين قبل التخرج ينبغى ان يكونوا أحسن اعدادا فيما يتعلق بوسائل تقييم واختبار الطلاب .	١	٢	٣	٤	٥
٦٣- المواد الدراسية فى قسم الرياضيات ينبغى ان تركز على دراسة الرياضيات المجردة .	١	٢	٣	٤	٥

٦٤ - اكتب فى الفراغ المدرج اسفله مقترحاتك التى ترى اضافتها الى المقترحات السابقة والتى تعتقد انها تساهم فى تطوير مناهج الدراسة فى قسم الرياضيات بكلية التربية بمكة المكرمة .

Dear Mathematics Teacher:

Efforts are being made to improve the quality and quantity of educational services in the Kingdom of Saudi Arabia. Teachers are considered to be the cornerstone of the educational process, and it is more so in the area of teaching mathematics, which has gone through technical and up-to-date changes in light of technological development and progress. The success of mathematics teachers in achieving the objectives of mathematics programs offered in schools is contingent on the way they were trained and prepared by their colleges.

This study is an attempt to assess the program and curricula used in preparing teachers of mathematics, as well as their needs. Your participation, cooperation, and honesty in responding to the questionnaire are highly appreciated and are a reflection of your awareness of the importance of this study.

The questionnaire consists of five parts:

1. General information
2. Adequacy of professional courses for teaching mathematics
3. Adequacy of courses in mathematics for teaching math in schools
4. Correlation between the high school objectives for a math curriculum and the design of the curriculum at the College of Education
5. Recommendations

Please make sure you read and understand the instructions provided for each part, which will help you in completing the questionnaire.

Thank you for your participation and cooperation.

Abdulwahab Zafar

QUESTIONNAIRE

PART I

GENERAL INFORMATION

Questions 1-11

DIRECTIONS: Please answer the following questions by putting an X in the blank space against the answer that most appropriately describes your response:

1. What is your sex?

   Male_____ Female_____

2. When did you graduate from the College of Education, Mecca?

   1975-76___ 1976-77___ 1977-78___ 1978-79___ 1979-80___

3. Did you graduate with 60 or 40 credits in Mathematics?

   60 credit hours_____ 40 credit hours_____

4. What was your overall Grade Point Average?

   4.0____ 3.5____ 3.0____ 2.5____ 2.0____

5. What was your Grade Point Average in Mathematics?

   4.0____ 3.5____ 3.0____ 2.5____ 2.0____

6. Are you working as a full-time teacher?

   Yes_____ No_____

7. Are you required to teach Mathematics in your present job assignment?

   Yes_____ No_____

8. At what level are you teaching now? _____

9. What percentage of your teaching assignment is devoted to teaching Mathematics?

   100%___ 80%___ 60%___ 50%___ Less than 50%___ None___

10. List the subject or subjects other than Mathematics you teach.

    1._____ 2._____ 3._____

11. Are you involved in any administrative duties in addition to teaching?

    Yes____ No_____

PART II

ADEQUACY OF PROFESSIONAL COURSES TO PREPARE AS A TEACHER OF MATHEMATICS

Questions 12-26

DIRECTIONS: Please record your assessment of the following professional courses by circling the number that appears in the column headed by a word or phrase that bears the nearest approximation to your opinion to indicate how well the particular course has prepared you as a teacher of Mathematics in schools:

	Very Valuable	Valuable	Uncertain	Of Little Value	Of No Value
12. Introduction to Education and Psychology	1	2	3	4	5
13. Social and Philosophical Foundations of Education	1	2	3	4	5
14. Development of Educational Thought	1	2	3	4	5
15. Developmental Psychology (Childhood and Adolescent)	1	2	3	4	5
16. Educational Psychology	1	2	3	4	5
17. Principles of Curriculum	1	2	3	4	5
18. Educational Media	1	2	3	4	5
19. Methods of Teaching Mathematics (1)	1	2	3	4	5
20. Student Teaching (1)	1	2	3	4	5
21. Education in Saudi Arabia	1	2	3	4	5
22. Educational Administration and Planning	1	2	3	4	5
23. Introduction to Counseling and Mental Hygiene	1	2	3	4	5
24. Curriculum Design	1	2	3	4	5
25. Methods of Teaching Mathematics (2)	1	2	3	4	5
26. Student Teaching (2)	1	2	3	4	5

PART III

ADEQUACY OF THE COURSES IN MATHEMATICS GIVEN BY THE COLLEGE OF EDUCATION, MECCA, FOR TEACHING MATHEMATICS IN INTERMEDIATE, JUNIOR HIGH, AND SENIOR HIGH SCHOOLS

Questions 27-48

DIRECTIONS: Please indicate your assessment of the courses in Mathematics given at the College of Education, Mecca, by circling the number in the column headed by a word or phrase that bears the nearest approximation to your opinion as to how well the courses prepared you to teach Mathematics in Saudi intermediate, junior high, and senior high schools.

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
27. The courses in Mathematics I took were valuable in helping me to understand the basics of Mathematics to teach Mathematics at school.	1	2	3	4	5
28. The courses in Mathematics at the College of Education, Mecca, were so designed as to make me adequately aware of the objectives of teaching Mathematics at school.	1	2	3	4	5
Courses in the following Mathematics subjects I took at the College of Education were such as to make me a highly competent teacher of these at school:					
29. Algebra	1	2	3	4	5
30. Geometry	1	2	3	4	5
31. Trigonometry	1	2	3	4	5
32. Calculus	1	2	3	4	5
33. Arithmetic	1	2	3	4	5
34. Statistics	1	2	3	4	5
35. Analytical Geometry	1	2	3	4	5
36. Modern Mathematics	1	2	3	4	5

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
37. Courses in Mathematics I took at the College of Education prepared me sufficiently well to enable me to pursue higher studies in Mathematics.	1	2	3	4	5
38. Courses in Mathematics I took at the College of Education created insights in me to develop curricula in Mathematics at various levels of Saudi schools.	1	2	3	4	5
39. The Mathematics courses developed competence in me to critically assess programs or curricula in schools.	1	2	3	4	5
40. Courses in Mathematics have enabled me to build competent tests to examine the attainment of my students in Mathematics.	1	2	3	4	5
41. I was competently trained in the methods of teaching Mathematics.	1	2	3	4	5
The program in Mathematics at the College of Education provided me with enough research opportunities into:					
42. Curriculum planning in Mathematics	1	2	3	4	5
43. Assessment of courses in Mathematics	1	2	3	4	5
44. Concept developing in Mathematics	1	2	3	4	5
45. Problems of teaching Mathematics	1	2	3	4	5
46. Mathematics in general	1	2	3	4	5
47. Mathematics textbook writing	1	2	3	4	5
48. Evaluation and grading	1	2	3	4	5

PART IV

RELATEDNESS BETWEEN THE SCHOOL MATHEMATICS CURRICULUM NEEDS AND THE COURSES IN MATHEMATICS AT THE COLLEGE OF EDUCATION

Questions 49-52

DIRECTIONS: Please indicate your assessment of the relatedness between the school Mathematics curriculum needs and the courses in Mathematics at the College of Education, Mecca, by circling the number in the column headed by a word or phrase that bears the nearest approximation to your opinion.

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
49. There is a high correlation between the objectives of the Mathematics curriculum at school and the course objectives for Mathematics at the College of Education, Mecca.	1	2	3	4	5
50. Courses in Mathematics at the College of Education, Mecca, include 50% of the material that is never made use of by the teacher of Mathematics in the classroom.	1	2	3	4	5
51. The curriculum of Mathematics at the College of Education does not take into account the differences in teaching Mathematics at intermediate and high school levels.	1	2	3	4	5
52. The courses in Mathematics at the College of Education do not prepare teachers adequately to teach Modern Mathematics.	1	2	3	4	5

PART V

RECOMMENDATIONS

Questions 53-64

DIRECTIONS: Please indicate the degree of your agreement with the following recommendations regarding the program for Mathematics at the College of Education by circling the number in the column headed by a word or phrase that very nearly approximates the degree of your response.

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
53. The program in Mathematics at the College of Education ought to have a closer bearing on teaching Mathematics at school.	1	2	3	4	5
54. A closer contact between schools in the country and the Department of Mathematics of the College of Education must be maintained to coordinate their programs.	1	2	3	4	5
55. There should be more seminars between the students and faculty of the Department of Mathematics of the College of Education and the teachers of Mathematics at school.	1	2	3	4	5
56. Courses in Mathematics at the College of Education need greater relevance in terms of the needs of teaching Mathematics at school.	1	2	3	4	5
57. Student teaching for Mathematics should be supervised largely by school teachers.	1	2	3	4	5
58. The College of Education should conduct in-service refresher courses at least once every two years.	1	2	3	4	5
59. The present program in Mathematics for teachers of Mathematics needs no improvement.	1	2	3	4	5

	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
60. The program in Mathematics for prospective teachers of Mathematics should place greater emphasis on practical problems of teaching the subject at school than on mathematical abstractions.	1	2	3	4	5
61. Prospective Mathematics teachers should be given greater freedom to experiment with new teaching methods.	1	2	3	4	5
62. Student teachers of Mathematics should be better prepared in the techniques of testing and evaluating.	1	2	3	4	5
63. Courses in Mathematics at the College of Education should emphasize the study of abstract Mathematics.	1	2	3	4	5

64. What other suggestions, in addition to the above, would you like to make in order to improve the Mathematics curriculum at the College of Education, Mecca?

_____

_____

_____

_____

_____

_____

_____

_____

_____

APPENDIX B

FREQUENCIES

Table B-1.1.--Personal background.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A01: Sex			
Male	76	65.5	65.5
Female	40	34.5	34.5
Total	116	100.0	100.0
Question A02: Year Graduated From Mecca College of Education			
Year 1975/76	15	12.9	12.9
Year 1976/77	22	19.0	19.0
Year 1977/78	29	25.0	25.0
Year 1978/79	22	19.0	19.0
Year 1979/80	28	24.1	24.1
Total	116	100.0	100.0
Question A03: Graduated With 40 or 60 Credits			
40 credits	74	63.8	63.8
60 credits	42	36.2	36.2
Total	116	100.0	100.0

Table B-1.2.--Academic performance.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A04: Overall GPA			
1.51-2.00	12	10.3	10.3
2.01-2.50	40	34.5	34.5
2.51-3.00	38	32.8	32.8
3.01-3.50	24	20.7	20.7
3.51-4.00	2	1.7	1.7
Total	116	100.0	100.0
Question A05: Mathematics GPA			
1.51-2.00	9	7.8	7.8
2.01-2.50	38	32.8	32.8
2.51-3.00	32	27.6	27.6
3.01-3.50	32	27.6	27.6
3.51-4.00	5	4.3	4.3
Total	116	100.0	100.0

Table B-1.3.--Working situation.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A06: Working as a Full-Time Teacher?			
No	1	.9	.9
Yes	112	96.6	99.1
No response	3	2.6	--
Total	116	100.0	100.0
Question A07: Required to Teach Mathematics?			
No	2	1.7	1.8
Yes	111	95.7	98.2
No response	3	2.6	--
Total	116	100.0	100.0
Question A08: Teaching at Which Level?			
Middle school	83	71.6	74.1
High school	28	24.1	25.0
Junior college	1	.9	.9
No response	4	3.4	--
Total	116	100.0	100.0
Question A09: Percent of Mathematics Teaching Duty			
None	1	.9	.9
60 percent	3	2.6	2.7
70 percent	1	.9	.9
80 percent	19	16.4	17.0
100 percent	88	75.9	78.6
No response	4	3.4	--
Total	116	100.0	100.0
Question A11: Administrative Duties			
No	99	85.3	88.4
Yes	13	11.2	11.6
No response	4	3.4	--
Total	116	100.0	100.0

Table B-2.--Education curriculum.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A12: Introduction to Education and Psychology			
Very positive	23	19.8	19.8
Positive	58	50.4	50.4
+/-	4	3.4	3.4
Negative	25	21.6	21.6
Very negative	6	5.2	5.2
Total	116	100.0	100.0
Mean 2.422	Standard deviation 1.181		
Question A13: Social and Philosophical Foundations of Education			
Very positive	7	6.0	6.0
Positive	65	56.0	56.0
+/-	8	6.9	6.9
Negative	26	22.4	22.4
Very negative	10	8.6	8.6
Total	116	100.0	100.0
Mean 2.716	Standard deviation 1.141		
Question A14: Development of Educational Thought			
Very positive	10	8.6	8.6
Positive	53	45.7	45.7
+/-	11	9.5	9.5
Negative	32	27.6	27.6
Very negative	10	8.6	8.6
Total	116	100.0	100.0
Mean 2.819	Standard deviation .110		
Question A15: Developmental Psychology			
Very positive	62	53.4	53.4
Positive	38	32.8	32.8
+/-	4	3.4	3.4
Negative	11	9.5	9.5
Very negative	1	.9	.9
Total	116	100.0	100.0
Mean 1.716	Standard deviation .976		

Table B-2.--Continued.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A16: Educational Psychology (Childhood and Adolescence)			
Very positive	41	35.3	35.3
Positive	55	47.4	47.4
+/-	4	3.4	3.4
Negative	14	12.1	12.1
Very negative	2	1.7	1.7
Total	116	100.0	100.0
Mean 1.974	Standard deviation 1.017		
Question A17: Principles of Curriculum			
Very positive	41	35.3	35.3
Positive	52	44.8	44.8
+/-	9	7.8	7.8
Negative	10	8.6	8.6
Very negative	4	3.4	3.4
Total	116	100.0	100.0
Mean 2.000	Standard deviation 1.047		
Question A18: Educational Media			
Very positive	76	65.5	65.5
Positive	30	25.9	25.9
+/-	1	.9	.9
Negative	7	6.0	6.0
Very negative	2	1.7	1.7
Total	116	100.0	100.0
Mean 1.526	Standard deviation .918		
Question A19: Methods of Teaching Math (1)			
Very positive	89	76.7	76.7
Positive	20	17.2	17.2
+/-	3	2.6	2.6
Negative	4	3.4	3.4
Total	116	100.0	100.0
Mean 1.328	Standard deviation .695		

Table B-2.--Continued.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A20: Student Teaching (1)			
Very positive	97	83.6	83.6
Positive	15	12.9	12.9
Negative	3	2.6	2.6
Very negative	1	.9	.9
Total	116	100.0	100.0
Mean 1.241	Standard deviation .668		
Question A21: Education in Saudi Arabia			
Very positive	7	6.0	6.0
Positive	30	25.9	25.9
+/-	29	25.0	25.0
Negative	43	37.1	37.1
Very negative	7	6.0	6.0
Total	116	100.0	100.0
Mean 3.112	Standard deviation 1.053		
Question A22: Educational Administration and Planning			
Very positive	24	20.7	20.7
Positive	54	46.6	46.6
+/-	12	10.3	10.3
Negative	19	16.4	16.4
Very negative	7	6.0	6.0
Total	116	100.0	100.0
Mean 2.405	Standard deviation 1.165		
Question A23: Introduction to Counseling and Mental Hygiene			
Very positive	27	23.3	23.3
Positive	46	39.7	39.7
+/-	8	6.9	6.9
Negative	23	19.8	19.8
Very negative	12	10.3	10.3
Total	116	100.0	100.0
Mean 2.543	Standard deviation 1.321		

Table B-2.--Continued.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A24: Curriculum Design			
Very positive	21	18.1	18.1
Positive	57	49.1	49.1
+/-	15	12.9	12.9
Negative	19	16.4	16.4
Very negative	4	3.4	3.4
Total	116	100.0	100.0
Mean 2.379	Standard deviation 1.069		
Question A25: Methods of Teaching Math (2)			
Very positive	89	76.7	76.7
Positive	22	19.0	19.0
+/-	1	.9	.9
Negative	2	1.7	1.7
Very negative	2	1.7	1.7
Total	116	100.0	100.0
Mean 1.328	Standard deviation .743		
Question A26: Student Teaching (2)			
Very positive	93	80.2	80.2
Positive	21	18.1	18.1
Negative	2	1.7	1.7
Total	116	100.0	100.0
Mean 1.233	Standard deviation .533		

Table B-3.--Mathematics curriculum.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A27: Understand basic math to teach math			
Very positive	27	23.3	23.3
Positive	70	60.3	60.3
Negative	17	14.7	14.7
Very negative	2	1.7	1.7
Total	116	100.0	100.0
Mean 2.112	Standard deviation .985		
Question A28: Understand objectives of teaching math			
Very positive	2	1.7	1.7
Positive	30	25.9	25.9
+/-	30	25.9	25.9
Negative	47	40.5	40.5
Very negative	7	6.0	6.0
Total	116	100.0	100.0
Mean 3.233	Standard deviation .963		
Question A29: Algebra			
Very positive	57	49.1	49.1
Positive	47	40.5	40.5
+/-	3	2.6	2.6
Negative	8	6.9	6.9
Very negative	1	.9	.9
Total	116	100.0	100.0
Mean 1.698	Standard deviation .887		
Question A30: Geometry			
Very positive	31	26.7	26.7
Positive	55	47.4	47.4
+/-	5	4.3	4.3
Negative	21	18.1	18.1
Very negative	4	3.4	3.4
Total	116	100.0	100.0
Mean 2.241	Standard deviation 1.139		

Table B-3.--Continued.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A31: Trigonometry			
Very positive	14	12.1	12.1
Positive	60	51.7	51.7
+/-	26	22.4	22.4
Negative	15	12.9	12.9
Very negative	1	.9	.9
Total	116	100.0	100.0
Mean 2.388	Standard deviation .892		
Question A32: Calculus			
Very positive	58	50.0	50.0
Positive	42	36.2	36.2
+/-	8	6.9	6.9
Negative	7	6.0	6.0
Very negative	1	.9	.9
Total	116	100.0	100.0
Mean 1.716	Standard deviation .902		
Question A33: Arithmetic			
Very positive	30	25.9	25.9
Positive	37	31.9	31.9
+/-	20	17.2	17.2
Negative	24	20.7	20.7
Very negative	5	4.3	4.3
Total	116	100.0	100.0
Mean 2.457	Standard deviation 1.204		
Question A34: Statistics			
Very positive	32	27.6	27.6
Positive	39	33.6	33.6
+/-	20	17.2	17.2
Negative	21	18.1	18.1
Very negative	4	3.4	3.4
Total	116	100.0	100.0
Mean 2.362	Standard deviation 1.168		

