

Appendix (9)

This appendix represents the translation of interview responses on the study tool from Arabic to English language, the response display according to the properties of curriculum elements and the questions of the study, and according to the specification of the interview sample as follow:

The first group included

Decision-maker group: Includes the persons who occupied administrative or responsible positions or were responsible in the Ministry of Education, the group are:

1. Dr. Al massray, Monther: Minster of Education/ Directorate of Jordanian Educational development center in 1987.
2. Dr. Hiyssat, Ahmad: Directorate of Curricula and school books/ National team member for developing Mathematics Curricula/ teaching staff member of Mathematics Curricula / Educational and Science College/ Al Hshmia University.

The interview with Dr. Al massray, Monther

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

Curricula and textbooks for all instructional subjects witnessed developments at the 1960s in light of Education law, which was issued by Ministry of Education in 1964. Mathematics curricula and methods of teaching were developed and continuously updated

2. Can you identify the periods during which the mathematics teaching curricula have witnessed change and development?

The curricula and textbooks witnessed development since 1964. The MOE established the curricula and textbooks department, which is considered the executive arm of MOE. Setting out the curricula and textbooks is the responsibility of this department. In 1988, the Education law number 4 for year 1964 was modified in light of the Educational reforms in the education structure; and the MOE stated suitable procedures for setting out the curricula and textbooks in light of the National conference of Educational developments in Jordan.

3. What are the characteristics of the developments which witnessed by the curricula of teaching Mathematics during these periods?

I would like to talk about the procedures, which were used by the MOE through the development process, regarding the procedures of curricula development, mechanism of setting out textbooks and evaluation.

During the 1960s, the developing process of curricula and textbooks was conducted by forming a specialized committee for setting out the guideline of the curricula through identifying the aims of educational stages, general specification of the curriculum, and the units of content for stages, then offered to the committee of Education in the MOE to be discussed and adopted after the adjustment. Then these guidelines were sent to the curricula and textbooks department, which is considers the executive arm of the curricula and textbooks in MOE.

Also, from 1964 to 1988 MOE through the development process used a Jumping system in the developing process, which means identifying a period of time (7 to 10 years) for developing, then after this period, MOE changed the curriculum without looking at the advantages or disadvantages of these curricula.

The period of 1980s was characterized by the educational development through the concentration on quality development, and the MOE adopted a suitable method constructing the curricula depending on a number of assumptions and purposes. MOE formed the National Committee for developing Education, where the committee conducted a study to assess the curricula and textbooks, through presenting a report about the points of strength and weakness of curricula; so the development process faced a political supporting from his Majesty king Hussein of Jordan, and from Information Media , then followed by the conference for educational development .

In light of the qualitative reforms, in all educational aspects such as education system, and modified educational ladder ...etc, MOE changed the curricula and textbooks for each educational stage, although results of curricula assessment indicated that mathematics curricula were coincident with

international curricula. Setting out the guidelines of mathematics curricula for educational stages were in light of the changes taken by committee for educational development. the textbooks of teaching mathematics changed according to the mathematics documents of educational stages set by the specialized team from curricula department, governmental universities, supervisors, teachers, parents, and international corporations. the curricula and textbooks of teaching mathematics for grades of educational stages during 1980s were characterized by stability, because curricula and textbooks faced a continuous process of assessment and development.

MOE used the mechanism of setting out the textbooks of teaching mathematics through the Competition method, where committees out side the MOE establish the textbooks, and present these textbooks to MOE; then these textbooks were assessed according to a set of criteria. Acceptance or refusal of the textbooks were in light of the marks achieved on the model of assessing. But MOE in middle of 1970s appointed a National team for developing curricula and methods of teaching mathematics.

The evaluation methods of curricula and textbooks, which were used by MOE during the 1960s focused on modifying the content, number of periods, and omitting or adding some topics. But the methods of evaluation witnessed developments through resorting to experts from International Corporation, and to the remarks of supervisors and teachers who execute the curricula and teaching the content of textbooks in the schools. the methods of evaluation and development of curricula and textbooks were characterized by the continuity.

4. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

In light of the development in curricula in general, and particularly in mathematics the concept of curriculum for teaching mathematics witnessed development, where in 1960s mathematics curriculum were represented with content of textbooks which were taught to students. The concept of mathematics curriculum developed according to the development in mathematics in 1970s, and 1980s, whereas mathematics were taught in light of the new view “modern mathematics”, and were effected with the psychological and learning theory, which were interested in stages of students’ growth; and curriculum included four elements: aims , content, instructional methods, and evaluation.

The concept of curriculum and aims of teaching mathematics were also developed, whereas in 1960s, the concentration was on cognition domain, and in 1970s curriculum consisted of domains such as: cognition, affective, and psychomotor. And in 1980s, MOE focused on developing skills of thinking, and problem solving through the educational process, which implied a development in the aims of teaching mathematics. Also, the content, instructional methods of teaching mathematics and evaluation were developed. MOE was interested in training teachers on methods of teaching the new curriculum, and methods of developing skills of thinking, and it trained teachers on how to assess the higher skills of thinking through courses in test construction.

5. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

The reasons behind the curricula developments are due to Educational law, which was issued by MOE in 1964, and this law considered as a main entrance for changing in curricula because it contained all details about curricula and textbooks. Another reason can be seen in light of technological and scientific developments. In 1988, the educational law NO.4 for year 1964 was updated, and concentrated on qualitative developments in all aspects of educational process, and followed by changes in the construction of education ladder of educational stages. Results of assessment studies, and reports about the situation of education in Jordan in light of the international development and situations played a role in this development. Another reason behind the development was the political decision and the support given by the high command of the political leader in Jordan, represented by his majesty king Hussein. Also the reason behind the developments were the Information Media support, and the recommendations of the National Conference of Education in 1987.

6. Do the developments witnessed by the mathematics curricula teaching coincide with international developments?

In light of the limited resources of Jordan; I can say that the curricula of teaching mathematics changed during the period 1980s, although these curricula were constructed in a high effective quality, also the plans of developing: curricula, aims, content and methods of teaching mathematics, and evaluation

stated to coincide the international developments in this domain, and by cooperating with curricula experts from the international corporations.

The interview with Dr. Hivssat, Ahmad

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

Mathematics curricula and methods of teaching witnessed continual international developments, as a result Jordan sought to coincide these developments.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed change and development?

Mathematics curricula and methods of teaching witnessed Developments and changing during the 50 years ago. The first period was in the 1960s, in light of the educational law for 1964, and where was the first qualitative movement in curricula. The second period was the 1970s. the third period was at the end of the 1980s.

MOE concentrated on quantitative education more than the qualitative during the 1960s, and busy in how to meet the increment of students, and offering the schools and seating for students, as the result, curricula of teaching mathematics didn't build in a valid way, whereas MOE depended on using textbooks for teaching mathematics from neighboring Arab countries. In 1964, MOE issued Education law, which considered the qualitative movement in history of Education in Jordan and in light of this law established the curricula department, modified the education ladder, and designed curricula for each material. Related to the curricula of teaching mathematics.

During the 1970s, MOE became concentrating on qualitative education, throughout the educational process, and looked after of the stages of students growth, also this period witnessed developments related to the curricula and methods of teaching mathematics, so the textbooks of secondary stage where developed throughout the Jordanian participation in the project of developing content and methods of teaching mathematics in the Arab world under the supervision of UNSECO organization, and in light of the new trends "modern mathematics" . Also the unification curriculum for Elementary stage was established by cooperative work between Jordan and Syria. MOE selected and appointed a national team for developing curricula, and methods of teaching mathematics. And composed the textbooks, and experimented the textbooks on sample of schools, and modified them in light of the remarks of teachers and supervisors. The MOE trained teachers on methods of teaching the new curricula.

At the end of the 1980s, MOE focused on the individual learning ,and developing critical thinking, problem solving and in light of the changes in educational system, which included 10 years for basic education and 2 years for secondary education, then setting out a new curricula according to the guideline and specification of educational stages. Also, MOE identified the first degree of university certificate for teaching, and caring with teachers training on a new curriculum, and methods of teaching, methods of developing thinking skills, methods of assessment, and test construction, also, MOE qualified teachers through qualification programs cooperating with governmental universities.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding of the development of learning objectives during these periods?

The 1960s, mathematics curriculum can describe as traditional curriculum in light of the concentrating on developing the higher skills of thinking, then the curriculum changed from traditional to the modern, from more than one book, where taught to students separately (geometry, algebra, and arithmetic skills) to one book consists of units including on all branches, and consists of a new topics of content organized in logical way, and built by using spiral method to encourage students to interact on learning mathematics. During this period 1964 and later, MOE named a committee of education his function were adopting the document of curriculum which consisting of identifying the aims of educational stages, guideline and general specification of curriculum, and identified the content of the material for grades,, whereas, content of textbooks designed by announcement to authors to write the content of textbooks for grades of educational stages; and choose the books that presented to the ministry according to an assessment model, which Consisted of a set of criteria, then adopted for schools. Each group of writing textbooks content was isolated from each others

Aims of teaching mathematics, which stated after 1964 were concentrated on aspects of mathematics knowledge, psychomotor, and were ambiguous for the teachers and students; concentrated on memorizing the mathematical content in the textbooks. The textbooks considered as traditional

curricula because curricula ignore the concentration on developing higher level of thinking skills, and real life problems (applications), moreover aims of mathematics curricula focused on mastering the arithmetical skills.

Properties of Aims of teaching mathematics, which stated in the stage of the 1970s, were more clearly than the previous aims stated in the 1960s, because the Aims of teaching mathematics developed in light of the project of developing mathematics curricula in the Arab countries in cooperative with the UNESCO Organization, and Identified the Aims of mathematics curricula for educational stages, Special objectives (behavior objectives) for each grades.

