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WITH SPECIAL REFERENCE TO DEVELOPING COUNTRIES*

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THE IMPROVEMENT OF MATHEMATICS EDUCATION IN THE ARAB COUNTRIES,
WITH SPECIAL REFERENCE TO THE UNITED ARAB REPUBLIC

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Independence of the Arab Countries, as well as newly developed ones, gave their people new aspirations. They have the keen desire of developing their countries to cope with the demands of the era. They are determined to share the responsibilities of promoting the cause of humanity aiming at the prosperity of mankind.

In their efforts towards development these countries faced many problems. In the field of education they had to solve problems of : providing education for the masses, securing sufficient numbers of qualified teachers and supplying adequate equipments for schools. The developmental plans need more scientifically and mathematically trained manpower. For this reason we see that science in general and mathematics in particular has held a place of honour and importance among other school subjects. Tables Nos. 1-3 in the Appendix show this trend as indicated by the number of hours allotted to mathematics in school programmes.

The problem of mathematics education in the Arab Countries then, is not a problem of appreciating its importance. It is a problem of defining a new core of mathematical knowledge embodying the leading ideas and the principal techniques of modern mathematics. The teaching of such a core has to be organized as a well articulated programme. In this we have to take advantage of whatever light modern psychology and pedagogy can throw on intellectual development, learning and teaching techniques.

With the position of the newly developed countries in mind I am going to deal with three important factors which may affect the design of such a core :

- 1- Defining the objectives,
- 2- Considering the nature of mathematics as a subject-matter,
- 3- Considering the existing status.

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Objectives of Mathematics Education

The first step towards building a new programme is to define our objectives. The objectives have to meet the national social and economic requirements. Taking the United Arab Republic as an example, in the late fifties the Ministry of Education made it an essential task to define general and specific objectives for different levels of education and different areas of teaching. It may be useful to use these objectives as a background and draw a framework of reference which would apply to most developing countries. Such a framework may be outlined as follows:

1) To Develop Objective and Creative Thinking:

Science and mathematics teaching should be planned and conducted in such a way to help learners to develop objectivity and creativity. This would mean new syllabi, new books and new teaching materials. It would also mean new teaching techniques and methods. The product of all these is hoped to be a person able to analyse a situation with an objective point of view, to see the relations involved, and to apply his knowledge to find a solution characterized by novelty rather than by habit and dogma. Objectivity has another merit. It helps one to understand the other man's point of view, an attitude which is greatly needed in international relations.

2) To Help The Learner Improve his conditions:

It is a fact that in most developing countries living conditions are inferior to the corresponding ones in the developed countries. Young citizens should be taught and trained to improve those conditions and to keep their health. This means new methods of teaching which transfer a learning situation in a class into a real situation in life. There are many topics in this concern which may be included in science syllabi. Mathematics may not have such an advantage, but it can use related situations to apply mathematical knowledge.

3) To Help the Learner Understand the Natural Resources in his Country and the Projects Run as Needed to Exploit them:

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Natural resources in developing countries differ in nature. A study should be made with the purpose of including, in the science syllabi and teaching techniques, topics and methods which lead to the acquisition of scientific and mathematical facts involved and of skills and experiences needed for better investment of natural resources.

4) To Provide the Scientifically and Mathematically Trained Manpower on Different Levels:

It is a fact that there is a great shortage in developing Countries of those who have specialized in scientific and mathematical fields. Engineers, physicists, chemists, medical doctors, mathematicians science and mathematics teachers etc., are needed. We also need technicians and skilled workers. Mathematics is essential in preparing these categories of workers.

5) To Help the Learner to Understand the New Developments and Achievements in the Fields of Mathematics and to Contribute to these Achievements:

Few Countries have been taking the responsibility of developing science, mathematics and technology. It is high time for other countries to help in this direction. Education at all levels has to aim at making "the contemporary achievements" a property of all mankind by carrying them to schools and universities.