Table B-3.--Continued.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A35: Analytical Geometry			
Very positive	44	37.9	37.9
Positive	49	42.2	42.2
+/-	15	12.9	12.9
Negative	8	6.9	6.9
Total	116	100.0	100.0
Mean 1.888	Standard deviation .882		
Question A36: Modern Mathematics			
Very positive	52	44.8	44.8
Positive	48	41.4	41.4
+/-	4	3.4	3.4
Negative	7	6.0	6.0
Very negative	5	4.3	4.3
Total	116	100.0	100.0
Mean 1.836	Standard deviation 1.046		
Question A37: Prepared for Higher Studies in Math			
Very positive	3	2.6	2.6
Positive	40	34.5	34.5
+/-	45	38.8	38.8
Negative	16	13.8	13.8
Very negative	12	10.3	10.3
Total	116	100.0	100.0
Mean 2.948	Standard deviation 1.003		
Question A38: Insight to Develop Math Curricula			
Very positive	2	1.7	1.7
Positive	28	24.1	24.1
+/-	32	27.6	27.6
Negative	42	36.2	36.2
Very negative	12	10.3	10.3
Total	116	100.0	100.0
Mean 3.293	Standard deviation 1.004		

Table B-3.--Continued.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A39: Competent to Critically Assess Programs			
Very positive	8	6.9	6.9
Positive	41	35.3	35.3
+/-	21	18.1	18.1
Negative	42	36.2	36.2
Very negative	4	3.4	3.4
Total	116	100.0	100.0
Mean 2.940	Standard deviation 1.066		
Question A40: Able to Construct Adequate Tests			
Very positive	27	23.3	23.3
Positive	49	42.2	42.2
+/-	14	12.1	12.1
Negative	24	20.7	20.7
Very negative	2	1.7	1.7
Total	116	100.0	100.0
Mean 2.353	Standard deviation 1.105		
Question A41: Competent in Methods of Teaching Math			
Very positive	30	25.9	25.9
Positive	54	46.6	46.6
+/-	9	7.8	7.8
Negative	19	16.4	16.4
Very negative	4	3.4	3.4
Total	116	100.0	100.0
Mean 2.250	Standard deviation 1.118		
Question A42: Curriculum Planning in Math			
Very positive	3	2.6	2.6
Positive	21	18.1	18.1
+/-	21	18.1	18.1
Negative	60	51.7	51.7
Very negative	11	9.5	9.5
Total	116	100.0	100.0
Mean 3.474	Standard deviation .982		

Table B-3.--Continued.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A43: Assessment of Math Courses			
Very positive	5	4.3	4.3
Positive	49	42.2	42.2
+/-	22	19.0	19.0
Negative	36	31.0	31.0
Very negative	4	3.4	3.4
Total	116	100.0	100.0
Mean 2.871	Standard deviation 1.018		
Question A44: Concept Development in Math			
Very positive	4	3.4	3.4
Positive	36	31.0	31.0
+/-	27	23.3	23.3
Negative	42	36.2	36.2
Very negative	7	6.0	6.0
Total	116	100.0	100.0
Mean 3.103	Standard deviation 1.025		
Question A45: Problems of Teaching Math			
Very positive	13	11.2	11.2
Positive	47	40.5	40.5
+/-	25	21.6	21.6
Negative	25	21.6	21.6
Very negative	6	5.2	5.2
Total	116	100.0	100.0
Mean 2.690	Standard deviation 1.091		
Question A46: Mathematics in General			
Very positive	9	7.8	7.8
Positive	48	41.4	41.4
+/-	21	18.1	18.1
Negative	30	25.9	25.9
Very negative	8	6.9	6.9
Total	116	100.0	100.0
Mean 2.828	Standard deviation 1.113		

Table B-3.--Continued.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A47: Math Textbook Writing			
Very positive	1	.9	.9
Positive	6	5.2	5.2
+/-	24	20.7	20.7
Negative	53	45.7	45.7
Very negative	32	27.6	27.6
Total	116	100.0	100.0
Mean 3.940	Standard deviation .878		
Question A48: Evaluation and Grading			
Very positive	7	6.0	6.0
Positive	49	42.2	42.2
+/-	23	19.8	19.8
Negative	33	28.4	28.4
Very negative	4	3.4	3.4
Total	116	100.0	100.0
Mean 2.810	Standard deviation 1.029		

Table B-4.--College-school relations.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A49: High correlation between college and school			
Very positive	7	6.0	6.0
Positive	32	27.6	27.6
+/-	16	13.8	13.8
Negative	48	41.4	41.4
Very negative	13	11.2	11.2
Total	116	100.0	100.0
Mean 3.241	Standard deviation 1.154		
Question A50: Half Material Taught Never Used in School			
Very positive	8	6.9	6.9
Positive	11	9.5	9.5
+/-	9	7.8	7.8
Negative	52	44.8	44.8
Very negative	36	31.0	31.0
Total	116	100.0	100.0
Mean 3.836	Standard deviation 1.172		
Question A51: College Ignores Differences in Schools			
Very positive	4	3.4	3.4
Positive	11	9.5	9.5
+/-	8	6.9	6.9
Negative	53	45.7	45.7
Very negative	40	34.5	34.5
Total	116	100.0	100.0
Mean 3.983	Standard deviation 1.055		
Question A52: College Does Not Prepare Adequately			
Very positive	5	4.3	4.3
Positive	29	25.0	25.0
+/-	6	5.2	5.2
Negative	47	40.5	40.5
Very negative	29	25.0	25.0
Total	116	100.0	100.0
Mean 3.569	Standard deviation 1.232		

Table B-4.--Continued.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A53: College Program Closer to Teaching in Schools			
Very positive	1	.9	.9
Negative	15	12.9	12.9
Very negative	100	86.2	86.2
Total	116	100.0	100.0
Mean 4.836	Standard deviation .492		
Question A54: More Contacts Between Schools and College			
+/-	1	.9	.9
Negative	18	15.5	15.5
Very negative	97	83.6	83.6
Total	116	100.0	100.0
Mean 4.828	Standard deviation .402		
Question A55: More Seminars Between College and Schools			
Positive	3	2.6	2.6
+/-	7	6.0	6.0
Negative	34	29.3	29.3
Very negative	72	62.1	62.1
Total	116	100.0	100.0
Mean 4.509	Standard deviation .728		
Question A56: More Relevance for Needs of Schools			
+/-	2	1.7	1.7
Negative	20	17.2	17.2
Very negative	94	81.0	81.0
Total	116	100.0	100.0
Mean 4.793	Standard deviation .448		

Table B-4.--Continued.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A57: Student Teaching Be Supervised by Teachers			
Very positive	1	.9	.9
Positive	4	3.4	3.4
+/-	4	3.4	3.4
Negative	36	31.0	31.0
Very negative	71	61.2	61.2
Total	116	100.0	100.0
Mean 4.483	Standard deviation .797		
Question A58: College to Offer In-Service Refresher			
Positive	3	2.6	2.6
+/-	3	2.6	2.6
Negative	24	20.7	20.7
Very negative	86	74.1	74.1
Total	116	100.0	100.0
Mean 4.664	Standard deviation .659		
Question A59: Present Program Needs Improvement			
Positive	5	4.3	4.3
+/-	6	5.2	5.2
Negative	62	53.4	53.4
Very negative	43	37.1	37.1
Total	116	100.0	100.0
Mean 4.233	Standard deviation .738		
Question A60: Greater Emphasis on Practical Problems			
Very positive	1	.9	.9
Positive	9	7.8	7.8
+/-	10	8.6	8.6
Negative	50	43.1	43.1
Very negative	46	39.7	39.7
Total	116	100.0	100.0
Mean 4.129	Standard deviation .928		

Table B-4.--Continued.

Category	Absolute Frequency	Relative Frequency (Percent)	Adjusted Frequency (Percent)
Question A61: More Experiments With New Teaching Methods			
Positive	1	.9	.9
+/-	6	5.2	5.2
Negative	47	40.5	40.5
Very negative	62	53.4	53.4
Total	116	100.0	100.0
Mean 4.466	Standard deviation .638		
Question A62: Better Preparation for Testing and Evaluation			
Very positive	1	.9	.9
Positive	2	1.7	1.7
+/-	5	4.3	4.3
Negative	52	44.8	44.8
Very negative	56	48.3	48.3
Total	116	100.0	100.0
Mean 4.379	Standard deviation .730		
Question A63: More Emphasis on Abstract Math			
Very positive	5	4.3	4.3
Positive	19	16.4	16.4
+/-	9	7.8	7.8
Negative	66	56.9	56.9
Very negative	17	14.7	14.7
Total	116	100.0	100.0
Mean 3.612	Standard deviation 1.061		

APPENDIX C

EXPLORATORY FACTOR ANALYSIS

Table C-1.--Means and standard deviations of variables entering the factor analysis.

Variable	Mean	Standard Deviation	Cases
A12	2.4224	1.1806	116
A13	2.7155	1.1406	116
A14	2.8190	1.1839	116
A15	1.7155	.9763	116
A16	1.9741	1.0169	116
A17	2.0000	1.0467	116
A18	1.5259	.9180	116
A19	1.3276	.6950	116
A20	1.2414	.6675	116
A21	3.1121	1.0531	116
A22	2.4052	1.1645	116
A23	2.5431	1.3213	116
A24	2.3793	1.0686	116
A25	1.3276	.7434	116
A26	1.2328	.5334	116
A27	2.1121	.9849	116
A28	3.2328	.9633	116
A29	1.6983	.8868	116
A30	2.2414	1.1392	116
A31	2.3879	.8922	116
A32	1.7155	.9022	116
A33	2.4569	1.2043	116
A34	2.3621	1.1677	116
A35	1.8879	.8824	116
A36	1.8362	1.0463	116

Table C-1.--Continued.

Variable	Mean	Standard Deviation	Cases
A37	2.9483	1.0030	116
A38	3.2931	1.0045	116
A39	2.9397	1.0656	116
A40	2.3534	1.1054	116
A41	2.2500	1.1180	116
A42	3.4741	.9821	116
A43	2.8707	1.0175	116
A44	3.1034	1.0247	116
A45	2.6897	1.0908	116
A46	2.8276	1.1134	116
A47	3.9397	.8776	116
A48	2.8103	1.0293	116
A49	3.2414	1.1544	116
A50	3.8362	1.1717	116
A51	3.9828	1.0549	116
A52	3.5690	1.2316	116
A53	4.8362	.4924	116
A54	4.8276	.4016	116
A55	4.5086	.7283	116
A56	4.7931	.4475	116
A57	4.4828	.7965	116
A58	4.6638	.6586	116
A59	4.2328	.7385	116
A60	4.1293	.9281	116
A61	4.4655	.6384	116
A62	4.3793	.7302	116
A63	2.3879	1.0613	116

Table C-2.--Correlation coefficients.

	A12	A13	A14	A15	A16	A17	A18	A19	A20
A12	1.00000	.35476	.19204	.17306	.36407	.26034	.13023	-.01115	.15637
A13	.35476	1.00000	.56682	.19219	.11355	.08012	.03615	-.10080	.01103
A14	.19204	.56682	1.00000	.10552	.10442	.08420	-.09566	-.00128	-.07626
A15	.17306	.19219	1.0552	1.00000	.33411	.18720	.01313	.06165	.09294
A16	.36407	.11355	.10442	.33411	1.00000	.20423	.20098	-.02482	.12457
A17	.26034	.08012	.08420	.18720	.20423	1.00000	.20813	.13148	.01245
A18	.13023	.03615	-.09566	.01313	.20098	.20813	1.00000	.25917	.24514
A19	-.01115	-.10080	-.00128	.06165	-.02482	.13148	.24917	1.00000	.40912
A20	.15637	.01103	-.07626	.09294	.12457	.01245	.24514	.40912	1.00000
A21	.19938	.06297	.13497	.19197	.12453	.10255	-.09746	.10385	.17147
A22	.20964	.17918	.11043	.14051	.04564	.19974	.01045	.04946	.00733
A23	.20283	.13225	.04116	.31629	.32117	.23891	.39334	-.00604	-.01190
A24	.11313	.03223	.06850	.02932	.00911	.43536	.12288	.05370	.06558
A25	.10847	-.01220	.07785	.04565	.16084	.11175	.24231	.76664*	.32993
A26	.11868	.03832	.10862	.06147	.07532	.01558	.28062	.44932	.62239
A27	.04120	-.12619	-.07940	-.05699	.08974	-.00844	.04966	.11105	-.00182
A28	.06571	-.21621	-.06947	.06177	.08609	-.11211	-.14944	.06695	.00357
A29	-.06823	-.18876	-.16843	.00043	.14555	.23419	.27135	.23230	.13879
A30	-.13466	-.05377	.04558	.09355	.11803	.16773	.11038	.10793	.07137
A31	.01644	-.06151	-.10581	.00800	.16450	-.01862	.04603	.11581	.17722
A32	.08114	-.10468	-.02421	-.02357	.27624	.07366	.01421	.12217	.02838
A33	-.03295	-.13245	-.20983	.14110	.02393	.02759	.05607	.15207	.22940
A34	.05209	-.03951	-.02765	.03775	.00795	.12806	.09664	.13117	.05424
A35	-.12110	-.03195	-.06121	.16455	.15179	.00941	.10558	.21635	.09061
A36	.00722	.08449	-.04521	.00506	.08589	.01588	.00898	.11030	.04465
A37	.15813	-.04338	.08724	.10029	.08393	.09111	.11479	.08689	-.07211
A38	.12199	-.07079	-.07198	.01483	.21179	0	.15201	-.12627	-.19721
A39	.04117	-.13587	-.11902	.05858	.04670	-.10915	-.01172	-.06701	-.05269
A40	.02453	-.05060	.08254	-.03494	.02367	-.01503	-.07335	-.06147	-.11663
A41	.18939	.02898	-.03777	.08166	.10516	.07430	-.06989	.09512	.10486
A42	.26073	-.03379	.05203	.00586	.09075	.08459	.03933	-.10213	-.21589
A43	.08930	.00549	.03815	-.01985	.01355	-.09797	.01757	-.09943	.07196
A44	-.06518	-.20523	-.16361	-.10071	-.03079	-.03243	.11729	-.02358	-.07496
A45	.04191	-.07158	-.05062	.13684	.06326	.07616	.05150	.05498	.07989
A46	.00958	-.04581	-.00409	.03448	.09587	-.05969	.06395	-.06122	-.02542
A47	.08356	-.02599	.03961	-.05066	.13464	-.10412	.12607	-.10987	-.24210
A48	.08797	.04253	.01439	.04834	-.05457	-.04843	-.08679	-.11904	-.05936
A49	.09680	.05261	.06406	-.00798	.10166	.02159	-.17826	-.08858	-.09884
A50	.13216	.04942	-.00902	.04253	.15697	.06381	-.16983	-.17913	-.12690
A51	.06176	-.07638	-.10696	-.00480	.25088	.10238	-.05341	.04335	-.04344
A52	.03062	.02956	-.00627	.15024	.19931	.19560	.14837	.02417	-.00985
A53	.09012	.04017	.03819	-.02542	-.06063	0	.03830	.03110	-.01095
A54	.13658	-.03207	.08008	-.03747	-.16004	0	-.03497	.07949	-.10289
A55	.10192	.01868	.16823	-.21055	-.12299	-.09126	-.24746	-.16025	-.09376
A56	.13518	-.09927	.01075	-.11598	-.12650	-.12993	.03430	-.11568	-.15156
A57	-.02455	-.02937	-.02639	.14396	.06922	.12515	-.07668	-.19390	-.12294
A58	-.01706	-.16315	-.06758	-.05537	.03884	-.20181	-.09335	-.08024	-.09071
A59	.10567	-.04459	.01878	-.22095	-.04981	-.06750	-.00254	-.08208	.06144
A60	.13701	-.13745	.02149	-.15098	-.06092	.06266	-.06009	-.07972	-.05082
A61	.04834	-.04345	.02043	-.16238	-.06167	-.16918	-.12459	-.15071	-.18437
A62	-.04626	-.04681	-.02046	-.06688	-.13892	-.27306	-.31313	-.16131	-.26085
A63	-.00006	.15660	.09098	.22492	-.05508	.03914	-.16656	.02662	-.03513

Table C-2.--Continued.