But The Aims of teaching mathematics, which stated in the 1980s were more clearer than previous periods due to the growth in experiences of Jordanian national team for developing curricula content and methods of teaching mathematics, and Identified the special objectives according to the aims of teaching mathematics, also, Participating more than one side through the process of setting out the guideline, and deriving the aims of teaching mathematics, The aims included concentration on developing critical thinking, and scientific method in solving mathematical problems, and Aims took in consideration covering the domains of cognitive in better manner. moreover, the MOE Invited local universities, international organizations, professional communities, and parents to participate in the development process, and identified the aims of education.

4. What are the characteristics of the developments witnessed by the curricula in respect of the content, during these periods?

During the period of 1960s, teaching mathematics in elementary and preparatory stages focused on arithmetic skills, and taught through branches as algebra, geometry, and arithmetic skills. But the secondary stage at the end of 1960s, witnessed developments through Inserting new concepts and topics to the mathematical content, and collecting branches of mathematics in one book for each grade (uniformed the topics of content) within the UNESCO project for developing mathematics teaching in Arab countries. Whereas mathematical content focused on teaching mathematical structures through introducing a unified topics and concepts, such as set, group, and properties of operations.

During the period of 1970s, teaching mathematics witnessed development, represented with isolating between the curriculum concept and textbooks. the textbooks considered a translation of mathematical content of curriculum., content of teaching mathematics designed and built according to the mathematics aims, also the content of mathematics curriculum included of focusing on teaching mathematical structures and systems, and the responsibility of building and developing content of mathematics curricula and methods of teaching related with the Jordanian National team for developing mathematics curricula.

During the 1980s, content of mathematics curricula witnessed changing and developing in light of the reforms and recommendations of the first national conference which was held in Jordan in September 1987. The content of teaching mathematics were built in light of the aims, whereas took in consideration the scope and sequence through the distribution of concepts and mathematical topics in the content, also the content were organized to achieve the objectives of the conference, which was indicated to focus on problems solving, and developing skills of thinking, through certain mathematical topics, moreover, the content and textbooks were set out on according to the recommendations of the conference by a specialized team in curricula, experts from Jordanian governmental universities, and international institutions, and took in consideration decreasing from the abstract concepts and topics through the content and concentrated on the applied aspect, and linking between the concepts and topics of content across the grades of educational stages.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

MOE during the 1960s, established the curricula department, and identified the differences between curriculum and textbook (material), and according to the new curricula which was adopted by the MOE. MOE trained teachers and Qualified the teachers whom, appointed in MOE on secondary certificate, by enrolled in the government of teacher training institutes, preparing and providing them with general culture, skills in specialization and education. The Methods, which were used by teachers in teaching mathematics could be described classical methods, because sometimes mathematics taught by teachers who were not specialized in mathematics, and these methods focused on covering the topics of mathematics content to prepare students for final examinations. After the middle of 1970s MOE developed the content of Mathematics curriculum, and focused on the roles of teacher in the Educational process, which was followed in training teachers on methods of teaching, and the new

trends of teaching mathematics. Due to Jordanian participation in the UNESCO project, which required training both of supervisors and teachers on the methods of teaching on the new mathematical content, in addition to concentrating on students' participation and interaction with the mathematical content through the use of the discovery method in the content presentation of the preparatory and secondary stages. In the early of 1980s, the government's teacher training institutes and all other private and public training institutes were transformed into community colleges. These education institutions offered a variety of vocational, technical, and teacher training programs .

Also the instructional methods for teaching mathematics had witnessed development through changing and modernizing curricula content. Through these innovations, the Ministry of Education aimed at developing skills of thinking by using the scientific method in problem-solving, using libraries and variety of educational technologies by providing schools with educational media and machines, training supervisors and teachers on the methods of teaching the new curricula and in the use of educational media and machines, training them to use various methods and techniques (such as cooperative learning, problem-solving techniques, the skill of asking questions and brain-storming, and diagnostic evaluation as a teaching technique), focusing on the methods of developing thinking, and observing individual differences in capability amongst students. MOE identified the qualifications for teachers of basic stage, and secondary stage, with the first certificate degree for teaching in basic stage, and first certificate degree, followed with two years in the educational science for teaching in secondary stage, according to the recommendations of the National Conference of Education in 1987.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

The methods of evaluation and development of Mathematics Curricula at the 1960s were depended on the remarks of mathematics teachers and supervisors. Moreover, students assessment were carried out by tests were prepared by teachers were focused on measuring the cognitive domain, also, Promotion from the compulsory cycle to the more specialized secondary schools was controlled by a standardized written examination. The MOE make a general exam at the end of the secondary stage, and according to the students' results can enrolled university. Also, during the 1970s, The evaluation process of mathematics curriculum was the responsibility of the Jordanian National team for developing the content of mathematics curriculum, by experimenting the textbooks of teaching mathematics before generalizing at all schools, and in light of the information and remarks about the suitability of textbooks were gathered through teachers and supervisors. Those remarks were then studied by a Jordanian National team for developing content of mathematics curriculum in the Ministry of Education.