Mathematics as a Subject-Matter

After defining "our" objectives we come to consider what we may call the subject-matter point of view. The following statements concerning the nature of mathematics may serve as guide lines for developing a mathematical programme :

- a) Mathematics is - or at least claimed to be - more abstract than any other subject-matter in general education. There is an increasing concern for the perception and analysis of broad mathematical patterns, with an emphasis upon abstraction in the new mathematics programmes of the high school.

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- b) There is a logical structure inherent in mathematical systems. In addition, it is understood that there is a pedagogical sequence which parallels the logical structure.
- c) There are basic skills and "essentials" in school mathematics which are required for given goals, particularly for college preparatory work. Such essentials must be chosen to furnish the best basis for further studies.
- d) There is a trend which indicates that the content of the secondary school mathematics programme should be the same for all students, varying only in degree and rate for students of different abilities.

The Present Status of Mathematics Education in the Arab Countries.

The process of education involves many aspects among which are : a syllabus, a book as a major learning-teaching tool, and a teacher. We have to admit that all these are still, for the most part, within the scope of traditional mathematics.

The syllabus goes up the ladder from counting in the first grade in the primary school to solid geometry and calculus in the twelfth grade in the secondary school. The content is traditional mathematics. I do not think it is necessary to discuss it in detail since this has been the case in many countries.

The books are written by national mathematical educators and mathematicians. In some Arab countries the books are chosen on competitive basis. Ministries of Education which are usually responsible for providing textbooks define the specifications of these books. Owing to economic reasons mathematics books may not look very attractive. Some of these books may be considered as a hinderance which we are doing our best to overcome.

With regard to teachers, the Arab countries are making sincere efforts for adequate preparation of mathematics

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teachers. I shall take the U.A.R. as an example.

Primary school teachers are prepared in institutes affiliated to the Ministry of Education. The students are chosen from the graduates of the preparatory school (the end of the ninth grade). The course of study in these institutes has been changed from a 3-year-course to a 5-year-course.

Preparatory and secondary school teachers are prepared in the universities. The majority of them are prepared in teachers colleges of a 4-year-course of study and training. Beside the mathematics courses as their major, students are given courses in different branches of pedagogy. They are also given field training in preparatory and secondary schools. There are three teachers colleges affiliated to Ain Shams University, Assiout University and Alexandria University.

Other teachers are graduates of the faculties of science. These are professionally prepared in the Faculty of Education of Ain Shams University in one year. There is also the University College for Women, Ain Shams University, which shares in the preparation of mathematics teachers in a 4-year-course.

I like to mention here that mathematics syllabi in teacher preparation contain some modern topics. However, these are mere injections in a traditional programme.

There is also a system for retraining in-service teachers. But I have to admit that we should pay more attention and care to that field in both plan and programme.

It may be relevant here to present some of the problems which we are facing :

- 1- Shortage of the number of qualified teachers owing to the great increase of the number of students.
- 2- Heavy teaching loads for the teachers owing to the shortage mentioned under 1 - above.
- 3- Overcrowdedness of classes with students.
- 4- Shortage in school buildings which makes many schools work two shifts per day.
- 5- Shortage in teaching aids and materials.
- 6- Shortage in the number of the mathematics staff in teachers colleges.

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Endeavours For Reform In Mathematics Education.

All of us here are aware - if not part of - the world-wide movement aiming at radical reformation of mathematics education. It is very fortunate that this movement is a universal one in which many nations are co-operating . It seems that modern programmes are unifying not only mathematical concepts but also people's ideas. In the Arab countries -as well as in other countries- there is a movement to introduce contemporary developments in mathematics education. Among the projects of reform I should refer you to the "UNESCO Mathematics Project for the Arab States". The last activity of this project was a seminar held in Cairo from March 8 to March 17 this year. It was attended by participants and observers from Iraq, Jordan, Lebanon, Libya, People's Republic of South Yemen, Saudi Arabia, Sudan, Syria, United Arab Republic and Yemen. It was also attended by several UNESCO experts and invited speakers who presented addresses and gave advices to the working groups. The seminar worked out plans for each of the following :

- a- A modern mathematics syllabus for grades 10, 11 and 12 of secondary schools.