	A21	A22	A23	A24	A25	A26	A27	A28	A29
A12	.19938	.20964	.20283	.11313	.10847	.11868	.04120	.06571	-.06823
A13	.06297	.17918	.13225	.03223	-.01220	.03832	-.12619	-.21621	-.18876
A14	.13497	.11043	.04116	.06850	.07785	.10862	-.07940	-.06947	-.16843
A15	.19197	.14051	.31629	.02932	.04565	.06147	-.05699	.06177	.00043
A16	.12453	.04564	.32117	.00911	.16084	.07532	.08974	.08609	.14555
A17	.10255	.19974	.23891	.43536	.11175	.01558	-.00844	-.11211	.23419
A18	-.09746	.01045	.39334	.12288	.24231	.28062	.04966	-.14944	.27135
A19	.10385	.04946	-.00604	.05370	.76664	.44932	.11105	.06695	.23230
A20	.17147	.00733	-.01190	.06558	.32993	.62239	-.00182	.03357	.13879
A21	1.00000	.24627	.04337	.30189	.13041	.16989	-.13797	.05978	-.08452
A22	.24627	1.00000	.34175	.37156	.14669	.02884	-.06268	.00047	-.00690
A23	.04337	.34175	1.00000	.16692	-.01450	.09052	.15329	.09794	.12622
A24	.30189	.37156	.16692	1.00000	.07210	.04209	-.01596	-.11186	-.08006
A25	.13041	.14669	-.01450	.07210	1.00000	.48589	.22260	.07474	.34909
A26	.16989	.02884	.09052	.04209	.48589	1.00000	.14856	.11366	.26007
A27	-.13797	-.06268	.15329	-.01596	.22260	.14856	1.00000	.28390	.25809
A28	.05978	.00047	.09794	-.11186	.07474	.11366	.28390	1.00000	.10328
A29	-.08452	-.00690	.12622	-.08006	.34909	.26007	.25809	.10328	1.00000
A30	-.11697	-.09403	.12012	-.06158	.17279	.15002	.20045	.08306	.55474
A31	.11066	-.01869	.07789	-.04623	.30494	.19234	.35583	.14697	.43497
A32	-.03022	.01962	.05779	.06780	.32166	.15687	.35914	.16689	.33738
A33	-.05444	-.05254	.14326	-.07503	.16161	.15790	.29371	.20736	.41518
A34	.09400	-.07045	.10252	.11896	.11261	.18464	.28956	.21819	-.00275
A35	.00428	.02765	.20927	.01781	.29507	.18524	.45484	.20486	.37868
A36	-.05422	.06208	.08377	-.03728	.14785	.08449	.22894	.31424	.25555
A37	.22781	.17444	.08699	.09149	.10456	.03895	.09395	.10257	.01163
A38	.07554	.03883	.14108	-.02347	-.01325	-.07975	.15989	.16253	.11967
A39	.03707	-.07823	.10377	.00500	-.00776	-.00567	.20536	.31877	.16461
A40	.04038	.06342	.11748	.05483	.03777	.00674	.20293	.34672	.24280
A41	.21233	.16864	.07211	.15285	.23540	.16405	.21915	.23616	.22584
A42	.14155	.18791	.09468	.23315	.03553	.00329	.09742	.22241	.00594
A43	-.01070	.16936	.10443	-.01048	-.02398	.10401	.17946	.24389	.03348
A44	.16643	.09573	.08659	.09886	.06928	.08284	.19520	.23086	.13033
A45	.06839	.18200	.05763	.19140	.15864	.12524	.04075	.22658	.17204
A46	.00179	-.06637	.08194	.07007	.06883	.02424	.12087	.19990	.04373
A47	-.04907	-.12902	.03601	-.16083	.04389	-.06262	.09844	.11961	-.04594
A48	-.01231	.17349	.08279	.10551	-.12266	-.02977	.11551	.17646	.01298
A49	.11346	.16595	.09574	.16481	-.10308	-.13441	.16722	.21491	-.04716
A50	.13480	.10004	.05234	.00838	-.04768	-.14718	.19689	.24978	.05245
A51	.10351	-.14292	-.03066	-.08672	.16251	.00719	.16928	-.05592	.19889
A52	.09120	-.13181	.09701	-.05309	.01310	.04816	.13336	.07064	.16650
A53	-.03137	.13189	.09781	.03647	.07658	-.05223	.00232	-.23056	.06506
A54	.10775	-.01667	-.08418	-.00838	-.01306	-.09518	-.12659	.01472	-.12291
A55	-.02962	.00097	-.31667	.01811	-.00526	-.10595	-.00742	-.09585	-.13731
A56	.08652	-.15476	.01521	.07461	-.23883	-.12436	-.06531	-.06885	-.24629
A57	.02824	.04041	-.04473	-.00247	-.16660	-.18491	-.20258	-.06839	-.07513
A58	.16762	-.13829	-.05814	-.08904	-.16382	-.09709	-.11568	-.01264	-.36872
A59	.05562	.13206	.07429	.12957	-.07674	-.02836	.04752	.04542	-.02461
A60	-.04165	-.07303	-.25630	.12547	-.09974	-.21942	.00303	-.15067	-.20574
A61	-.02654	-.10386	-.24049	-.04440	-.08593	-.26993	-.06987	-.12117	-.13374
A62	-.10100	-.11073	-.17933	-.24173	-.18285	-.34031	-.16846	.03410	-.27831
A63	.06968	.06872	.01588	-.18454	-.08532	-.02264	-.04195	.02148	-.05934

Table C-2.--Continued.

	A30	A31	A32	A33	A34	A35	A36	A37	A38
A12	-.13466	.01644	.08114	-.03295	.05209	-.12110	.00722	.15813	.12199
A13	-.05377	-.06151	-.10468	-.13245	-.03951	-.03195	.08449	-.04338	-.07079
A14	.04558	-.10581	-.02421	-.20983	-.02765	-.06121	-.04521	.08724	-.07198
A15	.09355	.00800	-.02357	.14110	.03775	.16455	.00506	.10029	.01483
A16	.11803	.16450	.27624	.02393	.00795	.15179	.08589	.08393	.21179
A17	.16773	-.01862	.07366	.02759	.12806	.00941	.01588	.09111	0
A18	.11038	.04603	.01421	.05607	.09664	.10558	.00898	.11479	.15201
A19	.10793	.11581	.12217	.15207	.13117	.21635	.11030	.08689	-.12627
A20	.07137	.17722	.02838	.22940	.05424	.09061	.04465	-.07211	-.19721
A21	-.11697	.11066	-.03022	-.05444	.09400	.00428	-.05422	.22781	.07554
A22	-.09403	-.01869	.01962	-.05254	-.07045	.02765	.06208	.17444	.03883
A23	.12012	.07789	.05779	.14326	.10252	.20927	.08377	.08699	.14108
A24	-.06158	-.04623	.06780	-.07503	.11896	.01781	-.03728	.09149	-.02347
A25	.17279	.30494	.32166	.16161	.11261	.29507	.14785	.10456	-.01325
A26	.15002	.19234	.15687	.15790	.18464	.18524	.08449	.03895	-.07975
A27	.20045	.35583	.35914	.29371	.28956	.45484	.22894	.09395	.15989
A28	.08306	.14697	.16689	.20736	.21819	.20486	.31424	.10257	.16253
A29	.55474	.43497	.33738	.41518	-.00275	.37868	.25555	.01163	.11967
A30	1.00000	.36906	.22814	.37528	.06447	.42507	.23774	.09474	.08202
A31	.36906	1.00000	.35434	.41630	.13945	.47542	.32017	.01290	.13400
A32	.22814	.35434	1.00000	.28873	.13164	.47296	.31868	.16617	.18875
A33	.37528	.41630	.28873	1.00000	.19053	.47411	.21174	.08453	.02491
A34	.06447	.13945	.13164	.19053	1.00000	.23383	.19844	.20918	.08667
A35	.42507	.47542	.47296	.47411	.23383	1.00000	.26251	.12112	.15511
A36	.23774	.32017	.31868	.21174	.19844	.26251	1.00000	.10786	.21156
A37	.09474	.01290	.16617	.08453	.20918	.12112	.10786	1.00000	.36042
A38	.08202	.13400	.18875	.02491	.08667	.15511	.21156	.36042	1.00000
A39	.13388	.19862	.22620	.31983	.07362	.28868	.31084	.13537	.42848
A40	.14954	.17718	.19761	.18465	.04821	.21927	.26102	.14997	.34446
A41	.17068	.26806	.33835	.26963	.04330	.15204	.33266	.12019	.09679
A42	.01340	.06613	.06523	.03581	.15989	.06185	.10162	.21049	.39559
A43	-.01785	.06532	.13955	.11250	-.01880	.08057	.15963	.04451	.11398
A44	.06781	.23154	.13557	.16571	.25185	.17642	.22681	.19984	.26596
A45	.15178	.08011	.17458	.11550	.04803	.12617	.31318	.07263	.09961
A46	.21821	.12044	.22776	.13709	.12201	.28110	.22189	.19440	.22441
A47	.04079	-.02537	.07697	.02631	.12333	.09225	.03649	.36193	.50356
A48	.06905	-.07069	.17549	.22485	.09381	.15831	.10818	.09149	.12993
A49	.10078	-.01572	.09990	.12014	.07653	.12069	.31381	.25121	.33592
A50	-.03527	.14449	.08715	.01036	.09457	.09984	.21200	.08152	.41794
A51	.05415	.26587	.21408	-.06220	-.10078	.14738	-.03410	.13887	.17715
A52	.05001	.10601	.09215	-.01850	.13969	.01918	.35636	.06626	.33495
A53	.04009	-.09162	-.00793	-.00468	.05867	.05745	.01499	.14115	.09790
A54	-.06029	-.19998	-.18452	-.10539	.06010	-.17767	-.02640	.23670	-.08919
A55	-.13879	-.05203	-.00285	-.21770	-.08551	-.30294	.06464	.08395	.02029
A56	-.13997	-.34167	-.16857	-.06509	.01148	-.16932	-.24013	.11155	.13607
A57	-.12953	-.25357	-.18233	-.25913	.03482	-.25639	-.02950	.00976	.09331
A58	-.19222	-.30883	-.11845	-.22124	.03528	-.27486	-.24465	.07875	.05824
A59	.16004	.08613	.06109	.16293	.15353	-.07972	.03852	.20423	.08307
A60	-.31763	-.22912	-.17376	-.17002	-.13987	-.26883	-.21082	.04461	.06159
A61	-.27544	-.09082	-.08512	-.23383	-.09977	-.24620	-.05410	.05152	-.06547
A62	-.32011	-.24119	-.13837	-.21858	-.20328	-.10890	-.13424	-.04422	.02494
A63	.13045	-.02256	-.09261	-.15348	-.00907	.00040	.09687	-.10352	-.21361

Table C-2.--Continued.

	A39	A40	A41	A42	A43	A44	A45	A46	A47
A12	.04117	.02453	.18939	.26073	.08930	-.06518	.04191	.00958	.08356
A13	-.13587	-.05060	.02898	-.03379	.00549	-.20523	-.07158	-.04581	-.02599
A14	-.11902	.08254	-.03777	.05203	.03815	-.16361	-.05062	-.00409	.03961
A15	.05858	-.03494	.08166	.00586	-.01985	-.10071	.13684	.03448	-.05066
A16	.04670	.02367	.10516	.09075	.01355	-.03079	.06326	.09587	.13464
A17	-.10915	-.01503	.07430	.08459	-.09797	-.03243	.07616	-.05969	-.10412
A18	-.01172	-.07335	-.06989	.03933	.01757	.11729	.05150	.06395	.12607
A19	-.06701	-.06147	.09512	-.10213	-.09943	-.02358	.05498	-.06122	-.10987
A20	-.05269	-.11663	.10486	-.21589	.07196	-.07496	.07989	-.02542	-.24210
A21	.03707	.04038	.21233	.14155	-.01070	.16643	.06839	.00179	-.04907
A22	-.07823	.06342	.16864	.18791	.16936	.09573	.18200	-.06637	-.12902
A23	.10377	.11748	.07211	.09468	.10443	.08659	.05763	.08194	.03601
A24	.00500	.05483	.15285	.23315	-.01048	.09886	.19140	.07007	-.16083
A25	-.00776	.03777	.23540	.03553	-.02398	.06928	.15864	.06883	.04389
A26	-.00567	.00674	.16405	.00329	.10401	.08284	.12524	.02424	-.06262
A27	.20536	.20293	.21915	.09742	.17946	.19520	.04075	.12087	.09844
A28	.31877	.34672	.23616	.22241	.24389	.23086	.22658	.19990	.11961
A29	.16461	.24280	.22584	.00594	.03348	.13033	.17204	.04373	-.04594
A30	.13388	.14954	.17068	.01340	-.01785	.06781	.15178	.21821	.04079
A31	.19862	.17718	.26806	.06613	.06532	.23154	.08011	.12044	-.02537
A32	.22620	.19761	.33835	.06523	.13955	.13557	.17458	.22776	.07697
A33	.31983	.18465	.26963	.03581	.11250	.16571	.11550	.13709	.02631
A34	.07362	.04821	.04330	.15989	-.01880	.25185	.04803	.12201	.12333
A35	.28868	.21927	.15204	.06185	.08057	.17642	.12617	.28110	.09226
A36	.31084	.26102	.33266	.10162	.15963	.22681	.31318	.22189	.03649
A37	.13537	.14997	.12019	.21049	.04451	.19984	.07263	.19440	.36193
A38	.52848	.34446	.09679	.39559	.11398	.26596	.09961	.22441	.50356
A39	1.00000	.50552	.34123	.40980	.34563	.30838	.22315	.21837	.30292
A40	.50552	1.00000	.37820	.18872	.25747	.12098	.37304	.21953	.16560
A41	.34123	.37820	1.00000	.19204	.19683	.20493	.34939	.13273	.04209
A42	.40980	.18872	.19204	1.00000	.32294	.42606	.19537	.13108	.41685
A43	.34563	.25747	.19683	.32294	1.00000	.34653	.48063	.12599	.20541
A44	.30838	.12098	.20493	.42606	.34653	1.00000	.37905	.38923	.31641
A45	.22315	.37304	.34939	.19537	.48063	.37905	1.00000	.39233	.03477
A46	.21837	.21953	.13273	.31308	.12599	.38923	.39233	1.00000	.29183
A47	.30292	.16560	.04209	.41685	.20541	.31641	.03477	.29183	1.00000
A48	.35419	.34223	.33627	.25318	.42475	.16717	.40409	.14575	.17975
A49	.35834	.36190	.35036	.37372	.38217	.10368	.30863	.18151	.32350
A50	.34721	.30021	.19084	.33255	.07690	.08080	-.01290	.15814	.15942
A51	.09963	.13951	.07742	-.00883	-.08311	.09015	.00287	.04187	.04583
A52	.24504	.18953	.16103	.09854	.03840	.17343	.06785	.12923	.12053
A53	.03071	.07533	-.05133	.10803	.02678	-.01783	.08262	.07493	.03729
A54	.03643	.04052	-.05809	-.01140	-.11886	-.14644	-.08350	-.00872	-.00510
A55	.15195	.12041	.15219	.17052	.06606	.01045	-.01850	-.09467	.03483
A56	.08300	.06122	-.17378	.12620	-.04017	-.00981	-.04361	-.03731	.14505
A57	-.03709	-.03746	-.04882	.04945	-.04033	-.04041	.00380	-.13805	.12911
A58	-.01677	-.06229	-.08561	.02005	-.10436	-.16704	-.17070	-.18646	.02477
A59	.05116	.16466	.18168	.15824	.02883	.04834	-.02829	-.01422	.04869
A60	-.00963	.02287	-.19903	.13249	-.06501	.00410	-.14898	-.14654	.07372
A61	-.17567	-.03803	-.09138	.00324	-.01362	-.02109	-.06546	.10168	.01954
A62	.05203	.06947	-.13848	.02592	-.01534	-.13425	-.10203	-.01512	.03603
A63	-.16365	-.13271	.08610	-.18633	.03880	-.12517	.06734	.00558	-.16136

Table C-2.--Continued.

	A48	A49	A50	A51	A52	A53	A54	A55	A56
A12	.08797	.09680	.13216	.06176	.03062	.09012	.13658	.10192	.03518
A13	.04253	.05261	.04942	-.07638	.02956	.04017	-.03207	.01868	-.09927
A14	.01439	.06406	-.00902	-.10696	-.00627	.03819	.08008	.16823	.01075
A15	.05834	-.00798	.04253	-.00480	.15024	-.02542	-.03747	-.21055	-.11598
A16	-.05457	.10166	.15697	.25088	.19931	-.06063	-.16004	-.12299	-.12650
A17	-.04843	.02159	.06381	.10238	.19560	0	0	-.09126	-.12993
A18	-.08679	-.17826	-.16983	-.05341	.14837	.03830	-.03497	-.24746	.03430
A19	-.11904	-.08858	-.17913	.14335	.02417	.03110	.07949	-.16025	-.11568
A20	-.05936	-.09884	-.12690	-.04344	-.00985	-.01095	-.10289	-.09376	-.15156
A21	-.01231	.11346	.13480	.10351	.09120	-.03137	.10775	-.02962	.08652
A22	.17349	.16595	.10004	-.14292	-.13181	.13189	-.01667	.00097	-.15476
A23	.08279	.09574	.05234	-.03066	.09701	.09781	-.08418	-.31667	.01521
A24	.10551	.15381	.00838	-.08672	-.05309	.03647	-.00838	.01811	.07461
A25	-.12266	-.10308	-.04768	.16251	.01310	.07658	-.01306	-.00526	-.23883
A26	-.02977	-.13441	-.14718	.00719	.04816	-.05223	-.09518	-.10595	-.12436
A27	.11551	.16722	.19689	.16928	.13336	.00232	-.12659	-.00742	-.06531
A28	.17646	.21491	.24978	-.05592	.07064	-.23056	.01472	-.09585	-.06885
A29	.01298	-.04716	.05245	.19889	.16650	.06506	-.12291	-.13731	-.24629
A30	.06905	.10078	-.03527	.05415	.05001	.04009	-.06029	-.13879	-.13997
A31	-.07069	-.01572	.14449	.26587	.10601	-.09162	-.19998	-.05203	-.34167
A32	.17549	.09990	.08715	.21408	.09215	-.00793	-.18452	-.00285	-.16857
A33	.22485	.12014	.01036	-.06220	-.01850	-.00468	-.10539	-.21770	-.06509
A34	.09381	.07653	.09457	-.10078	.13969	.05867	.06010	-.08551	.01148
A35	.15831	.12069	.09984	.14738	.01918	.05745	-.17767	-.30294	-.16932
A36	.10181	.31381	.21200	-.03410	.35636	.01499	-.02640	.06464	-.24013
A37	.09149	.25121	.08152	.13887	.06626	.14115	.23670	.08395	.11155
A38	.12993	.33592	.41794	.17715	.33495	.09790	-.08919	.02029	.13607
A39	.35419	.35834	.34721	.09963	.24504	.03071	.03643	.15195	.08300
A40	.34223	.36190	.30021	.13951	.18953	.07533	.04052	.12041	.06122
A41	.33627	.35036	.19084	.07742	.16103	-.05133	-.05809	.15219	-.17378
A42	.25318	.37372	.33255	-.00883	.09854	.10803	-.01140	.17052	.12620
A43	.42475	.38217	.07690	-.08311	.03840	.02678	-.11886	.06606	-.04017
A44	.16717	.10368	.18080	.09015	.17343	-.01783	-.14644	.01045	-.00981
A45	.40409	.30863	-.01290	.00287	.06785	.08262	-.08350	-.01850	-.04361
A46	.14575	.18151	.15814	.04187	.12923	.07493	-.00872	-.09467	-.03731
A47	.17975	.32350	.15942	.04583	.12053	.03729	-.00510	.03483	.14505
A48	1.00000	.39017	.01007	-.14720	-.07877	.05827	-.10082	.00220	.04622
A49	.39017	1.00000	.36379	-.13937	.05547	.03956	-.05950	.03888	.08068
A50	.01007	.36379	1.00000	.25800	.37244	-.03183	-.04205	.10867	-.01544
A51	-.14720	-.13937	.25800	1.00000	.38242	.19539	.11607	.10207	.08447
A52	-.07877	.05547	.37244	.38242	1.00000	.18366	.14729	.09143	-.00544
A53	.05827	.03956	-.03183	.19539	.18366	1.00000	.47148	.28281	.35782
A54	-.10082	-.05950	-.04205	.11607	.14729	.47148	1.00000	.36187	.42870
A55	.00220	.03888	.10867	.10207	.09143	.28281	.36187	1.00000	.13892
A56	.04622	.08068	-.01544	.08447	-.00544	.35782	.42870	.13892	1.00000
A57	.16568	.13696	.20658	.04104	.21395	.07033	.07217	.12768	.08748
A58	-.05640	.05048	-.07198	-.00842	-.01941	.15046	.33778	.17832	.44046
A59	.15011	.28034	.04444	-.13992	.02522	.01010	.16579	.13367	.12066
A60	.00769	-.02939	.04363	.21546	.07961	.27505	.22362	.46792	.33712
A61	-.11592	-.21282	-.01343	.12824	-.00801	.07869	.18010	.32798	.09656
A62	.09656	-.06830	.12407	.04243	-.10670	.12592	.16564	.15733	.21563
A63	-.01963	-.05580	-.05335	-.08718	-.01067	-.17684	-.08652	-.20124	-.26892

Table C-2.--Continued.