At the end of the 1980s, evaluating and developing the content of mathematics curricula carried by giving hand from experts from international institutions; reports of the curricula submitted by specialized committees of teachers and supervisors, and according to remarks from experts, the content was modified by members of textbooks and curriculum experimentation, also teachers trained on the new methods of assessment and the achievement, and trained on how to build tests in valid way, also, the major development in the domain of evaluating students' achievement, through Jordanian participation in the international study for evaluating the eighth grade students' achievement.

7. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

The concept of mathematics curriculum witnessed development, so during the 1960s and before 1975, can be described as a traditional curriculum with respected to the concentration on developing of the higher level of thinking skills, but the concept of curriculum of teaching mathematics from middle of 1970s, was developed and became focused on developing the higher level of thinking skills, and problem solving, and contained on aims of teaching mathematics, content, instructional methods, evaluation, and all activities support to achieve the aims of educational process.

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

The reasons behind the developments of the mathematics curricula and methods of teaching are the developments, which was witnessed by mathematics science, and what appeared of applications as a result of development. The new trends for mathematics and methods of teaching (modern mathematics) in the world. The developments witnessed by the Educational Sciences. The

development in the structure of Educational System in Jordan, and modifying the educational ladder. Building and opening the universities in Jordan.

9. Do the developments witnessed by the mathematics curricula teaching coincide with international developments?

According to developments which the curriculum of teaching mathematics in Jordan from the 1964 up to the 1990s, we can say these developments coincide with the international developments.

The second group included on

Curricula experts: includes members of university teaching staff or members of the curricula and textbook in Ministry of Education in Jordan , represented with:

1. Dr. Mogdadie, Farouq: teaching staff member of Mathematics Curricula / Educational and Science College/ Yarmouk University.
2. Dr. Al Zuobi, Ali: teaching staff member of Mathematics Curricula / Educational and Science College/ Mo'ta University.
3. Arabiat, Kalid: Member of improving Mathematics curricula /department of curricula and School Mathematics books/ Ministry of Education/ Amman, Jordan.
4. Gharaibeh, Shadia: Member of improving Mathematics curricula /department of curricula and School books/ Ministry of Education/ Amman, Jordan.

The interview with Dr. Mogdadie, Farouq

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

Yes, the Curricula and the methods of teaching Mathematics in Jordan witnessed drastic developments across the five decades ago.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed change and development?

The maintops of developments and changes witnessed in curricula and methods of teaching mathematics in Jordan were:

- In the 60s, when MOE used the traditional curricula in teaching mathematics and the concept of curriculum represented with the mathematical content which presented in textbooks. Moreover, mathematics was taught as branches and at the end of the 1960s replaced in new concepts and topics instead of traditional mathematics (algebra, geometry and arithmetic...).
- In the 1970s, and early of the 1980s, when MOE inserted "modern mathematics" and published new textbooks in light of the new view to the curricula and methods of teaching mathematics. The National team for developing the content of curricula and methods of teaching mathematics changed the textbooks under the supervision of UNSECO organization.
- At the end of the 1980s,when the curricula and methods of teaching mathematics witnessed the development in the light of the recommendations of the first National conference for Educational developments in Jordan.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding of the development of learning objectives during these periods?

The Curriculum of teaching mathematics in 1960s took the form of traditional mathematics through concentrating on teaching Algebra, geometry, trigonometry calculations and arithmetic skills. Also teaching mathematics during this period ignored the development of fundamental skills for students; and aims of teaching mathematics decreased the concentration on the practical applications of mathematics. Whereas, the aims of teaching mathematics in the 1960s, concentrated on the cognitive domain and focused on proficiency of arithmetic skills which was in the textbooks. The curricula documents of teaching mathematics didn't include the special aims for the textbooks for stage and for grades among the units of the content, also, the aims didn't state in detailing form across the educational stages and didn't take into consideration the scope and sequence. .

In the 1970s, the curriculum of teaching mathematics witnessed integration and linking among branches of the mathematical topics (arithmetic, algebra, geometry), through uniform among the

branches of mathematics by a number of fundamental concepts and skills such as sets, correlation, functions, and operations. The aims identified according to the new mathematical knowledge: sets, group, relations, and functions; and inserted modern topics according to the international development through unification branches and renewed the content of mathematics with modern topics.

In the 1980s, the curriculum of teaching mathematics witnessed development in light of the educational reforms, whereas the aims of teaching mathematics took into consideration the individual deference among the students. Also the aims focused on developing the higher level of thinking skills for students, by using scientific method in solving mathematical problems, then the aims came more clear for both the teachers and learners and consisted of three domains of cognitive and took into consideration the scope and sequence according to the mathematical knowledge for grades of educational stages.