The new programme includes modern topics within the frame-work of algebraic and geometric structures. It also includes units on probability, statistics, logic, proof, analysis and applications in mathematics.

- b- Suggestions for writing materials for experimental teaching: student's textbooks and teacher's commentaries.

Writing sessions are scheduled to be held in some Arab capitals. The first one will be held in Bagdad from September 1 to September 15 this year.

- c- Procedures for innovation.

- d- Formation of an inter-Arab Committee on mathematics.

A report about that seminar was published by UNESCO in April 1969, (Sc/WS/227). I suggest that some copies of this report are to be available in the meeting of the working group in Paris.

The Union of the Arab Teachers is also planning for an international conference to be held in Alexandria next

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August. It aims at discussing the problems of reform and putting recommendations for modernizing mathematics teaching in different stages. Special attention is being paid for the improvement of teacher pre-service and in-service education.

The above efforts have an important advantage, namely the liquidation of the static condition in which the classical programmes have existed for a long time.

The coming decade will be a real challenge to us in advancing mathematics education. Our developmental plans can be summarized in the following points:

1- Modernization of the Mathematics Programmes:

This has already started by defining a new syllabus for grades 10, 11 and 12. This will be followed by :

- a) The activities of the writing sessions where textbooks and teacher guides will be prepared on an inter - Arab - Unesco co-operative basis. As already mentioned, the first writing session will be in Bagdad from 1-15 September, 1969.
- b) Experimentation of the new materials along three consecutive years. The start will be with grade 10 in the school year 1970/1971. Implied here is the preparation of pilot teachers who will conduct the experiment.
- c) According to the experiment and after necessary revisions, a new programme will be implemented on a wide basis. This is expected to be adapted to the local state of affairs in each of the participating countries.
- d) Simultaneous with the previous steps, plans are underway to reorganize the programmes for primary and preparatory schools (grades 1-9). This is supposed to be a preparatory step which will be followed by another in which the whole school programme from grade 1 to grade 12 will be modernized as an articulated programme.
- e) There are plans to make more experiments with other new programmes. These will be conducted in local language schools where mathematics is taught either in English or in French.
- f) A board for research and experimentation is planned to be formed. The members of this board will be chosen from specialists, experts and concerned people in the field of mathematics education. Its function is to organize, co-ordinate, conduct and evaluate the experiments.

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2- The Improvement of the Preparation of Mathematics Teachers:

With the increase of the number of students and the need for more well prepared teachers, the following plans are underway :

- a) The number of teachers colleges will be gradually increased. This year we are going to have two more teachers colleges affiliated to two new regional universities at Tanta and El-Mansourah.
- b) The programme for teachers colleges is planned to be developed. The course of mathematics education is hoped to be rebuilt to bridge the gap between basic courses in mathematics and the needs of the mathematics teacher. This includes better knowledge and understanding of the new programmes the student is going to teach after graduation.
- c) Plans for better in -service training of mathematics teachers are being worked on. In particular, we have to re-educate, within the next 3 years, the secondary school mathematics teachers concerning the content and methodology of the new proposed programme.

3- Initiation of Professional Organizations:

The Cairo seminar, referred to above, proposed the establishment of an inter-Arab committee for the promotion of mathematics education. Plans are being made to form a national committee in each of the Arab countries for the same purpose. Such an organization is expected to help in:

- a) Producing professional journals, year-books and teaching materials.
- b) Linking the Arab reformation movement with international ones. This can be done through organizing regional and international conferences, participating in similar ones and exchanging ideas and personnel.
- c) Synthesizing the results of the efforts of researchers and mathematics educators for the benefit of better schooling in mathematics.