	A57	A58	A59	A60	A61	A62	A63
A12	-.02455	-.01706	.10567	.03701	.04834	-.04626	-.00006
A13	-.02937	-.16315	-.04459	-.13745	-.04345	-.04681	.15660
A14	-.02639	-.06758	.01878	.02149	.02043	-.02046	.09098
A15	.04396	-.05537	-.22095	-.15098	-.16238	-.06688	.22492
A16	.06922	.03884	-.04981	-.06092	-.06167	-.13892	-.05508
A17	.12515	-.20181	-.06750	.06266	-.16918	-.27306	.03914
A18	-.07668	-.09335	-.00254	-.06009	-.12459	-.31313	-.16656
A19	-.19390	-.08024	-.08208	-.07972	-.15071	-.16131	.02662
A20	-.12294	-.09071	.06144	-.05082	-.18437	-.26085	-.03513
A21	.02824	.16762	.05562	-.04165	-.02654	-.10100	.06968
A22	.04041	-.13829	.13206	-.07303	-.10386	-.10073	.06872
A23	-.04473	-.05814	.07429	-.25630	-.24049	-.17933	.01588
A24	-.00247	-.08904	.12957	.12547	-.04440	-.24173	-.18454
A25	-.16660	-.16382	-.07674	-.09974	-.08593	-.18285	-.08532
A26	-.18491	-.09709	-.02836	-.21942	-.26993	-.34031	-.02264
A27	-.20258	-.11568	.04752	.00303	-.06987	-.16846	-.04195
A28	-.06839	-.01264	.04542	-.15067	-.12117	.03410	.02148
A29	-.07513	-.36872	-.02461	-.20574	-.13374	-.27831	-.05934
A30	-.12953	-.19222	.16004	-.31763	-.27544	-.32011	.13045
A31	-.25357	-.30883	.08613	-.22912	-.09082	-.24119	-.02256
A32	-.18233	-.11845	.06109	-.17376	-.08512	-.13837	-.09261
A33	-.25913	-.22124	.16293	-.17002	-.23383	-.21858	-.15348
A34	.03482	.03528	.15353	-.13987	-.09977	-.20328	-.00907
A35	-.25639	-.27486	-.07972	-.26883	-.24620	-.10890	.00040
A36	-.02950	-.24465	.03852	-.21082	-.05410	-.13424	.09687
A37	.00976	.07875	.20423	.04461	.05152	-.04422	-.10352
A38	.09331	.05824	.08307	.06159	-.06547	.02494	-.21361
A39	-.03709	-.01677	.05116	-.00963	-.17567	.05203	-.16365
A40	-.03746	-.06229	.16466	.02287	-.03803	.06947	-.13271
A41	-.04882	-.08561	.18168	-.19903	-.09138	-.13848	.08610
A42	.04945	.02005	.15824	.13249	.03324	.02592	-.18633
A43	-.04033	-.10436	.02883	-.06501	-.01362	-.01534	.03880
A44	-.04041	-.16704	.04834	.00410	-.02109	-.13425	-.12517
A45	.00380	-.17070	-.02829	-.14898	-.06546	-.10203	.06734
A46	-.13085	-.18646	-.01422	-.14654	.10168	-.01512	.00558
A47	.12911	.02477	.04869	.07372	.01954	.03603	-.16136
A48	.16568	-.05640	.15011	.00769	-.11592	.09656	-.01963
A49	.13696	.05048	.28034	-.02939	-.21282	-.06830	-.05580
A50	.20658	-.07198	.04444	.04363	-.01343	.12407	-.05335
A51	.04104	-.00842	-.13992	.21546	.12824	.04243	-.08718
A52	.21395	-.01941	.02522	.07961	-.00801	-.10670	-.01067
A53	.07033	.15046	.01010	.27505	.07869	.12592	-.17684
A54	.07217	.33778	.16579	.22362	.18010	.16564	-.08652
A55	.12768	.17832	.13367	.46792	.32798	.15733	-.20124
A56	.08748	.44046	.12066	.33712	.09656	.21563	-.26892
A57	1.00000	.12974	-.00051	.17359	.16983	.16085	.02341
A58	.12974	1.00000	.10865	.10019	.06526	.24940	-.07303
A59	-.00051	.10865	1.00000	.05720	-.02894	-.08453	-.32700
A60	.17359	.10019	.05720	1.00000	.33783	.20929	-.37799
A61	.16983	.06526	-.02894	.33783	1.00000	.32680	.01350
A62	.16085	.24940	-.08453	.20929	.32680	1.00000	.05533
A63	.02341	-.07303	-.32700	-.37799	.01350	.05533	1.00000

Table C-3.--Factor matrix using principal factor with iterations.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9
A12	.13641	.11322	.52445	-.00492	-.10282	.10352	.12403	-.01788	.03779
A13	-.06462	-.07538	.45691	-.31655	-.23186	.23476	.21722	.16948	.32809
A14	-.06596	.02638	.38386	-.14214	-.06881	.23337	.21115	.12883	.26438
A15	.15963	-.13860	.29307	-.19735	-.25900	-.00621	.20605	-.00104	-.05187
A16	.29302	-.04428	.29747	.02762	-.45309	-.03833	.09059	-.09794	-.03884
A17	.16616	-.15151	.47077	.02872	-.22268	-.08238	-.37753	.15041	-.07341
A18	.21478	-.25381	.25480	.23936	-.06077	-.47903	-.07894	-.12542	.28217
A19	.24021	-.46722	.17380	.39490	.27188	.09919	.17510	-.17404	.02101
A20	.18029	-.45132	.19272	.17600	.27661	.07357	.11267	-.13432	-.10536
A21	.12143	.06680	.44491	.02193	.07716	.12797	.11653	-.20243	-.42323
A22	.15995	.02307	.50466	-.26989	.16689	.06524	-.20387	.07359	-.03378
A23	.32327	-.07195	.33950	-.17492	-.20426	-.38839	.06007	.14357	.02382
A24	.12648	.04663	.51075	-.04527	.25051	-.11461	-.44120	.07374	-.17288
A25	.41593	-.39764	.20786	.43643	.17385	.25779	.08474	-.22489	.14889
A26	.33989	-.42641	.20676	.20106	.25378	.03633	.20030	-.21529	.02307
A27	.47379	.00093	-.19273	.14970	-.03161	.01330	.01869	.06753	-.03511
A28	.40897	.15361	-.17433	-.11251	.09420	.07095	.21708	-.14183	-.20952
A29	.53945	-.30562	-.17520	.23232	-.12482	.02285	-.23325	.20799	.08716
A30	.47467	-.24400	-.16748	.03246	-.09035	-.08064	.03323	.39712	.10424
A31	.55245	-.23714	-.20949	.13870	-.12585	.18066	-.08948	.05850	-.13119
A32	.53320	-.05547	-.10905	.11496	-.04302	.13160	-.02667	.07498	.01094
A33	.52852	-.17357	-.23940	.04576	.15501	-.14539	.06650	.27388	-.08900
A34	.29914	.01806	.06714	.09641	.07759	-.18382	.14734	-.04210	-.16089
A35	.63242	-.20817	-.21159	.04747	-.08565	-.07631	.13089	.16259	.05587
A36	.51702	.05750	-.09759	-.06517	-.05545	.25505	.01558	.05760	.02628
A37	.26510	.27364	.21799	.18010	.01952	-.11623	.14731	-.00471	.01523
A38	.40783	.49202	-.00168	.11247	-.29314	-.21023	.04426	-.13360	.00031
A39	.52672	.44390	-.17753	.01116	.01567	-.00477	.09855	.01427	-.05612
A40	.45583	.36877	-.07990	-.02272	.05834	.15743	.02328	.17670	.00689
A41	.41962	.10871	.08793	-.09893	.15162	.32042	-.00960	.07313	-.15631
A42	.34207	.49917	.17921	-.02448	.06861	-.10136	-.09121	-.16143	.02513
A43	.35348	.26823	-.01665	-.26950	.25568	.07100	-.01378	-.15258	.21961
A44	.46088	.26125	-.10384	.01839	.13815	-.13732	-.24111	-.39275	.05854
A45	.47369	.14729	.06741	-.22892	.30742	.15023	-.15068	-.13509	.24851
A46	.38453	.16794	-.10303	-.04673	-.01978	-.03281	.03201	-.12934	.22727
A47	.25658	.46420	-.06013	.06185	-.13270	-.28304	.18714	-.26728	.28777
A48	.31722	.33088	-.00259	-.33132	.30037	-.01077	.01485	.12556	.13045
A49	.39017	.47075	.09904	-.29455	.13295	-.01141	.08195	.12820	-.10530
A50	.29210	.40946	.01441	-.02572	-.34999	.17800	-.04679	-.07075	-.27053
A51	.13843	.10125	-.02622	.45163	-.38852	.22383	-.10359	-.04382	-.04187
A52	.27567	.21091	.09961	.27552	-.43525	.12655	-.03332	-.05555	-.07635
A53	-.01588	.25108	.19018	.38273	.06252	.01021	.04638	.29935	.27767
A54	-.21980	.29058	.20231	.43854	.13747	.09291	.26990	.29542	.01576
A55	-.16694	.43374	.06320	.29567	.14942	.43047	-.11745	.12166	.08676
A56	-.24428	.43694	.09170	.29818	.15738	-.29549	.19539	.14038	.01008
A57	-.17425	.28979	.11991	-.03791	-.16489	.02176	-.10637	-.05787	-.06632
A58	-.33036	.29408	.06193	.19045	.10341	-.13927	.37113	-.00303	-.26208
A59	.12151	.22052	.08585	.06562	.27211	-.13083	-.00630	.30520	-.20174
A60	-.31207	.40529	.09123	.42237	.06578	.06014	-.29946	-.00062	.07011
A61	-.30639	.24878	-.06876	.17622	-.04482	.26073	-.13485	-.12910	.15985
A62	-.34235	.36006	-.20442	-.01094	-.03479	.18303	.17516	-.04949	.06371
A63	-.04925	-.24262	-.01529	-.39788	-.16888	.26078	.18927	-.07633	.01088

Table C-3.--Continued.

	Factor 10	Factor 11	Factor 12	Factor 13	Factor 14	Factor 15	Factor 16	Factor 17
A12	-.19298	-.13426	.10639	.13996	-.01449	.21448	-.08525	.15809
A13	-.27333	-.01882	-.13612	.13320	.12219	-.16457	.08799	-.04557
A14	-.23895	.10788	-.10988	-.00852	-.03162	-.09650	.17167	-.04104
A15	.25124	-.00573	.17733	.03996	.02199	-.00121	.11238	.21023
A16	-.08102	-.18529	.24866	.05367	-.21429	.27123	.02505	-.05980
A17	.15015	.04560	-.06908	-.18143	.02599	.14605	.18768	.14357
A18	.03199	-.19974	-.09281	.03507	.03541	.02357	-.14840	-.09590
A19	.10805	.07491	.00831	-.34645	.15010	-.02665	.00695	-.01134
A20	-.02160	-.37558	-.00438	.15774	.00089	-.03897	.08799	.04280
A21	.07416	.19200	.04912	.15979	-.21873	-.25568	.05705	.05306
A22	.01197	.17602	.16807	-.08787	.09319	-.10647	-.39823	.01411
A23	.11273	-.03462	.14610	.12325	.16948	.04109	-.26656	-.07609
A24	-.00049	.20237	.04825	.02787	.04163	-.01298	.21487	-.20103
A25	-.08838	.12873	.11089	-.30780	.00804	.00575	-.06765	-.03444
A26	-.05907	-.20864	-.09181	.08679	.00550	-.09036	.06900	-.01094
A27	-.17125	.07566	.05469	.05940	.25540	.20900	.04213	-.04446
A28	.05017	-.01010	-.00412	-.01615	.12612	.15197	-.05796	.04899
A29	.11829	-.12749	.00768	-.12506	-.13142	-.07060	-.13218	.13823
A30	.08557	.06400	-.17268	-.08156	-.32041	-.06210	.06798	.09466
A31	-.20989	.08138	.01594	.22782	-.07263	-.09445	-.11778	.06036
A32	-.14104	.09385	.18410	.00179	-.08568	.23706	.04639	-.19549
A33	-.04695	-.06013	.09664	.11063	.04847	-.01020	.06139	.27038
A34	-.01026	.22795	-.31098	.09283	.23360	.25037	.14026	.07246
A35	-.02414	.29533	.25278	.04775	.16338	-.07975	.14910	-.03795
A36	.08802	-.02092	-.30706	-.01831	.14146	.09922	-.11522	-.13161
A37	-.02962	.26380	-.05328	-.06574	-.17189	.05803	-.06069	.06855
A38	-.08775	-.04396	.00690	-.15868	-.05029	-.17103	-.07539	-.10570
A39	.02786	-.19013	.07828	-.02025	.09759	-.20387	.04208	.03616
A40	.06587	-.10139	.07824	-.06141	.00996	-.09356	.01469	-.13715
A41	.02077	-.09664	-.00090	-.01951	-.12807	.07006	-.04710	-.01188
A42	-.15369	.06442	.00091	-.04272	.02940	-.04858	-.03788	.18947
A43	.03759	-.20340	.07141	.10661	.05475	.01631	-.05177	.05452
A44	.05519	.19484	-.15879	.25897	-.00277	-.09601	-.06178	.10858
A45	.43392	-.07258	.04084	.08628	-.16171	.07681	.08346	-.12314
A46	.12210	.22570	-.06179	.18773	-.11819	.05109	.09853	-.13119
A47	-.20346	.07831	-.09036	-.19131	-.16193	.00595	.05354	.13783
A48	.07840	-.12490	.16271	-.05923	.03182	.08700	.13790	.11070
A49	-.06795	-.06901	-.06622	-.25251	-.04045	.00754	.09817	-.09871
A50	-.07866	-.01725	-.03857	-.07415	.18827	-.12638	-.02336	-.00737
A51	.10563	.01961	.21464	.11807	-.09399	-.07336	.06578	-.05019
A52	.26883	-.20742	-.33550	.06559	.14569	-.04771	.04692	-.09043
A53	.23540	.05561	.06984	.09295	.10603	-.07956	-.06847	.00518
A54	.27850	.12878	-.14765	.07917	.01322	.03916	-.13232	.09205
A55	-.15512	-.08399	-.11416	.04333	-.03405	.04890	-.04533	.05269
A56	.13722	-.01443	.10502	.11288	.00639	-.08079	.12417	-.07440
A57	.19304	-.12523	-.10417	-.20654	-.01780	.09249	.03467	.11014
A58	.10908	-.05226	.07646	-.01758	-.13664	.11458	-.04117	-.14392
A59	-.27303	-.06920	-.20495	.04169	-.15568	.08541	-.16241	-.04385
A60	-.11537	-.11146	.15018	-.00402	.14475	.02782	.20028	.13634
A61	-.01744	.15028	.03509	.15002	-.06173	.20931	-.10333	.04885
A62	.09778	.07192	.28614	-.06969	.11184	.01139	-.08130	.02754
A63	.29832	.16365	-.10243	-.02814	-.01580	.06074	-.04218	.10302