4. What are the characteristics of the developments witnessed by the curricula in respect of the content, during these periods?

In the 1960s, the content of mathematics curriculum for secondary stage changed from traditional to the modern and from multiple books that taught to students as separately (geometry, algebra, and arithmetic skills) to one book including all branches. And the topics of content were renewed and organized in logical way. The content of the curriculum didn't take into consideration the focusing on the application side of mathematics in suitable form, and it didn't encourage the students to learn mathematics; and the number of lessons for teaching the content for grades of educational stages were not sufficient. Also the content inserted in the unification concepts as group, relation and function, and focused on mathematical structures as field, cycles and group. The content concentrated on teaching the mathematical deductive proof. The content of teaching mathematics for elementary stage focused on teaching arithmetic skills; but the content of teaching mathematics for preparatory stage consisted on teaching Algebra and Geometry and arithmetic skills as separate topics.

From 1970s to 1980s, the content of teaching mathematics for secondary and preparatory stages stated by the national team for developing the content and curriculum of teaching mathematics in Jordan according to the UNESCO project of developing mathematics curricula. The content focused on the mathematical structures and using explorer method in presenting the content to increase the students' interaction, and the content took into consideration the scope and sequence which consisted of new concepts and topics. But the content of mathematics curriculum for elementary stage was stated as unification curricula between Jordan and Syria. The content of teaching mathematics characterized with weakness in linking between the topics across the educational stages and there were some repeated topics through the content of educational stages.

In the 1980s, the methods of content presentation developed and focused on fundamental concepts and interested in methods of presentation and display in way of increasing the interaction of students through the mathematics learning, and increased the motivation of students and developing levels of thinking and using discovery method, investigation in solving mathematical and real life problems. Also the scope and sequence and integration among the content across the grades of educational stages were taken into consideration as well as in the previous periods.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

The Ministry of Education in the 1960s busy with the quantitative developments as a result of increasing in numbers of students who enrolled in the educational government. The major resource for supporting student with mathematical knowledge was the teachers. And the methods of teaching were used by teachers focused on memorization, and proficiency of mathematical skills; and were described traditional methods because it didn't take into consideration the development of higher levels of thinking for students.

In the 1970s, the MOE gave short courses of training for teachers due to the developing and changing the curriculum of teaching mathematics and in light of the new view of teaching mathematics. UNESCO organization helped the MOE in Jordan among the process of development through sending experts and trained nationals' teams from Arabs countries on methods of teaching the new content of mathematics curriculum. Also, this period characterized with low in level of understanding the new topics and method of presenting the new content "explorer method", due to the scarcity in teachers qualifications, also most of teachers focused in displaying as in the textbooks, and not concentrated on developing thinking skills.

But in the 1980s, because of changes of mathematics curricula the MOE trained the teachers on the methods of teaching the new curricula and also trained teachers on new methods of teaching such as: strategies of problem solving, investigation, cooperative learning, also the MOE prepared and qualified teachers through sending them into the governmental universities to get the first degree of education.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

The Methods of evaluation in the 1960s and 1970s, were described as traditional methods, due to the concentrating on cognition domain through the tests were prepared by teachers, and measuring the student's achievement and the low levels of thinking. But in the 1980s due to the developing in aims of teaching mathematics, and the concentrating on qualitative Education by MOE through developing critical thinking, investigation and skills of problem solving. MOE trained supervisors and teachers on how to measure and assess the skills of thinking, diagnostic evaluation through short courses and test constructions. Also MOE participated in international tests to compare the performance level of students in Jordan with performance of the other countries and put the clinical plans in light of the results of test analysis.

7. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

Yes, the concept of curriculum of the first period representing with the mathematical topics and the textbooks were taught to the students. But the curriculum during the second period became consisted of four elements: objectives, content, instructional methods and evaluation, and all the elements correlated with each other.

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

The major reasons behind the developments of the mathematics curricula and methods of teaching were the developments, which happened in mathematics science, and what happened in applications as a result. Also the developments were happened in the Educational Sciences.

The new trends for mathematics curricula and methods of teaching (modern mathematics) in the world. And the Unification and integration among branches of mathematics (such as Algebra, geometry, arithmetic) to teach as one topic. Moreover, the benefit from the developments which witnessed the curricula in different countries in the world. Then In light of the development in the structure of Educational System in Jordan and modifying the educational ladder; and the Educational reforms by MOE and the interesting in the qualitative developments instead of the quantitative. Also due to the plentiful and crowded of the curriculum with concepts and mathematical topics, also the weakness related to scope and sequence, and integration between curricula of educational stages. Finally, in light of the Establishing and opening the universities in Jordan. And the Participation in the international study in 1991: "third international Mathematics and science study (TIMSS)

9. Did the developments witnessed by the mathematics curricula teaching coincide with international developments?

Due to the movements of developments in Jordan and changing from teaching traditional curricula to the unification, and developing the curricula and methods of teaching in light of the new trends (views) of teaching mathematics, and developing the aims of teaching, and inserting new concepts and topics, also participating in the international conferences of developing curricula and methods of teaching. I can say the developments in mathematics curricula in Jordan coincide the international developments.