The following recommendations may help towards the fulfilment of the requirements of the above-mentioned plans :

- 1- Since compulsory education ends with primary schools (age from 6-12 years) in most developing countries at present, I stress here the need for better attention to this stage. In particular, primary school teachers' course should be extended so as to be equivalent to

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the university level.

- 2- Teachers Colleges must revise their programmes in quality and in quantity. The syllabi should be modernized and should reflect contemporary applications of Science and mathematics.
- 3- Mathematics programmes at the faculties of science are not designed specifically for teacher preparation. The graduates of these faculties who like to hold mathematics teaching jobs should study a course in mathematics related to the programme which they are going to teach. This can be given at the Faculty of Education.
- 4- It is preferable that instructors in teachers colleges should have adequate knowledge and experience in the problems and needs of the process of education in general and the art of teaching mathematics in particular.
- 5- To attract better qualities to the teaching profession, more favourable working conditions and more incentives should be provided.
- 6- To encourage secondary school teachers to gain more knowledge and experience, study leaves and scholarships should be made available to them.
- 7- Conferences, seminars and television programmes can be of great help in promoting the professional growth of teachers and supervisors.
- 8- The availability of up-to-date libraries in teachers institutes, colleges and schools is very important. A plan needs to be drawn for writing and translating books dealing with school mathematics from a contemporary point of view.
- 9- To urge teachers to seek professional growth, promotion should be based not only on field experience but also on pursuing further studies.

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APPENDIX..

TABLE I *

PERCENTAGE OF MATHEMATICS HOURS TO TOTAL HOURS
IN ELEMENTARY SCHOOLS IN SOME ARAB COUNTRIES AND
SOME OTHER DEVELOPED COUNTRIES

Countries	Math. Hours	Total Hours	Percentage
Iraq	34	192	17.7
Jordan	30	192	15.6
Kuwait	36	213	16.9
Saudi Arabia	31	200	15.5
Sudan	23	110	20.9
Syria	33	186	18.3
U.A.R.	30	180	16.7
England	16	138	11.6
France	25	174	14.4
Japan	18	167	10.8
U.S.A.	-	-	12.5
U.S.S.R.	36	180	20

* Ministry of Education, Kuwait State, March, 1968.

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TABLE II *

PERCENTAGE OF MATHEMATICS HOURS TO TOTAL NUMBER
OF HOURS IN THE INTERMEDIATE SCHOOLS IN SOME
ARAB COUNTRIES AND SOME OTHER DEVELOPED COUNTRIES
OF THE WORLD

Countries	Mathematics Hours	Total Hours	Percentage
Iraq	15	96	15.6
Jordan	16	107	14.9
Kuwait	16	115	13.9
Saudi Arabia	13	114	11.4
Sudan	20	120	16.7
Syria	15	108	13.9
U.A.R.	15	102	14.7
France	9	74	12.2
Germany	12	99	12.1
Japan	11	96	11.5
U.S.A.	15	90	16.7
U.S.S.R.	17	104	16.3

* Kuwait state, Ministry of Education, March, 1968.

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TABLE III *

NUMBER OF HOURS OF MATHEMATICS PER WEEK AND
THE TOTAL NUMBER OF HOURS IN SECONDARY SCHOOLS
(FOR THE FIRST YEAR AND THE SCIENTIFIC SECTION COMBINED)

Country	Mathematics Hours	Total Hours	Percentage
Iraq	15	90	16.7
Jordan	18	116	15.5
Kuwait	21	117	18
Saudi Arabia	18	109	16.5
Syria	19	108	17.6
U.A.R.	19	114	16.7
England	15	105	14.3
France	17	78	21.8
Germany	9	101	8.9
Japan	11	96	11.5
U.S.A.	15	90	16.7
U.S. S.R.	11	108	10.2

* Ministry of Education, Kuwait State, March, 1968.