Table C-4.--Varimax rotated factor matrix after rotation with Kaiser normalization.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
A12	.10521	-.03186	.10612	.06960	.13371	.00891	-.06889	.00065
A13	-.02467	-.02857	-.05764	-.03921	-.06201	.05161	-.04166	-.09749
A14	.00934	-.04820	.03223	.04447	.04981	-.05213	-.02033	.06488
A15	.08036	-.03411	-.05659	.02868	-.27216	.03342	.09940	-.01849
A16	-.00706	.09486	.11916	.10510	-.11480	.15993	.03933	.02205
A17	-.06529	-.13849	-.02600	-.03076	-.05670	.13344	.28959	.08859
A18	-.21499	-.02504	.24342	.10579	-.28511	.03253	.09250	.12676
A19	-.06938	.09216	-.06439	.06646	-.10727	-.03120	.06483	.78026*
A20	.03476	.05761	-.22207	-.05746	-.05044	-.04844	.03566	.22647
A21	.01817	-.04805	.06897	.05252	-.04231	.07277	-.09000	.06993
A22	.18783	-.05030	-.01669	-.01840	-.09131	-.07979	-.03575	.13009
A23	.04753	.12564	.07444	.12623	-.49852	.07921	.01897	-.11625
A24	.10034	.02207	-.02172	.03350	-.03122	-.05803	-.12312	.02856
A25	-.03152	.25908	.07746	-.03994	.08548	-.00009	.12370	.83249*
A26	.02981	.13053	-.02970	-.05984	-.12276	-.01334	.06041	.36747
A27	.15816	.51753*	.07348	-.05038	.02136	.15845	.02969	.10091
A28	.38176*	.16648	.07134	-.11578	-.08145	.13515	-.05795	.08062
A29	.06659	.27594(*)	.00374	-.06757	-.05082	.18793	.63665(*)	.20355
A30	.08342	.22913(*)	.02266	.01087	-.23339	.00425	.71365(*)	.05779
A31	-.00320	.57575*	.03186	-.23372	.06515	.20224	.34546	.03674
A32	.20539	.49398*	.01897	-.11119	.02940	.07660	.13503	.21598
A33	.26405	.46777(*)	.02574	.01847	-.15193	-.09584	.38481(*)	-.04803
A34	.01562	.15802	.12896	.05476	-.10460	.08233	-.00843	.05837
A35	.14989	.72169*	.09256	.00078	-.29130	.03074	.20956	.15699
A36	.31575	.16108	-.05600	-.12176	-.01867	.41051*	.19761	.13823
A37	.06785	.04067	.38528*	.23093	.00226	-.00161	.00902	.14749
A38	.19015	.08219	.60568*	.05631	-.13620	.41311*	-.01141	-.01561
A39	.54117*	.22767	.32759	.09413	-.06070	.32354	.04287	-.07533
A40	.53046*	.20239	.10287	.12100	-.00594	.26753	.08621	.02305
A41	.49804*	.13542	-.06497	-.11187	.07237	.16332	.19147	.14452
A42	.33291	.01668	.54312*	.02045	.13082	.08574	-.05227	-.05272
A43	.57114*	.02299	.15458	-.07649	.06251	-.02984	-.06775	-.07806
A44	.18618	.16200	.45060*	-.11201	.12015	.12329	.02444	-.10482
A45	.62141*	-.05162	-.03633	.00243	.00040	-.00358	.11123	.08887
A46	.18923	.21103	.22337	.02071	-.03228	.05860	.06692	-.02834
A47	.14142	-.04311	.77627*	.02040	.00629	.00960	.01924	.01945
A48	.68105*	.02077	.10025	.04301	-.03077	-.17010	.02112	-.10421
A49	.61335*	-.04920	.24239	-.03388	-.15233	.11873	-.00045	-.01313
A50	.20177	.10383	.23055	-.11299	.05427	.56448*	-.08154	-.08237
A51	-.15147	.24383	.06061	.17131	.24660	.39383*	.08072	.06725
A52	.00935	-.07820	.07450	.13835	.02467	.76083*	.11496	-.01460
A53	.03368	.03965	.03717	.65543*	.13957	.08375	.06472	.05155
A54	-.07451	-.16991	-.07079	.72603*	.19909	.06591	.04453	.08182
A55	.12646	-.10066	.00636	.24066	.64235*	.14110	-.04312	.00702
A56	.01541	-.09521	.18164	.63002*	-.01374	-.06463	-.24267	-.16415
A57	.06584	-.42111	.07061	.03916	.09946	.18243	-.01725	-.06678
A58	-.04970	-.23758	-.00130	.38489*	-.06559	-.06073	-.31217	-.01048
A59	.14211	.02407	.08453	.12399	.03760	-.05742	.10883	-.11494
A60	-.03984	-.08401	.16591	.30482	.54789*	.00424	-.22273	-.07548
A61	-.14983	-.07798	.00044	.09713	.52784*	-.02550	-.14927	-.04954
A62	.08032	-.07498	-.00633	.19703	.20269	-.03907	-.31360	-.04755
A63	-.00002	-.17935	-.29681	-.21807	-.14966	-.00973	.11012	.04304

Table C-4.--Continued.

	Factor 9	Factor 10	Factor 11	Factor 12	Factor 13	Factor 14	Factor 15	Factor 16	Factor 17
A12	.16951	.28784	.05488	.51021*	.08860	-.09218	.02384	.23405*	.10984
A13	.06906	.84176*	.00320	.10040	-.03040	-.02686	-.07501	.13610	-.03412
A14	-.02993	.67616*	.05106	.05743	.07318	.00656	.00754	-.02035	-.01031
A15	.03054	.13509	.03444	.31721	.19279	-.06104	-.40446*	.07423	.08526
A16	.05855	.05730	.05651	.73153*	.03750	.03883	-.04816	-.03811	-.07503
A17	-.01831	.05062	.61320*	.25109	-.01992	-.08902	-.14252	.11277	.13777
A18	.43154*	-.07092	.16402	.17982	-.34830*	.16607	.03571	.16077	-.02323
A19	.28765	-.05927	.05224	-.07040	.02679	-.05940	-.09842	.01153	.11287
A20	.67937*	-.01864	.00670	.09925	.10205	-.07806	.01061	-.04863	.01537
A21	.14197	.04712	.15517	.09651	.75011*	.04028	-.00657	.10589	.02559
A22	-.08046	.13423	.26040	.05051	.16591	-.01566	.05839	.69040*	-.07591
A23	.07079	.03286	.12740	.32556	-.11793	.04071	-.03105	.41709*	.06011
A24	.04189	.04181	.76879*	-.01674	.18595	.09458	.14421	.16545	.02283
A25	.24612	.03732	.04456	.09410	.04316	.04676	-.04518	.08966	-.01979
A26	.63668*	.07943	-.02328	.04242	.09410	.05711	.01034	-.02848	.07704
A27	.00635	-.09074	.00918	.08363	-.16154	-.01200	.05309	-.02422	.25133
A28	-.01230	-.17688	-.21490	.05114	.10565	.01882	.00880	.01503	.29640*
A29	.14321	-.22252	.03955	.05978	-.15036	.00579	-.03720	.08932	-.13501
A30	-.00876	.03727	-.00298	.00365	-.01602	.10988	.08058	-.13494	.02327
A31	.15796	-.07069	-.09071	.05022	.15273	.05876	.07200	.10644	.00872
A32	-.06549	-.05650	.06190	.26478	-.04074	.16807	.12901	-.07694	.01364
A33	.21400	-.17696	-.04104	-.01833	-.01052	-.16276	-.01002	-.01134	.17329
A34	.08361	-.02434	.11515	-.01111	.03282	.07203	.06121	-.04809	.62692*
A35	-.04990	-.00832	.03492	-.00460	-.00343	.06484	-.19524	-.03626	.08481
A36	-.01476	.07044	-.09471	-.03364	-.09989	.21831	.10524	.09735	.23648*
A37	-.10482	.03911	.05036	.14715	.19208	.11726	.13545	.06686	.17356
A38	-.12233	-.06651	-.02050	.12416	.01044	.02652	.10799	-.00689	-.11135
A39	.04150	-.11564	-.10740	-.05438	.04909	-.07050	.00368	-.04445	-.03711
A40	-.09714	.00113	-.00599	-.00854	.02473	.04948	.11366	-.01216	-.10122
A41	.05583	.01018	.02088	.14539	.21806*	.07440	.16091	.09749	.05330
A42	-.01241	.00345	.13413	.04720	.09953	-.01119	.04473	.19625	.11167
A43	.17195	.01183	-.08461	-.00422	-.08967	.18204	-.06105	.16210	-.00720
A44	.17583	-.24399	.07953	-.18763	.11709	.40888*	-.06861	.18925	.18041
A45	.12293	-.08480	.14632	.02233	.01933	.54530*	-.14191	.06652	-.05228
A46	-.04767	.02011	-.00634	.01026	.01681	.49525*	-.07449	-.07002	.09431
A47	-.10319	.05565	-.14541	.08811	-.09433	.10342	.01342	-.14662	.08057
A48	-.04240	.02189	.07324	.00917	-.06906	.00447	-.04578	.02189	.04872
A49	-.18847	.11905	.11007	.02123	.08324	-.04525	.25476	-.03945	.08577
A50	-.19728	.01802	.01518	.06287	.16176	-.15644	-.00742	.07168	.04702
A51	-.04753	-.12801	.03717	.23818	.13693	.06026	-.17303	-.12170	-.23638
A52	.10172	-.00330	.04287	.11807	-.02497	.10659	-.07894	-.07689	.11733
A53	-.01189	.07819	.07082	-.02140	-.10295	.05112	-.04518	.11843	-.07146
A54	-.07505	.04508	-.10877	-.03060	.12871	-.01373	.10862	.04567	.18305
A55	-.04859	.13668	-.02675	-.05434	.01378	-.06454	.23418	-.00208	-.05614
A56	-.01182	-.08278	.04861	-.04226	.04436	-.04746	.09503	-.18053	-.04372
A57	-.17717	-.06399	.08918	.09303	-.01839	-.09218	-.07854	-.03560	.03260
A58	-.10391	-.16019	-.18247	.14708	.20373	-.08233	.23210	-.20067	.02884
A59	.05244	-.00556	.05674	.00618	.06648	-.10195	.60472*	.07592	.13295
A60	.00557	-.09002	.27673	-.02395	-.12341	-.25078	-.03475	-.11548	-.12307
A61	-.19436	-.03182	-.10023	.05866	-.03620	.17116	-.03977	.03654	-.01967
A62	-.36394	-.05838	-.29837	-.04237	-.00667	-.09885	-.18018	-.02720	-.13520
A63	-.18861	.16457	-.22435	.01380	.13836	.16066	-.33025*	.07823	.15809

APPENDIX D

RELIABILITY ANALYSES OF SCALES

Table D-1.--Reliability analysis for scale: Dimension 1--Understanding the Objectives of Teaching Mathematics.

A28: Understand objectives of teaching math
A39: Competent to critically assess programs
A40: Able to construct adequate tests
A41: Competent in methods of teaching math
A43: Assessment of math courses
A45: Problems of teaching math
A48: Evaluation and grading
A49: High correlation between college and school

	Means	Std. Dev.	Cases
A28	3.233	.963	116
A39	2.940	1.066	116
A40	2.353	1.105	116
A41	2.250	1.118	116
A43	2.871	1.018	116
A45	2.690	1.091	116
A48	2.810	1.029	116
A49	3.241	1.154	116

Correlation Matrix:

	A28	A39	A40	A41	A43	A45	A48	A49
A28	1.00000							
A39	.31877	1.00000						
A40	.34672	.50552	1.00000					
A41	.23616	.34123	.37820	1.00000				
A43	.24389	.34563	.25747	.19683	1.00000			
A45	.22658	.22315	.37304	.34939	.48063	1.00000		
A48	.17464	.35419	.34223	.33627	.42475	.40409	1.00000	
A49	.21491	.35834	.36190	.35036	.38217	.30862	.39017	1.00000

N of Cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	22.388	30.326	5.5	8

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	2.798	2.3	3.2	1.0	1.4	.132

Table D-1.--Continued.

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A28	19.155	25.715	.377	.171	.794
A39	19.448	23.606	.539	.363	.770
A40	20.034	23.060	.569	.384	.765
A41	20.138	23.842	.479	.266	.780
A43	19.517	24.182	.511	.365	.775
A45	19.698	23.639	.518	.359	.774
A48	19.578	23.863	.537	.320	.771
A49	19.147	23.204	.521	.289	.774

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 8 items

Alpha = .79795 Standardized item alpha = .79726

Table D-2.--Reliability analysis for scale: Dimension 2--Understanding Basic Mathematics to Teach Mathematics.

A27: Understand basic math to teach math
A29: Algebra
A30: Geometry
A31: Trigonometry
A32: Calculus
A33: Arithmetic
A35: Analytical geometry

	Means	Std. Dev.	Cases
A27	2.112	.985	116
A29	1.698	.887	116
A30	2.241	1.139	116
A31	2.388	.892	116
A32	1.716	.902	116
A33	2.457	1.204	116
A35	1.888	.882	116

Correlation Matrix:

	A27	A29	A30	A31	A32	A33	A35
A27	1.00000						
A29	.25809	1.00000					
A30	.20045	.55474	1.00000				
A31	.35583	.43497	.36906	1.00000			
A32	.35914	.33738	.22814	.35434	1.00000		
A33	.29371	.41518	.37528	.41630	.28873	1.00000	
A35	.45484	.37868	.42507	.47542	.47296	.47411	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	14.500	22.078	4.7	7

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	2.071	1.7	2.5	.8	1.4	.096

Table D-2.--Continued.

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A27	12.388	17.457	.444	.256	.793
A29	12.802	17.013	.585	.410	.769
A30	12.259	16.106	.511	.375	.783
A31	12.112	17.005	.581	.345	.770
A32	12.784	17.666	.474	.283	.787
A33	12.043	15.485	.543	.318	.778
A35	12.612	16.553	.661	.464	.757

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 7 items

Alpha = .80242 Standardized item alpha = .80918

Table D-3.--Reliability analysis for scale: Dimension 3--Preparation for Higher Mathematics.

A37: Prepared for higher studies in math
A38: Insight to develop math curricula
A42: Curriculum planning in math
A44: Concept development in math
A47: Math textbook writing

	Means	Std. Dev.	Cases
A37	2.948	1.003	116
A38	3.293	1.004	116
A42	3.474	.982	116
A44	3.103	1.025	116
A47	3.940	.878	116

Correlation Matrix:

	A37	A38	A42	A44	A47
A37	1.00000				
A38	.36042	1.00000			
A42	.21049	.39559	1.00000		
A44	.19984	.26596	.42606	1.00000	
A47	.36193	.50356	.41685	.31641	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	16.749	11.350	3.4	5

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	3.352	2.9	3.9	1.0	1.3	.147

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Alpha Deleted
A37	13.810	8.155	.382	.178	.713
A38	13.466	7.399	.538	.328	.650
A42	13.284	7.614	.511	.301	.662
A44	13.655	7.915	.414	.211	.702
A47	12.819	7.767	.575	.349	.642

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 5 items

Alpha = .72138 Standardized item alpha = .72542

Table D-4.--Reliability analysis for scale: Dimension 4--College-School Relations.

A53: College program closer to teaching in schools
A54: More contacts between schools and college
A56: More relevance for needs of schools
A58: College to offer in-service refresher

	Means	Std. Dev.	Cases
A53	4.836	.492	116
A54	4.828	.402	116
A56	4.793	.448	116
A58	4.664	.659	116

Correlation Matrix:

	A53	A54	A56	A58
A53	1.00000			
A54	.47148	1.00000		
A56	.35782	.42870	1.00000	
A58	.15046	.33778	.44046	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	19.121	2.072	1.4	4

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	4.780	4.7	4.8	.2	1.0	.006

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A53	14.284	1.388	.381	.257	.640
A54	14.293	1.392	.548	.328	.555
A56	14.328	1.300	.560	.315	.534
A58	14.457	1.102	.388	.227	.678

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 4 items

Alpha = .66551 Standardized item alpha = .69639

Table D-5.--Reliability analysis for scale: Dimension 5--Emphasis on Practical Problems.

A55: More seminars between college and schools
A60: Greater emphasis on practical problems
A61: More experiments with new teaching methods

	Means	Std. Dev.	Cases
A55	4.509	.728	116
A60	4.129	.928	116
A61	4.466	.638	116

Correlation Matrix:

	A55	A60	A61
A55	1.00000		
A60	.46792	1.00000	
A61	.32798	.33783	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	13.103	3.137	1.8	3

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	4.368	4.1	4.5	.4	1.1	.043

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A55	8.595	1.669	.498	.252	.480
A60	8.974	1.243	.499	.257	.491
A61	8.638	2.024	.388	.151	.625

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 3 items

Alpha = .63967 Standardized item alpha = .64570

Table D-6.--Reliability analysis for scale: Dimension 6--Preparation for School Teaching.

A36: Modern mathematics
A38: Insight to develop math curricula
A50: Half material taught never used in schools
A51: College ignores differences in schools
A52: College does not prepare adequately

	Means	Std. Dev.	Cases
A36	1.836	1.046	116
A38	3.293	1.004	116
A50	3.836	1.172	116
A51	3.983	1.055	116
A52	3.569	1.232	116

Correlation Matrix:

	A36	A38	A50	A51	A52
A36	1.00000				
A38	.21156	1.00000			
A50	.21200	.41794	1.00000		
A51	-.03410	.17715	.25800	1.00000	
A52	.35636	.33495	.37244	.38242	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	16.517	12.808	3.6	5

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	3.303	1.8	4.0	2.1	2.2	.742

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A36	14.681	9.906	.274	.179	.659
A38	13.224	9.167	.433	.218	.592
A50	12.681	8.219	.479	.253	.565
A51	12.534	9.764	.293	.200	.651
A52	12.948	7.476	.567	.341	.515

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 5 items

Alpha = .65407 Standardized item alpha = .64773

Table D-7.--Reliability analysis for scale: Dimension 8--Student Teaching.

A18: Educational media
A20: Student Teaching (1)
A26: Student Teaching (2)

	Means	Std. Dev.	Cases
A18	1.526	.918	116
A20	1.241	.668	116
A26	1.233	.533	116

Correlation Matrix:

	A18	A20	A26
A18	1.00000		
A20	.24514	1.00000	
A26	.28062	.62239	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	4.000	2.591	1.6	3

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	1.333	1.2	1.5	.3	1.2	.028

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A18	2.474	1.173	.289	.087	.755
A20	2.759	1.402	.470	.393	.392
A26	2.767	1.589	.534	.405	.378

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 3 items

Alpha = .58953 Standardized item alpha = .65035

Table D-8.--Reliability analysis for scale: Dimension 9--Educational Thought.

A12: Introduction to education and psychology
A13: Social and philosophical foundations of education
A14: Development of educational thought

	Means	Std. Dev.	Cases
A12	2.422	1.181	116
A13	2.716	1.141	116
A14	2.819	1.184	116

Correlation Matrix:

	A12	A13	A14
A12	1.00000		
A13	.35476	1.00000	
A14	.19204	.56682	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	7.957	7.120	2.7	3

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	2.652	2.4	2.8	.4	1.2	.042

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A12	5.534	4.234	.307	.126	.723
A13	5.241	3.333	.597	.384	.322
A14	5.138	3.650	.457	.321	.523

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 3 items

Alpha = .63693 Standardized item alpha = .63913

Table D-9.--Reliability analysis for scale: Dimension 10--Curriculum Design.