The interview with Dr. Al Zuobi, Ali

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

The Curricula and teaching mathematics in Jordan in the 1980s witnessed drastic changes and developments comparing with the Curricula and methods of teaching mathematics in the 1960s. The MOE in Jordan gave a special importance since 1964 to develop the curricula and methods of teaching mathematics.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed change and development?

The Curricula and methods of teaching mathematics witnessed three periods of development. The first period was in the 1960s, when the MOE had traditional curricula of teaching mathematics. The second period was in the 1970s, when the curricula changed in light of the new trends and inserted modern mathematics. The third period was in the 1980s, when the curricula developed in light of the educational reforms in Jordan, through concentration on developing skills of thinking, problem solving to convey the information technology and international developments.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding of the development of learning objectives during these periods?

In the 1960s, the aims of teaching mathematics concentrated on the cognitive domain and ignored the psychomotor and affective domains; also the aims of teaching mathematics focused on proficiency of arithmetical skills; and the integration between the aims of educational stages were weak; also the scope and sequence were weak among the branches of learning objectives of mathematics. The aims ignored the concentration on solving mathematical and real life problems, moreover the aims didn't take into consideration the individual differences between the students abilities.

The aims of teaching mathematics in the 1970s witnessed developments due to the changes in the content of mathematics curriculum, and in light of the new trends in methods of teaching mathematics. Whereas the aims became consist on psychology and affective domains, focused on understanding the mathematical structures, also the documents of teaching mathematics included on special learning objectives related to the units of each grade, and the scope and sequence were weak between the learning objectives among educational stages, grades and units of curricula. Also the content of mathematics curriculum for grades of educational stages was plentiful and crowded with the concepts and mathematical topics.

In the 1980s, the aims of teaching mathematics became take into consideration the abilities of students, scope and sequence, integration between the topics of mathematics units, through grades and educational stages, also the learning objectives consisted on developing critical thinking, problem solving, and developing the positive attitudes for teaching mathematics. Also learning objectives took into consideration the mathematical application aspect, and stages of students' growth.

4. What are the characteristics of the developments witnessed by the curricula in respect of the content, during these periods?

At the first period (1960s), the mathematics curriculum changed from traditional to the modern and the branches of mathematics (geometry, algebra, and arithmetic skills) were unified in one book and the topics of content were organized in logical way, but the content didn't encourage students to learning mathematics, and didn't focus on the mathematical application aspect; and the number of lessons were not sufficient to teach the content of mathematics for grades of educational stages.

At the second period (1970s), the methods of display the content were developed and built according to the fundamental skills and concepts, and the methods of displaying the content interested in: increasing students motivation and interaction and developing levels of thinking skills, and investigation through the mathematics learning. Also the content of mathematics curricula took into consideration the scope and sequence and integration among the content of the grades of educational stages better than the previous period.

During the third period (1980s), the content of mathematics curricula included on new and modern topics similar to the topics that are taught to student in international countries. The spiral method is used in designing the content of mathematics through the textbooks for grades of educational stages. Moreover, the mathematics content is divided into major topics, and the basic skills and concepts were identified among the content of each grade. The content of teaching mathematics is stated in light of the guideline and aims of teaching mathematics for educational stages, which focused on decreasing the concentration on the abstract topics through including real life and mathematical applications on the curricula content; and some topics of the secondary stage were introduced into the content of the basic stage. Also the scope and sequence of concepts and mathematical topics, the development of critical thinking, focusing on problem solving, and the abilities of students were taken into consideration when the content was designed.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

The Methods of teaching mathematics developed from concentration on memorizing the mathematical knowledge, skill proficiency; and teacher was considered as a resource of mathematical knowledge, also teachers used traditional methods through teaching mathematics. But the second period witnessed development in instructional methods in light of the new trends (view) which was interested in stages of students' growth, and looking at the teacher not as the unique resource of the knowledge and the role of student was not to receive the knowledge and remember it to success in the examinations. But the concentration became on how to teach student to learn and understand mathematics, and to solve problems in mathematics and real life, and to encourage the cooperative learning and to investigate the mathematical knowledge.