A17: Principles of curriculum
A24: Curriculum design
A62: Better preparation for testing and evaluation

	Means	Std. Dev.	Cases
A17	2.000	1.047	116
A24	2.379	1.069	116
A62	4.379	.730	116

Correlation Matrix:

	A17	A24	A62
A17	1.00000		
A24	.43536	1.00000	
A62	-.27306	-.24173	1.00000

N of Cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	8.759	2.950	1.7	3

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	2.920	2.0	4.4	2.4	2.2	1.634

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A17	6.759	1.298	.233	.219	-.581
A24	6.379	1.211	.254	.206	-.689
A62	4.379	3.211	-.304	.093	.607

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 3 items

Alpha = .09118 Standardized item alpha = -.08387

Table D-10.--Reliability analysis for scale: Dimension 11--Educational Psychology.

A12: Introduction to education and psychology
A16: Educational psychology (childhood and adolescence)
A23: Introduction to counseling and mental hygiene

	Means	Std. Dev.	Cases
A12	2.422	1.181	116
A16	1.974	1.017	116
A23	2.543	1.321	116

Correlation Matrix:

	A12	A16	A23
A12	1.00000		
A16	.36407	1.00000	
A23	.20283	.32117	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	6.940	6.544	2.6	3

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	2.313	2.0	2.5	.6	1.3	.090

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A12	4.517	3.643	.334	.141	.474
A16	4.966	3.773	.440	.196	.335
A23	4.397	3.302	.312	.112	.529

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 3 items

Alpha = .54327 Standardized item alpha = .55782

Table D-11.--Reliability analysis for scale: Factor 13.

A18: Educational media
A21: Education in Saudi Arabia
A41: Competent in methods of teaching math

	Means	Std. Dev.	Cases
A18	1.526	.918	116
A21	3.112	1.053	116
A41	2.250	1.118	116

Correlation Matrix:

	A18	A21	A41
A18	1.00000		
A21	-.09746	1.00000	
A41	-.06989	.21233	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	6.888	3.370	1.8	3

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	2.296	1.5	3.1	1.6	2.0	.631

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A18	5.362	2.859	-.107	.012	.350
A21	3.776	1.949	.106	.052	-.147
A41	4.638	1.763	.120	.048	-.214

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 3 items

Alpha = .07481 Standardized item alpha = .04366

Table D-12.--Reliability analysis for scale: Dimension 12--Problems of Teaching Mathematics.

A44: Concept development in mathematics
A45: Problems of teaching mathematics
A46: Mathematics in general

	Means	Std. Dev.	Cases
A44	3.103	1.025	116
A45	2.690	1.091	116
A46	2.828	1.113	116

Correlation Matrix:

	A44	A45	A46
A44	1.00000		
A45	.37905	1.00000	
A46	.38923	.39233	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	8.621	6.168	2.5	3

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	2.874	2.7	3.1	.4	1.2	.044

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A44	5.517	3.382	.460	.212	.563
A45	4.931	3.178	.463	.214	.559
A46	5.793	3.087	.471	.221	.549

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 3 items

Alpha = .65382 Standardized item alpha = .65433

Table D-13.--Reliability analysis for scale: Factor 15.

A15: Developmental psychology
A59: Present program needs improvement
A63: More emphasis on abstract math

	Means	Std. Dev.	Cases
A15	1.716	.976	116
A59	4.233	.738	116
A63	3.612	1.061	116

Correlation Matrix:

	A15	A59	A63
A15	1.00000		
A59	-.22095	1.00000	
A63	-.22492	.32700	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	9.560	2.353	1.5	3

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	3.187	1.7	4.2	2.5	2.5	1.720

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A15	7.845	2.184	-.272	.075	.469
A59	5.328	1.613	.103	.130	-.578
A63	5.948	1.180	.020	.131	-.540

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 3 items

Alpha = -.17348 Standardized item alpha = -.12910

Table D-14.--Reliability analysis for scale: Factor 16.

A22: Educational administration and planning
A23: Introduction to counseling and mental hygiene
A12: Introduction to education and psychology

	Means	Std. Dev.	Cases
A22	2.405	1.165	116
A23	2.543	1.321	116
A12	2.422	1.181	116

Correlation Matrix:

	A22	A23	A12
A22	1.00000		
A23	.34175	1.00000	
A12	.20964	.20283	1.00000

N of cases = 115

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	7.371	6.757	2.6	3

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	2.457	2.4	2.5	.1	1.1	.006

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A22	4.966	3.773	.360	.137	.335
A23	4.828	3.327	.349	.135	.347
A12	4.948	4.154	.251	.063	.506

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 3 items

Alpha = .50192 Standardized item alpha = .50187

Table D-15.--Reliability analysis for scale: Factor 17.

A34: Statistics
A28: Understand objectives of teaching mathematics
A51: College ignores differences in schools

	Means	Std. Dev.	Cases
A34	2.362	1.168	116
A28	3.233	.963	116
A51	3.983	1.055	116

Correlation Matrix:

	A34	A28	A51
A34	1.00000		
A28	.21819	1.00000	
A51	-.10078	-.05592	1.00000

N of cases = 116

Statistics for Scale	Mean	Variance	Std. Dev.	Variables
	9.578	3.533	1.9	3

Item Means	Mean	Min.	Max.	Range	Min./Max.	Variance
	3.193	2.4	4.0	1.6	1.7	.658

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
A34	7.216	1.927	.075	.055	-.118
A28	6.345	2.227	.131	.049	-.223
A51	5.595	2.782	-.103	.011	.353

A value of 99.0 is printed if a coefficient cannot be computed.

Reliability coefficients 3 items

Alpha = .05474 Standardized item alpha = .05907

APPENDIX E

ANALYSIS OF VARIANCE

Table E-1.--Analysis of variance of Dimension 1--Understand the objectives of teaching mathematics--by sex and graduated with 40 or 60 credits.

D01 Understand the Objectives of Teaching Mathematics
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.005	2	.003	.005	.995
A04	.003	1	.003	.006	.941
A05	.000	1	.000	.000	.988
Main effects	.538	2	.269	.548	.580
A01	.263	1	.263	.537	.465
A03	.097	1	.097	.197	.658
2-way interactions	.000	1	.000	.001	.980
A01 A03	.000	1	.000	.001	.980
Explained	.543	5	.109	.222	.953
Residual	53.950	110	.490		
Total	54.493	115	.474		

Cell Means

A01: Sex		A03: 40/60 Credits 40	60	Total Sex
1 = Male	$\bar{m}$	2.86	2.79	2.84
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	2.75	2.69	2.72
	n	(15)	(25)	(40)
Total	$\bar{m}$	2.83	2.74	2.80
40/60 credits	n	(74)	(42)	(116)

Table E-2.--Analysis of variance of Dimension 1--Understand the objectives of teaching mathematics--by sex and teaching at which level.

D01 Understand the Objectives of Teaching Mathematics
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.016	2	.008	.015	.985
A04	.015	1	.015	.030	.862
A05	.012	1	.012	.023	.879
Main effects	.737	2	.369	.736	.482
A01	.445	1	.445	.889	.348
A08	.323	1	.323	.644	.424
2-way interactions	.043	1	.043	.087	.769
A01 A08	.043	1	.043	.087	.769
Explained	.796	5	.159	.318	.901
Residual	53.105	106	.501		
Total	53.901	111	.486		

Cell Means

A01: Sex		A08: Teaching Level		Total Sex
		Middle School	High School	
1 = Male	$\bar{m}$	2.88	2.74	2.85
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	2.74	2.69	2.72
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	2.83	2.72	2.81
	n	(83)	(29)	(112)

Table E-3.--Analysis of variance of Dimension 1--Understand the objectives of teaching mathematics--by sex and percent of mathematics teaching duty.

D01 Understand the Objectives of Teaching Mathematics
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.016	2	.008	.017	.984
A04	.015	1	.015	.033	.857
A05	.012	1	.012	.025	.874
Main effects	1.833	2	.942	2.010	.139
A01	.523	1	.523	1.116	.293
A09	1.469	1	1.469	3.136	.079
2-way interactions	2.354	1	2.354	5.025	.027
A01 A09	2.354	1	2.354	5.025	.027
Explained	4.252	5	.850	1.816	.116
Residual	49.649	106	.468		
Total	53.901	111	.486		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	100%	Total Sex
1 = Male	$\bar{m}$	2.87	2.84	2.85
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	3.31	2.57	2.72
	n	(8)	(30)	(38)
Total	$\bar{m}$	3.02	2.75	2.81
percent teaching duty	n	(24)	(88)	(112)

Table E-4.--Analysis of variance of Dimension 1--Understand the objectives of teaching mathematics--by year graduated from Mecca College of Education (male teachers).

D01 Understand the Objectives of Teaching Mathematics
By A02 Year Graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.414	2	.207	.406	.668
A04	.296	1	.296	.581	.448
A05	.048	1	.048	.095	.759
Main effects	1.179	4	.295	.578	.679
A02	1.179	4	.295	.578	.679
Explained	1.593	6	.266	.521	.791
Residual	35.168	69	.510		
Total	36.762	75	.490		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	2.92	2.87	2.96	2.83	2.56	2.84
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-5.--Analysis of variance of Dimension 1--Understand the objectives of teaching mathematics--by year graduated from Mecca College of Education (female teachers).

D01 Understand the Objectives of Teaching Mathematics
By A02 Year graduated from Mecca College of Education
With A04 Mathematics GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.477	2	.238	.536	.590
A04	.435	1	.435	.977	.330
A05	.128	1	.128	.288	.595
Main effects	1.262	2	.631	1.418	.256
A02	1.262	2	.631	1.418	.256
Explained	1.739	4	.435	.977	.433
Residual	15.573	35	.445		
Total	17.312	39	.444		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	2.91	2.73	2.55	2.72
n	(0)	(0)	(12)	(13)	(15)	(40)

Table E-6.--Analysis of variance of Dimension 2--Understand basic math to teach mathematics--by sex and graduated with 40 or 60 credits.

D02 Understand Basic Math to Teach Mathematics
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.721	2	.360	.786	.458
A04	.048	1	.048	.105	.746
A05	.450	1	.450	.982	.324
Main effects	.672	2	.336	.733	.483
A01	.372	1	.372	.812	.369
A03	.528	1	.528	1.152	.285
2-way interactions	.001	1	.001	.003	.955
A01 A03	.001	1	.001	.003	.955
Explained	1.395	5	.279	.608	.694
Residual	50.422	110	.458		
Total	51.816	115	.451		

Cell Means

A01: Sex		A03: 40/60 Credits 40	60	Total Sex
1 = Male	$\bar{m}$	2.06	1.93	2.03
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	2.20	2.11	2.14
	n	(15)	(25)	(40)
Total	$\bar{m}$	2.09	2.04	2.07
40/60 credits	n	(74)	(42)	(116)

Table E-7.--Analysis of variance of Dimension 2--Understand basic math to teach mathematics--by sex and teaching at which level.

D02 Understand Basic Math to Teach Mathematics
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.514	2	.257	.561	.572
A04	.071	1	.071	.155	.695
A05	.380	1	.380	.829	.365
Main effects	1.038	2	.519	1.132	.326
A01	.256	1	.256	.560	.456
A08	.742	1	.742	1.618	.206
2-way interactions	.167	1	.176	.384	.537
A01 A08	.176	1	.176	.384	.537
Explained	1.728	5	.346	.754	.585
Residual	48.587	106	.458		
Total	50.315	111	.453		

Cell Means

A01: Sex		A08: Teaching Level		Total Sex
		Middle School	High School	
1 = Male	$\bar{m}$	2.07	1.86	2.02
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	2.16	2.11	2.15
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	2.10	1.95	2.06
	n	(83)	(29)	(112)

Table E-8.--Analysis of variance of Dimension 2--Understand basic math to teach mathematics--by sex and percent of mathematics teaching duty.

D02 Understand Basic Math to Teach Mathematics
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.514	2	.257	.565	.570
A04	.071	1	.071	.156	.694
A05	.380	1	.380	.835	.363
Main effects	1.302	2	.651	1.430	.244
A01	.227	1	.227	.498	.482
A09	1.006	1	1.006	2.210	.140
2-way interactions	.238	1	.238	.522	.472
A01 A09	.238	1	.238	.522	.472
Explained	2.054	5	.411	.902	.483
Residual	48.261	106	.455		
Total	50.315	111	.453		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	100%	Total Sex
1 = Male	$\bar{m}$	2.14	1.98	2.02
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	2.45	2.07	2.15
	n	(8)	(30)	(38)
Total	$\bar{m}$	2.24	2.01	2.06
percent teaching duty	n	(24)	(88)	(112)

Table E-9.--Analysis of variance of Dimension 2--Understand basic math to teach mathematics--by year graduated from Mecca College of Education (male teachers).

D02 Understand Basic Math to Teach Mathematics
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.088	2	.544	1.168	.317
A04	.015	1	.015	.031	.860
A05	.534	1	.534	1.146	.288
Main effects	4.305	4	1.076	2.309	.066
A02	4.305	4	1.076	2.309	.066
Explained	5.393	6	.899	1.929	.088
Residual	32.153	69	.466		
Total	37.546	75	.501		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	2.06	2.22	2.19	1.89	1.58	2.03
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-10.--Analysis of variance of Dimension 2--Understand basic math to teach mathematics--by year graduated from Mecca College of Education (female teachers).

D02 Understand Basic Math to Teach Mathematics
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.249	2	.124	.327	.723
A04	.201	1	.201	.528	.472
A05	.036	1	.036	.095	.760
Main effects	.412	2	.206	.542	.586
A02	.412	2	.206	.542	.586
Explained	.661	4	.165	.435	.782
Residual	13.298	35	.380		
Total	13.959	39	.358		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	2.14	2.25	2.05	2.14
n	(0)	(0)	(12)	(13)	(15)	(40)

Table E-11.--Analysis of variance of Dimension 3--Preparation for higher mathematics--by sex and graduated with 40 or 60 credits.

D03 Preparation for Higher Mathematics
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.260	2	.630	1.406	.249
A04	1.257	1	1.257	2.807	.097
A05	.748	1	.748	1.670	.199
Main effects	1.673	2	.836	1.867	.159
A01	1.654	1	1.654	3.693	.057
A03	.103	1	.103	.231	.632
2-way interactions	.007	1	.007	.016	.900
A01 A03	.007	1	.007	.016	.900
Explained	2.939	5	.588	1.313	.264
Residual	49.270	110	.448		
Total	52.210	115	.454		

Cell Means

A01: Sex		A03: 40/60 Credits 40	60	Total Sex
1 = Male	$\bar{m}$	3.27	3.20	3.26
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	3.61	3.48	3.53
	n	(15)	(25)	(40)
Total 40/60 credits	$\bar{m}$	3.34	3.37	3.35
	n	(74)	(42)	(116)

Table E-12.--Analysis of variance of Dimension 3--Preparation for higher mathematics--by sex and teaching at which level.

D03 Preparation for Higher Mathematics
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.328	2	.664	1.458	.237
A04	1.298	1	1.298	2.852	.094
A05	.639	1	.639	1.404	.239
Main effects	1.715	2	.858	1.884	.157
A01	1.213	1	1.213	2.665	.106
A08	.436	1	.436	.959	.330
2-way interactions	.214	1	.214	.471	.494
A01 A08	.214	1	.214	.471	.494
Explained	3.257	5	.651	1.431	.219
Residual	48.250	106	.455		
Total	51.507	111	.464		

Cell Means

A01: Sex		A08: Teaching Level: Middle School	A08: Teaching Level: High School	Total Sex
1 = Male	$\bar{m}$	3.30	3.19	3.27
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	3.61	3.34	3.54
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	3.40	3.24	3.36
	n	(83)	(29)	(112)

Table E-13.--Analysis of variance of Dimension 3--Preparation for higher mathematics--by sex and percent of mathematics teaching duty.

D03 Preparation for Higher Mathematics
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.328	2	.664	1.459	.237
A04	1.298	1	1.298	2.852	.094
A05	.639	1	.639	1.404	.239
Main effects	1.842	2	.921	2.024	.137
A01	1.163	1	1.163	2.555	.113
A09	.563	1	.563	1.238	.268
2-way interactions	.102	1	.102	.224	.637
A01 A09	.102	1	.102	.224	.637
Explained	3.272	5	.654	1.438	.217
Residual	48.235	106	.455		
Total	51.507	111	.464		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	100%	Total Sex
1 = Male	$\bar{m}$	3.34	3.25	3.27
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	3.70	3.49	3.54
	n	(8)	(30)	(38)
Total percent teaching duty	$\bar{m}$	3.46	3.33	3.36
	n	(24)	(88)	(112)

Table E-14.--Analysis of variance of Dimension 3--Preparation for higher mathematics--by year graduated from Mecca College of Education (male teachers).

D03 Preparation for Higher Mathematics
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	2.660	2	1.330	2.667	.077
A04	2.573	1	2.573	5.158	.026
A05	2.099	1	2.099	4.208	.044
Main effects	.266	4	.067	.134	.097
A02	.266	4	.067	.134	.970
Explained	2.927	6	.488	.978	.447
Residual	34.418	69	.499		
Total	37.345	75	.498		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	3.24	3.25	3.46	3.09	3.14	3.26
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-15.--Analysis of variance of Dimension 3--Preparation for higher mathematics--by year graduated from Mecca College of Education (female teachers).

D03 Preparation for Higher Mathematics
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.545	2	.272	.779	.467
A04	.487	1	.487	1.393	.246
A05	.133	1	.133	.379	.542
Main effects	.136	2	.068	.195	.824
A02	.136	2	.068	.195	.824
Explained	.681	4	.170	.487	.745
Residual	12.243	35	.350		
Total	12.924	39	.331		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	3.47	3.60	3.52	3.53
n	(0)	(0)	(12)	(13)	(15)	(40)

Table E-16.--Analysis of variance of Dimension 4--College-school relations--by sex and graduated with 40 or 60 credits.