The methods of teaching mathematics during the third period (1980s) witnessed development, whereas MOE concentrated on programs of teachers training and teachers qualifications; also MOE focused on training teacher on methods of increasing the interaction in the class, and co-operative learning as a result of focusing on problem solving, and developing the critical thinking, MOE trained teachers and supervisors on the new methods, and in the methods of teaching new curricula that adopted in 1990s.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

The Methods of evaluation in the first period (1960s), focused on measuring the mathematical knowledge and proficiency of the arithmetic skills, by tests were prepared by teachers and concentrated on the low levels of thinking related to the cognition domain. Also MOE depended on three general examinations at the end of educational stages (elementary, preparatory and secondary) were prepared by specialized team in MOE, and in light of the achievement average, the students transferred from stage to another stage.

In the second period (1970s), MOE trained teachers on methods of teaching the new curricula, and assessment through short courses in test constructions. Also MOE is still making two general examinations at the end of educational stages (preparatory and secondary) were prepared by specialized team in MOE and in light of the achievement average the students transferred from stage to another stage.

But during the third period (1980s), the methods of evaluation were developed and the MOE trained teachers on methods of test construction, diagnostic evaluation, methods of developing thinking and investigation. The MOE prepared national examinations to measure the achievement and performance of students, and to present the feedback in light of analysis the results of these examinations; and also MOE participated in international tests to compare the performance level of students in Jordan with performance of the other countries, put the clinical plans in light of the results of test analysis. MOE still make one general examination at the end of secondary stage which prepared by specialized team in MOE and in light of the achievement average the students transferred to university.

7. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

Yes, the concept of curriculum through the 1960s, representing with the mathematical topics which were organized in the textbooks and taught to students. Then, the concept of curriculum developed and became consist on all the experiences and activities offered to students in the school or outside the school, also consisted on four elements: objectives, content, instructional methods and evaluation and all the elements correlated with each other.

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

The reasons behind the developments of the mathematics curricula and methods of teaching were the developments, which happened in mathematics and Educational Sciences; the new trends for mathematics and methods of teaching (modern mathematics) in the world. The development in the structure of Educational System in Jordan, and modifying the educational ladder; also the cooperation between Jordan and the Arab countries to design unified curricula. Multiplicity of the governmental universities and private universities in Jordan.

9. Do the developments witnessed by the mathematics curricula teaching coincide with international?

Yes, there is a historical development in mathematics curriculum and methods of teaching, and we can say: the developments were coinciding the international developments.

The interview with Mr. Arabiat, Kalid and Mrs. Gharaibeh, Shadia:

1. Have the mathematics curricula in Jordan witnessed a change or a development since 1964?

Of course, mathematics curricula and methods of teaching witnessed changes and developments since 1964.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed changes and development?

I can say there are three periods of developments in the history of teaching mathematics in Jordan. The first period was called teaching traditional mathematics during the middle of 1960s and before; the second period was the modern mathematics, where mathematics was looked at as a unity form structure, and included new concepts and topics during the 1970s. The third period of developments, occurred in the last of the 1980s, was identified in light of recommendations of the first National Reference for Educational developments in Jordan.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding of the development of learning objectives during these periods?

I can describe the learning objectives during the first period as ambiguous, related to the students and teachers, limited, concentrated on understanding the concepts and mathematical facts, and proficiency of mathematical skills; Also the learning objectives did not focus on real life and mathematics applications. The connection between the mathematical topics and learning objectives was weak and focused on the cognition domain. The learning objectives of mathematics focused on the importance of the logical organization of the mathematical content among the textbooks; also the connections between the aims of teaching mathematics through the educational stages were weak. But the aims and the learning objectives of teaching mathematics during the two periods were better than the first period. The documents of teaching mathematics included the special objectives for each grade of the educational stage, and these documents Set out the special objectives for each unit of the curriculum and grade of the stage. The aims are clear for both the teacher and the learner; they concentrate on developing higher mental skills and the scientific technique of thinking; they are also in line with the modern aims of teaching mathematics, in light of Jordan's limited resources, through focusing on problem-solving in most of the topics contained in the curriculum. Furthermore, the special objectives of the content took into consideration the scope and sequence of mathematical knowledge through the school grades. Also the aims of mathematics education were identified with respect to each domain of cognition; and the special objectives were also identified in relation to the mathematical communication, mathematical thinking, and the aims indicated to take into consideration the individual differences between the capability of students.

4. What are the characteristics of the developments witnessed by the curricula in respect of the content during these periods?

During the first period, the content properties of teaching mathematics were distributed among more than one book; there exists one book for teaching every branch of mathematics. There was no balance in topics distribution among the grades of stages. Also the Content of secondary education focused on abstract topics through teaching the mathematical systems; and the process of content organization doesn't take into consideration the needs of students, but focused on logical organization of the topics through the textbooks; and the linking among the topics through the grades of educational stages were weak. The textbooks were overcrowded with topics; and as a result, the number of lesson that allotted to teaching the topics was not sufficient. Moreover, the process of development was limited on modifying the content through omitting or adding some topics; and the scope and sequence of the content among the grades of educational stages were weak.