D04 College-School Relations
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.016	2	.008	.062	.940
A04	.005	1	.005	.041	.841
A05	.000	1	.000	.000	.989
Main effects	.225	2	.112	.848	.431
A01	.003	1	.003	.019	.890
A03	.211	1	.211	1.591	.210
2-way interactions	.084	1	.084	.637	.427
A01 A03	.084	1	.084	.637	.427
Explained	.325	5	.065	.491	.782
Residual	14.569	110	.132		
Total	14.894	115	.130		

Cell Means

A01: Sex		A03: 40/60 Credits 40	60	Total Sex
1 = Male	$\bar{m}$	4.76	4.81	4.77
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	4.70	4.86	4.80
	n	(15)	(25)	(40)
Total	$\bar{m}$	4.75	4.84	4.78
40/60 credits	n	(74)	(42)	(116)

Table E-17.--Analysis of variance of Dimension 4--College-school relations--by sex and teaching at which level.

D04 College-School Relations
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.015	2	.008	.057	.945
A04	.007	1	.007	.049	.826
A05	.000	1	.000	.000	.984
Main effects	.263	2	.132	.977	.380
A01	.034	1	.034	.251	.617
A08	.237	1	.237	1.756	.188
2-way interactions	.100	1	.100	.741	.391
A01 A08	.100	1	.100	.741	.391
Explained	.379	5	.076	.562	.729
Residual	14.291	106	.135		
Total	14.670	111	.132		

Cell Means

A01: Sex		A08: Teaching Level		Total Sex
		Middle School	High School	
1 = Male	$\bar{m}$	4.75	4.80	4.76
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	4.75	4.95	4.80
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	4.75	4.85	4.78
	n	(83)	(29)	(112)

Table E-18.--Analysis of variance of Dimension 4--College-school relations--by sex and percent of mathematics teaching duty.

D04 College-School Relations
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.015	2	.008	.057	.945
A04	.007	1	.007	.048	.826
A05	.000	1	.000	.000	.984
Main effects	.215	2	.107	.793	.455
A01	.037	1	.037	.272	.603
A09	.188	1	.188	1.389	.241
2-way interactions	.072	1	.072	.533	.467
A01 A09	.072	1	.072	.533	.467
Explained	.303	5	.061	.446	.815
Residual	14.367	106	.136		
Total	14.670	111	.132		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	100%	Total Sex
1 = Male	$\bar{m}$	4.72	4.78	4.76
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	4.66	4.84	4.80
	n	(8)	(30)	(38)
Total	$\bar{m}$	4.70	4.80	4.78
percent teaching duty	n	(24)	(88)	(112)

Table E-19.--Analysis of variance of Dimension 4--College-school relations--by year graduated from Mecca College of Education (male teachers).

D04 College-School Relations
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.136	2	.068	.474	.625
A04	.136	1	.136	.947	.334
A05	.084	1	.084	.588	.446
Main effects	.931	4	.233	1.622	.179
A02	.931	4	.233	1.622	.179
Explained	1.067	6	.178	1.239	.297
Residual	9.903	69	.144		
Total	10.970	75	.146		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	4.73	4.66	4.75	4.92	4.92	4.77
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-20.--Analysis of variance of Dimension 4--College-school relations--by year graduated from Mecca College of Education (female teachers).

D04 College-School Relations
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.168	2	.084	.867	.429
A04	.158	1	.158	1.631	.210
A05	.132	1	.132	1.367	.250
Main effects	.350	2	.175	1.810	.179
A02	.350	2	.175	1.810	.179
Explained	.517	4	.129	1.338	.275
Residual	3.383	35	.097		
Total	3.900	39	.100		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	4.79	4.67	4.92	4.80
n	(0)	(0)	(12)	(13)	(15)	(40)

Table E-21.--Analysis of variance of Dimension 5--Emphasis on practical problems--by sex and graduated with 40 or 60 credits.

D05 Emphasis on Practical Problems
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.235	2	.118	.332	.718
A04	.197	1	.197	.556	.458
A05	.055	1	.055	.156	.694
Main effects	.813	2	.407	1.148	.321
A01	.725	1	.725	2.047	.155
A03	.000	1	.000	.001	.974
2-way interactions	.088	1	.088	.248	.619
A01 A03	.088	1	.088	.248	.619
Explained	1.136	5	.227	.642	.668
Residual	38.948	110	.354		
Total	40.084	115	.349		

Cell Means

A01: Sex		A03: 40/60 Credits 40	A03: 40/60 Credits 60	Total Sex
1 = Male	$\bar{m}$	4.34	4.25	4.32
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	4.40	4.49	4.46
	n	(15)	(25)	(40)
Total	$\bar{m}$	4.35	4.40	4.37
40/60 credits	n	(74)	(42)	(116)

Table E-22.--Analysis of variance of Dimension 5--Emphasis on practical problems--by sex and teaching at which level.

D05 Emphasis on Practical Problems
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.237	2	.118	.398	.673
A04	.126	1	.126	.424	.516
A05	.235	1	.235	.788	.377
Main effects	1.044	2	.522	1.753	.178
A01	.785	1	.785	2.637	.107
A08	.298	1	.298	1.002	.319
2-way interactions	.003	1	.003	.009	.924
A01 A08	.003	1	.003	.009	.924
Explained	1.284	5	.257	.862	.509
Residual	31.569	106	.298		
Total	32.853	111	.296		

Cell Means

A01: Sex		A08: Teaching Level		Total Sex
		Middle School	High School	
1 = Male	$\bar{m}$	4.31	4.44	4.34
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	4.48	4.60	4.51
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	4137	4.49	4.40
	n	(83)	(29)	(112)

Table E-23.--Analysis of variance of Dimension 5--Emphasis on practical problems--by sex and percent of mathematics teaching duty.

D05 Emphasis on Practical Problems
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall Gpa
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.237	2	.118	.399	.672
A04	.126	1	.126	.426	.516
A05	.235	1	.235	.790	.376
Main effects	.746	2	.373	1.256	.289
A01	.743	1	.743	2.503	.117
A09	.000	1	.000	.000	.990
2-way interactions	.401	1	.401	1.351	.248
A01 A09	.401	1	.401	1.351	.248
Explained	1.384	5	.277	.932	.463
Residual	31.469	106	.297		
Total	32.853	111	.296		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	100%	Total Sex
1 = Male	$\bar{m}$	4.44	.432	4.34
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	4.38	4.54	4.51
	n	(8)	(30)	(38)
Total	$\bar{m}$	4.42	4.39	4.40
percent teaching duty	n	(24)	(88)	(112)

Table E-24.--Analysis of variance of Dimension 5--Emphasis on practical problems--by year graduated from Mecca College of Education (male teachers).

D05 Emphasis on Practical Problems
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.588	2	.294	.714	.493
A04	.398	1	.398	.967	.329
A05	.054	1	.054	.130	.719
Main effects	1.521	4	.380	.923	.456
A02	1.521	4	.380	.923	.456
Explained	2.110	6	.352	.853	.534
Residual	28.433	69	.412		
Total	30.542	75	.407		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	4.60	4.20	4.27	4.22	4.33	4.32
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-25.--Analysis of variance of Dimension 5--Emphasis on practical problems--by year graduated from Mecca College of Education (female teachers).

D05 Emphasis on Practical Problems
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.038	2	.019	.076	.927
A04	.022	1	.022	.087	.770
A05	.001	1	.001	.003	.958
Main effects	.109	2	.055	.215	.808
A02	.109	2	.055	.215	.808
Explained	.148	4	.037	.145	.964
Residual	8.894	35	.254		
Total	9.042	39	.232		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	4.42	4.41	4.53	4.46
n	(0)	(0)	(12)	(13)	(15)	(40)

Table E-26.--Analysis of variance of Dimension 6--Preparation for school teaching--by sex and graduated with 40 or 60 credits.

D06 Preparation for School Teaching
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.696	2	.348	.668	.515
A04	.307	1	.307	.590	.444
A05	.004	1	.004	.008	.929
Main effects	.969	2	.484	.930	.397
A01	.084	1	.084	.160	.689
A03	.965	1	.965	1.854	.176
2-way interactions	.000	1	.000	.000	.997
A01 A03	.000	1	.000	.000	.997
Explained	1.664	5	.333	.640	.670
Residual	57.254	110	.520		
Total	58.919	115	.512		

Cell Means

A01: Sex		A03: 40/60 Credits 40	60	Total
1 = Male	$\bar{m}$	3.38	3.14	3.33
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	3.37	3.19	3.26
	n	(15)	(25)	(40)
Total	$\bar{m}$	3.38	3.17	3.30
40/60 credits	n	(74)	(42)	(116)

Table E-27.--Analysis of variance of Dimension 6--Preparation for school teaching--by sex and teaching at which level.

D06 Preparation for School Teaching
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.530	2	.265	.498	.609
A04	.195	1	.195	.365	.547
A05	.000	1	.000	.000	.998
Main effects	.163	2	.081	.153	.859
A01	.005	1	.005	.010	.920
A08	.159	1	.159	.299	.585
2-way interactions	.279	1	.279	.523	.471
A01 A08	.279	1	.279	.523	.471
Explained	.971	5	.194	.365	.872
Residual	56.467	106	.533		
Total	57.439	111	.517		

Cell Means

A01: Sex		A08: Teaching Level Middle School	A08: Teaching Level High School	Total Sex
1 = Male	$\bar{m}$	3.33	3.32	3.32
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	3.34	3.06	3.26
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	3.33	3.23	3.30
	n	(83)	(29)	(112)

Table E-28.--Analysis of variance of Dimension 6--Preparation for school teaching--by sex and percent of mathematics teaching duty.

D06 Preparation for School Teaching
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.530	2	.265	.498	.609
A04	.195	1	.195	.366	.547
A05	.000	1	.000	.000	.998
Main effects	.252	2	.126	.237	.789
A01	.008	1	.008	.015	.903
A09	.249	1	.249	.468	.495
2-way interactions	.275	1	.275	.516	.474
A01 A09	.275	1	.275	.516	.474
Explained	1.057	5	.211	.397	.850
Residual	56.382	106	.532		
Total	57.439	111	.517		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	100%	Total Sex
1 = Male	$\bar{m}$	3.36	3.31	3.32
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	3.53	3.19	3.26
	n	(8)	(30)	(38)
Total	$\bar{m}$	3.42	3.27	3.30
percent teaching duty	n	(24)	(88)	(112)

Table E-29.--Analysis of variance of Dimension 6--Preparation for school teaching--by year graduated from Mecca College of Education (male teachers).

D06 Preparation for School Teaching
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.465	2	.733	1.435	.245
A04	.082	1	.082	.161	.689
A05	.244	1	.244	.478	.492
Main effects	1.140	4	.285	.558	.694
A02	1.140	4	.285	.558	.694
Explained	2.605	6	.434	.850	.536
Residual	35.223	69	.510		
Total	37.827	75	.504		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	3.37	3.22	3.41	3.07	3.52	3.33
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-30.--Analysis of variance of Dimension 6--Preparation for school teaching--by year graduated from Mecca College of Education (female teachers).

D06 Preparation for School Teaching
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.494	2	.247	.431	.653
A04	.102	1	.102	.177	.676
A05	.427	1	.427	.746	.393
Main effects	.437	2	.219	.382	.685
A02	.437	2	.219	.382	.685
Explained	.932	4	.233	.407	.803
Residual	20.044	35	.573		
Total	20.976	39	.538		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	3.25	3.38	3.16	3.26
n	(0)	(0)	(12)	(13)	(15)	(40)

Table E-31.--Analysis of variance of Dimension 7--Method of teaching mathematics--by sex and graduated with 40 or 60 credits.

D07 Method of Teaching Mathematics
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.233	2	.116	.263	.769
A04	.156	1	.156	.353	.553
A05	.022	1	.022	.049	.825
Main effects	.369	2	.185	.418	.659
A01	.353	1	.353	.798	.374
A03	.008	1	.008	.017	.896
2-way interactions	3.320	1	3.320	7.510	.007
A01 A03	3.320	1	3.320	7.510	.007
Explained	3.923	5	.785	1.775	.124
Residual	48.629	110	.442		
Total	52.552	115	.457		

Cell Means

A01: Sex		A03: 40/60 Credits 40	A03: 40/60 Credits 60	Total Sex
1 = Male	$\bar{m}$	1.42	1.15	1.36
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	1.00	1.44	1.27
	n	(15)	(25)	(40)
Total	$\bar{m}$	1.33	1.32	1.33
40/60 credits	n	(74)	(42)	(116)

Table E-32.--Analysis of variance of Dimension 7--Method of teaching mathematics--by sex and teaching at which level.

D07 Method of Teaching Mathematics
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.330	2	.165	.355	.702
A04	.119	1	.119	.256	.614
A05	.000	1	.000	.000	.993
Main effects	1.059	2	.529	1.136	.325
A01	.337	1	.337	.724	.397
A08	.678	1	.678	1.456	.230
2-way interactions	1.339	1	1.339	2.875	.093
A01 A08	1.339	1	1.339	2.875	.093
Explained	2.728	5	.546	1.171	.328
Residual	49.379	106	.466		
Total	52.107	111	.469		

Cell Means

A01: Sex		A08: Teaching Level		Total Sex
		Middle School	High School	
1 = Male	$\bar{m}$	1.36	1.37	1.36
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	1.14	1.70	1.29
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	1.29	1.48	1.34
	n	(83)	(29)	(112)

Table E-33.--Analysis of variance of Dimension 7--Method of teaching mathematics--by sex and percent of mathematics teaching duty.

D07 Method of Teaching Mathematics
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.330	2	.165	.342	.711
A04	.119	1	.119	.246	.621
A05	.000	1	.000	.000	.993
Main effects	.503	2	.252	.521	.596
A01	.351	1	.351	.725	.396
A09	.123	1	.123	.254	.615
2-way interactions	.048	1	.048	.099	.753
A01 A09	.048	1	.048	.099	.753
Explained	.882	5	.176	.365	.872
Residual	51.226	106	.483		
Total	52.107	111	.469		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	100%	Total Sex
1 = Male	$\bar{m}$	1.31	1.38	1.36
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	1.13	1.33	1.29
	n	(8)	(30)	(38)
Total percent teaching duty	$\bar{m}$	1.25	1.36	1.34
	n	(24)	(88)	(112)

Table E-34.--Analysis of variance of Dimension 7--Method of teaching mathematics--by year graduated from Mecca College of Education (male teachers).

D07 Method of Teaching Mathematics
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.717	2	.358	.818	.446
A04	.611	1	.611	1.395	.242
A05	.175	1	.175	.400	.529
Main effects	1.960	4	.490	1.118	.355
A02	1.960	4	.490	1.118	.355
Explained	2.676	6	.446	1.018	.421
Residual	30.231	69	.438		
Total	32.908	75	.439		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	1.23	1.50	1.56	1.17	1.12	1.36
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-35.--Analysis of variance of Dimension 7--Method of teaching mathematics--by year graduated from Mecca College of Education (female teachers).

D07 Method of Teaching Mathematics
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.108	2	.054	.100	.905
A04	.040	1	.040	.074	.787
A05	.104	1	.104	.192	.664
Main effects	.370	2	.185	.341	.714
A02	.370	2	.185	.341	.714
Explained	.478	4	.120	.220	.925
Residual	18.997	35	.543		
Total	19.475	39	.499		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	1.29	1.38	1.17	1.27
n	(0)	(0)	(12)	(13)	(15)	(40)

Table E-36.--Analysis of variance of Dimension 8--Student teaching--by sex and graduated with 40 or 60 credits.

D08 Student Teaching
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.215	2	.607	2.127	.124
A04	1.176	1	1.176	4.119	.045
A05	.556	1	.556	1.947	.166
Main effects	.220	2	.110	.385	.681
A01	.008	1	.008	.028	.867
A03	.160	1	.160	.560	.456
2-way interactions	.879	1	.879	3.076	.082
A01 A03	.879	1	.879	3.076	.082
Explained	2.313	5	.463	1.620	.161
Residual	31.417	110	.286		
Total	33.731	115	.293		

Cell Means

A01: Sex		A03: 40/60 Credits 40	A03: 40/60 Credits 60	Total Sex
1 = Male	$\bar{m}$	1.33	1.06	1.27
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	1.03	1.26	1.17
	n	(15)	(25)	(40)
Total 40/60 credits	$\bar{m}$	1.27	1.18	1.24
	n	(74)	(42)	(116)

Table E-37.--Analysis of variance of Dimension 8--Student teaching--by sex and teaching at which level.

D08 Student Teaching
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.280	2	.640	2.196	.116
A04	1.274	1	1.274	4.371	.039
A05	.720	1	.720	2.471	.119
Main effects	.169	2	.085	.290	.749
A01	.061	1	.061	.210	.648
A08	.115	1	.115	.393	.532
2-way interactions	1.164	1	1.164	3.995	.048
A01 A08	1.164	1	1.164	3.995	.048
Explained	2.613	5	.523	1.793	.120
Residual	30.885	106	.291		
Total	33.498	111	.302		

Cell Means

A01: Sex		A08: Teaching Level		Total Sex
		Middle School	High School	
1 = Male	$\bar{m}$	1.33	1.13	1.28
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	1.13	1.35	1.18
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	1.26	1.21	1.25
	n	(83)	(29)	(112)

Table E-38.--Analysis of variance of Dimension 8--Student teaching--by sex and percent of mathematics teaching duty.

D08 Student Teaching
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.280	2	.640	2.131	.124
A04	1.274	1	1.274	4.242	.042
A05	.720	1	.720	2.398	.124
Main effects	.073	2	.037	.122	.885
A01	.058	1	.058	.195	.660
A09	.019	1	.019	.063	.802
2-way interactions	.323	1	.323	1.077	.302
A01 A09	.323	1	.323	1.077	.302
Explained	1.676	5	.335	1.117	.356
Residual	31.822	106	.300		
Total	33.498	111	.302		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	100%	Total Sex
1 = Male	$\bar{m}$	1.41	1.24	1.28
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	1.13	1.20	1.18
	n	(8)	(30)	(38)
Total	$\bar{m}$	1.31	1.23	1.25
percent teaching duty	n	(24)	(88)	(112)

Table E-39.--Analysis of variance of Dimension 8--Student teaching--by year graduated from Mecca College of Education (male teachers).

D08 Student Teaching
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.011	2	.506	1.437	.245
A04	.997	1	.997	2.835	.097
A05	.515	1	.515	1.463	.231
Main effects	2.935	4	.734	2.086	.092
A02	2.935	4	.734	2.086	.092
Explained	3.947	6	.658	1.870	.098
Residual	24.274	69	.352		
Total	28.220	75	.376		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	1.40	1.50	1.15	1.11	1.00	1.27
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-40.--Analysis of variance of Dimension 8--Student teaching--by year graduated from Mecca College of Education (female teachers).

D08 Student Teaching
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.129	2	.064	.444	.645
A04	.125	1	.125	.862	.359
A05	.093	1	.093	.644	.428
Main effects	.071	2	.035	.244	.785
A02	.071	2	.035	.244	.785
Explained	.199	4	.050	.344	.846
Residual	5.076	35	.145		
Total	5.275	39	.135		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	1.21	1.19	1.13	1.17
n	(0)	(0)	(12)	(13)	(15)	(40)

Table E-41.--Analysis of variance of Dimension 9--Educational thought--by sex and graduated with 40 or 60 credits.

D09 Educational Thought
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.839	2	.920	.845	.432
A04	1.524	1	1.524	1.401	.239
A05	1.750	1	1.750	1.608	.207
Main effects	.184	2	.092	.085	.919
A01	.122	1	.122	.002	.738
A03	.012	1	.012	.011	.916
2-way interactions	.008	1	.008	.007	.934
A01 A03	.008	1	.008	.007	.934
Explained	2.031	5	.406	.373	.866
Residual	119.684	110	1.088		
Total	121.716	115	1.058		

Cell Means

A01: Sex		A03: 40/60 Credits 40	A03: 40/60 Credits 60	Total Sex
1 = Male	$\bar{m}$	2.79	2.79	2.79
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	2.83	2.66	2.72
	n	(15)	(25)	(40)
Total 40/60 credits	$\bar{m}$	2.80	2.71	2.77
	n	(74)	(42)	(116)

Table E-42.--Analysis of variance of Dimension 9--Educational thought--by sex and teaching at which level.

D09 Educational Thought
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	2.171	2	1.086	.990	.375
A04	1.675	1	1.675	1.528	.219
A05	2.119	1	2.119	1.933	.167
Main effects	.193	2	.096	.088	.916
A01	.049	1	.049	.045	.833
A08	.136	1	.136	.124	.725
2-way interactions	.896	1	.896	.817	.368
A01 A08	.896	1	.896	.817	.368
Explained	3.260	5	.652	.595	.704
Residual	116.231	106	1.097		
Total	119.491	111	1.076		

Cell Means

A01: Sex		A08: Teaching Level		Total Sex
		Middle School	High School	
1 = Male	$\bar{m}$	2.81	2.66	2.77
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	2.64	3.00	2.74
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	2.75	2.78	2.76
	n	(83)	(29)	(112)

Table E-43.--Analysis of variance of Dimension 9--Educational thought--by sex and percent of mathematics teaching duty.

D09 Educational Thought
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	2.171	2	1.086	.999	.372
A04	1.675	1	1.675	1.542	.217
A05	2.119	1	2.119	1.950	.165
Main effects	.154	2	.077	.071	.932
A01	.067	1	.067	.061	.805
A09	.098	1	.098	.090	.765
2-way interactions	1.989	1	1.989	1.831	.179
A01 A09	1.989	1	1.989	1.831	.179
Explained	4.315	5	.863	.794	.556
Residual	115.176	106	1.087		
Total	119.491	111	1.076		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	A09: Mathematics Teaching Duty 100%	Total Sex
1 = Male	$\bar{m}$	2.97	2.27	2.77
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	2.38	2.83	2.74
	n	(8)	(30)	(38)
Total percent teaching duty	$\bar{m}$	2.77	2.76	2.76
	n	(24)	(88)	(112)

Table E-44.--Analysis of variance of Dimension 9--Educational thought--by year graduated from Mecca College of Education (male teachers).

D09 Educational Thought
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.482	2	.241	.196	.822
A04	.061	1	.061	.049	.825
A05	.041	1	.041	.034	.855
Main effects	1.848	4	.462	.376	.825
A02	1.848	4	.462	.376	.825
Explained	2.330	6	.388	.316	.927
Residual	84.801	69	1.229		
Total	87.132	75	1.162		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	2.80	2.91	2.65	2.50	2.96	2.79
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-45.--Analysis of variance of Dimension 9--Educational thought--by year graduated from Mecca College of Education (female teachers).

D09 Educational Thought
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	6.554	2	3.277	4.357	.020
A04	6.552	1	6.552	8.711	.006
A05	3.560	1	3.560	4.733	.036
Main effects	1.595	2	.798	1.060	.357
A02	1.595	2	.798	1.060	.357
Explained	8.150	4	2.037	2.709	.046
Residual	26.325	35	.752		
Total	34.475	39	.884		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	3.04	2.58	2.60	2.72
n	(0)	(0)	(12)	(13)	(15)	(40)

Table E-46.--Analysis of variance of Dimension 10--Curriculum design--by sex and graduated with 40 or 60 credits.

D10 Curriculum Design
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	2.128	2	1.064	1.328	.269
A04	1.898	1	1.898	2.369	.127
A05	.653	1	.653	.814	.369
Main effects	2.060	2	1.030	1.285	.281
A01	1.720	1	1.720	2.147	.146
A03	1.010	1	1.010	1.261	.264
2-way interactions	.000	1	.000	.000	.990
A01 A03	.000	1	.000	.000	.990
Explained	4.188	5	.838	1.045	.395
Residual	88.139	110	.801		
Total	92.328	115	.803		

Cell Means

A01: Sex		A03: 40/60 Credits 40	60	Total Sex
1 = Male	$\bar{m}$	2.21	1.94	2.15
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	2.33	2.22	2.26
	n	(15)	(25)	(40)
Total 40/60 credits	$\bar{m}$	2.24	2.11	2.19
	n	(74)	(42)	(116)

Table E-47.--Analysis of variance of Dimension 10--Curriculum design--by sex and teaching at which level.

D10 Curriculum Design
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	2.177	2	1.088	1.386	.255
A04	2.176	1	2.176	2.770	.099
A05	1.403	1	1.403	1.786	.184
Main effects	2.456	2	1.228	1.563	.214
A01	1.003	1	1.003	1.277	.261
A08	1.556	1	1.556	1.980	.162
2-way interactions	.027	1	.027	.035	.852
A01 A08	.027	1	.027	.035	.852
Explained	4.660	5	.932	1.186	.321
Residual	83.260	106	.785		
Total	87.920	111	.792		

Cell Means

A01: Sex		A08: Teaching Level		Total Sex
		Middle School	High School	
1 = Male	$\bar{m}$	2.11	2.39	2.18
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	2.23	2.50	2.30
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	2.15	2.43	2.22
	n	(83)	(29)	(112)

Table E-48.--Analysis of variance of Dimension 10--Curriculum design--by sex and percent of mathematics teaching duty.

D10 Curriculum Design
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	2.177	2	1.088	1.415	.248
A04	2.176	1	2.176	2.829	.096
A05	1.403	1	1.403	1.824	.180
Main effects	3.666	2	1.833	2.383	.097
A01	1.118	1	1.118	1.453	.231
A09	2.766	1	2.766	3.596	.061
2-way interactions	.542	1	.542	.705	.403
A01 A09	.542	1	.542	.705	.403
Explained	6.385	5	1.277	1.660	.151
Residual	81.535	106	.769		
Total	87.920	111	.792		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	100%	Total Sex
1 = Male	$\bar{m}$	2.03	2.22	2.18
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	1.94	2.40	2.30
	n	(8)	(30)	(38)
Total percent teaching duty	$\bar{m}$	2.00	2.28	2.22
	n	(24)	(88)	(112)

Table E-49.--Analysis of variance of Dimension 10--Curriculum design--by year graduated from Mecca College of Education (male teachers).

D10 Curriculum Design
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	6.171	2	3.086	3.912	.025
A04	5.139	1	5.139	6.516	.013
A05	1.366	1	1.366	1.732	.193
Main effects	1.420	4	.355	.450	.772
A02	1.420	4	.355	.450	.772
Explained	7.591	6	1.265	1.604	.159
Residual	54.419	69	.789		
Total	62.010	75	.827		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	2.03	2.32	1.88	2.28	2.27	2.15
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-50.--Analysis of variance of Dimension 10--Curriculum design--by year graduated from Mecca College of Education (female teachers).

D10 Curriculum Design
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.354	2	.177	.223	.802
A04	.311	1	.311	.391	.536
A05	.078	1	.078	.099	.755
Main effects	1.840	2	.920	1.158	.326
A02	1.840	2	.920	1.158	.326
Explained	2.193	4	.548	.690	.604
Residual	27.800	35	.794		
Total	29.994	39	.769		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	2.17	2.58	2.07	2.15
n	(0)	(0)	(12)	(13)	(15)	(40)

Table E-51.--Analysis of variance of Dimension 11--Educational psychology--by sex and graduated with 40 or 60 credits.

D11 Educational Psychology
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	3.636	2	1.818	2.558	.082
A04	.327	1	.327	.460	.499
A05	.415	1	.415	.583	.447
Main effects	1.797	2	.898	1.264	.287
A01	.372	1	.372	.523	.471
A03	.819	1	.819	1.152	.286
2-way interactions	.000	1	.000	.001	.982
A01 A03	.000	1	.000	.001	.982
Explained	5.433	5	1.087	1.529	.187
Residual	78.187	110	.711		
Total	83.620	115	.727		

Cell Means

A01: Sex		A03: 40/60 Credits 40	A03: 40/60 Credits 60	Total Sex
1 = Male	$\bar{m}$	2.27	2.37	2.29
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	2.27	2.40	2.35
	n	(15)	(25)	(40)
Total	$\bar{m}$	2.27	2.39	2.31
40/60 credits	n	(74)	(42)	(116)

Table E-52.--Analysis of variance of Dimension 11--Educational psychology--by sex and teaching at which level.

D11 Educational Psychology
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	3.656	2	1.828	2.507	.086
A04	.464	1	.464	.636	.427
A05	.299	1	.299	.410	.524
Main effects	1.662	2	.831	1.139	.324
A01	1.080	1	1.080	1.480	.226
A08	.515	1	.515	.706	.403
2-way interactions	.030	1	.030	.041	.840
A01 A08	.030	1	.030	.041	.840
Explained	5.348	5	1.070	1.467	.207
Residual	77.303	106	.729		
Total	82.651	111	.745		

Cell Means

A01: Sex		A08: Teaching Level		Total Sex
		Middle School	High School	
1 = Male	$\bar{m}$	2.35	2.16	2.30
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	2.45	2.13	2.37
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	2.38	2.15	2.32
	n	(83)	(29)	(112)

Table E-53.--Analysis of variance of Dimension 11--Educational psychology--by sex and percent of mathematics teaching duty.

D11 Educational Psychology
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	3.656	2	1.828	2.508	.086
A04	.464	1	.464	.636	.427
A05	.299	1	.299	.410	.523
Main effects	1.173	2	.587	.805	.450
A01	1.118	1	1.118	1.534	.218
A09	.027	1	.027	.037	.848
2-way interactions	.550	1	.550	.755	.387
A01 A09	.550	1	.550	.755	.387
Explained	5.380	5	1.076	1.476	.204
Residual	77.271	106	.729		
Total	82.651	111	.745		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	100%	Total Sex
1 = Male	$\bar{m}$	2.27	2.30	2.30
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	2.71	2.28	2.37
	n	(8)	(30)	(38)
Total percent teaching duty	$\bar{m}$	2.42	2.30	2.32
	n	(24)	(88)	(112)

Table E-54.--Analysis of variance of Dimension 11--Educational psychology--by year graduated from Mecca College of Education (male teachers).

D11 Educational Psychology
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.118	2	.559	.816	.446
A04	.212	1	.212	.309	.580
A05	.048	1	.048	.070	.791
Main effects	2.501	4	.625	.913	.461
A02	2.501	4	.625	.913	.461
Explained	3.619	6	.603	.881	.514
Residual	47.262	69	.685		
Total	50.882	75	.678		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	2.44	2.32	2.02	2.56	2.26	2.29
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-55.--Analysis of variance of Dimension 11--Educational psychology--by year graduated from Mecca College of Education (female teachers).

D11 Educational Psychology
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	4.754	2	2.377	3.304	.048
A04	.644	1	.644	.896	.350
A05	.550	1	.550	.765	.388
Main effects	2.725	2	1.363	1.894	.166
A02	2.725	2	1.363	1.894	.166
Explained	7.479	4	1.870	2.599	.053
Residual	25.177	35	.719		
Total	32.656	39	.837		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	2.56	2.10	2.40	2.35
n	(0)	(0)	(12)	(13)	(15)	(40)

Table E-56.--Analysis of variance of Dimension 12--Problems of teaching mathematics--by sex and graduated with 40 or 60 credits.

D12 Problems of Teaching Mathematics
By A01 Sex
A03 Graduated with 40 or 60 credits
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.580	2	.290	.413	.663
A04	.360	1	.360	.513	.475
A05	.580	1	.580	.826	.365
Main effects	.891	2	.446	.635	.532
A01	.864	1	.864	1.232	.270
A03	.229	1	.229	.326	.569
2-way interactions	.140	1	.140	.199	.656
A01 A03	.410	1	.140	.199	.656
Explained	1.611	5	.322	.459	.806
Residual	77.202	110	.702		
Total	78.812	115	.685		

Cell Means

A01: Sex		A03: 40/60 Credits 40	A03: 40/60 Credits 60	Total Sex
1 = Male	$\bar{m}$	2.83	2.78	2.82
	n	(59)	(17)	(76)
2 = Female	$\bar{m}$	3.04	2.93	2.98
	n	(15)	(25)	(40)
Total 40/60 credits	$\bar{m}$	2.87	2.87	2.87
	n	(74)	(42)	(116)

Table E-57.--Analysis of variance of Dimension 12--Problems of teaching mathematics--by sex and teaching at which level.

D12 Problems of Teaching Mathematics
By A01 Sex
A08 Teaching at which level?
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.677	2	.338	.467	.628
A04	.398	1	.398	.549	.460
A05	.675	1	.675	.932	.337
Main effects	.696	2	.348	.481	.620
A01	.656	1	.656	.905	.344
A08	.028	1	.028	.038	.845
2-way interactions	.496	1	.496	.685	.410
A01 A08	.496	1	.496	.685	.410
Explained	1.869	5	.374	.516	.764
Residual	76.796	106	.724		
Total	78.666	111	.709		

Cell Means

A01: Sex		A08: Teaching Level		Total Sex
		Middle School	High School	
1 = Male	$\bar{m}$	2.79	2.91	2.82
	n	(55)	(19)	(74)
2 = Female	$\bar{m}$	3.05	2.80	2.98
	n	(28)	(10)	(38)
Total teaching level	$\bar{m}$	2.88	2.87	2.88
	n	(83)	(29)	(112)

Table E-58.--Analysis of variance of Dimension 12--Problems of teaching mathematics--by sex and percent of mathematics teaching duty.

D12 Problems of Teaching Mathematics
By A01 Sex
A09 Percent of mathematics teaching duty
With A04 Overall GPA
A05 Mathematics GPA

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.677	2	.338	.471	.625
A04	.398	1	.398	.554	.458
A05	.675	1	.675	.941	.334
Main effects	1.876	2	.938	1.307	.275
A01	.552	1	.552	.769	.383
A09	1.207	1	1.207	1.682	.198
2-way interactions	.030	1	.030	.041	.839
A01 A09	.030	1	.030	.041	.839
Explained	2.582	5	.516	.719	.610
Residual	76.084	106	.718		
Total	78.666	111	.709		

Cell Means

A01: Sex		A09: Mathematics Teaching Duty 80%	100%	Total Sex
1 = Male	$\bar{m}$	3.02	2.77	2.82
	n	(16)	(58)	(74)
2 = Female	$\bar{m}$	3.25	2.91	2.98
	n	(8)	(30)	(38)
Total percent teaching duty	$\bar{m}$	3.10	2.82	2.88
	n	(24)	(88)	(112)

Table E-59.--Analysis of variance of Dimension 12--Problems of teaching mathematics--by year graduated from Mecca College of Education (male teachers).

D12 Problems of Teaching Mathematics
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for male teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	.327	2	.164	.213	.809
A04	.022	1	.022	.029	.866
A05	.208	1	.208	.270	.605
Main effects	1.556	4	.389	.505	.732
A02	1.556	4	.389	.505	.732
Explained	1.883	6	.314	.408	.872
Residual	53.104	69	.770		
Total	54.987	75	.733		

Cell Means

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	2.76	2.97	2.88	2.52	2.77	2.82
n	(15)	(22)	(17)	(9)	(13)	(76)

Table E-60.--Analysis of variance of Dimension 12--Problems of teaching mathematics--by year graduated from Mecca College of Education (female teachers).

D12 Problems of Teaching Mathematics
By A02 Year graduated from Mecca College of Education
With A04 Overall GPA
A05 Mathematics GPA
Selected for female teachers

Source of Variation	Sum of Squares	df	Mean Square	F	Signif. of F
Covariates	1.397	2	.699	1.150	.328
A04	1.300	1	1.300	2.139	.153
A05	.419	1	.419	.689	.412
Main effects	.530	2	.265	.436	.650
A02	.530	2	.265	.436	.650
Explained	1.928	4	.482	.793	.538
Residual	21.270	35	.608		
Total	23.197	39	.595		

	A02: Year Graduated From Mecca College of Education					Total
	1975-76	1976-77	1977-78	1978-79	1979-80	
$\bar{m}$	0	0	2.97	3.08	2.89	2.98
n	(0)	(0)	(12)	(13)	(15)	(40)

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