During the second period, the content of teaching mathematics witnessed the process of determination of the content according to the aims of teaching mathematics through unification the mathematics

topics (geometry, algebra...), providing the content with new subjects and topics that took into consideration the students' needs and abilities through the process of building the curricula content; and the content was set out by technical committees, specialized in mathematics, experts in curricula and education; also the content for grades was overcrowded by the new topics.

During the third period, the content of mathematics curricula included new and modern topics similar to the topics that are taught to student in international countries. The spiral method is used in designing the content of mathematics through the textbooks for grades of educational stages. Moreover, the mathematics content is divided into major topics, and the basic skills and concepts were identified among the content of each grade. The content of teaching mathematics is stated in light of the guideline of the political philosophy and the aims of teaching mathematics, which focused on decreasing the concentration on the abstract topics through including real life and mathematical applications on the curricula content; and some topics of the secondary stage were introduced into the content of the basic stage. Also the scope and sequence of concepts and mathematical topics, the development of critical thinking, focusing on problem solving, and the abilities of students were taken into consideration when designing the content.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

Methods of teaching mathematics during the periods of 1960s and 1970s, which used by most teachers focused on methods of presentation and solving problems without taking into considering the individual differences between students. Because of changing the content of mathematics curricula during the 1970s , MOE trained teachers on the new trends of teaching mathematics, and used Educational T.V programs due to the scarcity of teachers and training courses in the methods of teaching mathematics. Also the MOE ignored training and teachers were not qualified because the government and the MOE were busy in the rapid growth in numbers of students during the 1960s, and 1970s. But the MOE at the end of the 1980s identified the qualifications for teachers of basic stage, and secondary stage, with the first certificate degree for teaching in basic stage, and first certificate degree, followed with two years in the educational science for teaching in secondary stage. Also the MOE focused on training teacher on methods of increasing interaction in the class, co-operative learning , focusing on problem solving , and developing the critical thinking ; MOE has trained teachers and supervisors on these new methods , and on the methods of teaching new curricula that were adopted in 1990s.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

During the 1960s, evaluation was focused on modifying the mathematical content of the textbooks, regarding the method of presentation, logical organizing, and the number of periods allotted for teaching the topics, and methods of evaluation of mathematics curricula, concerning the method of content presentation, and adding or omitting some topics.

During the 1970s, teaching mathematics had developed and curricula content became the responsibility of Jordanian National Team of development curricula and teaching mathematics. Also the MOE make for Compulsory cycle a public examination for students transference from preparatory stage to the secondary stage, and was active until the later of 1980s.

The methods of evaluation during the early 1990s focused on the development of thinking skills and preparing teachers and supervisors on how to construct tests that measure the higher levels of the cognitive objectives. Moreover, du to the results of the participation of the eighth grade students in the international study, MOE presented the feedback for teachers aiming to improve Mathematics' curriculum and the methods used by the teachers of Mathematics

7. Did the concept of the educational curriculum in the teaching of mathematics witness a development during the phases of change?

The concept of curriculum for teaching mathematics witnessed a development. During the first period, the concept referred to the textbooks which were taught to students; but the concept during the second period included the three cognitive domains. The curriculum concept during the third period consisted of all the experiences and activities which were designed to prepare the students to achieve the objectives of teaching mathematics, and included the objectives of teaching mathematics, content,

methods of teaching, and methods of evaluation, textbooks, and interested with preparing and training teachers to achieve the aims of teaching mathematics for students.

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

The reasons behind the developments of the mathematics curricula teaching during the periods of development were due to: understanding and the continued follow by the political leader in Jordan. Another reason was the participation in the development process, which happened in the Arab countries under the UNSCO supervision. A third reason was the independence of the general department of curricula, in the light of the result of the assessment studies held by MOE. Also referring to the acquisition and growth in development experiences of the national team for developing mathematics curriculum and methods of teaching in Jordan. Other reason were due to the recommendations of the First National Conference of Education which was held by MOE in 1987, and due to the scientific developments.

9. Do the developments witnessed by the mathematics curricula teaching coincide with the international developments?

In light of the limited resources of Jordan, we can say that the developments witnessed by mathematics curricula and methods of teaching mathematics do coincide with the international developments.

The third group included on

Executive group: includes teachers and supervisors of mathematics teaching.

1. Joun'ah, Moustafa: supervisor for teaching Mathematics/ Ministry of Education.
2. Al ssmady, Mohammed: member of writing and developing mathematics books/ supervisor for teaching Mathematics/ Ministry of Education.
3. Al kaleel, Ahmad: supervisor for teaching Mathematics/ Ministry of Education.
4. Dr. Namarneh, Ibrahim: Teacher for Mathematics during the 1960s and middle of 1970s.
5. Ta'mneh, Akrum: : supervisor for teaching Mathematics/ Ministry of Education.
6. Hamadneh, Ahmmad: supervisor for teaching Mathematics/ Ministry of Education
7. Na'mneh, Mohammed : teacher of mathematics in secondary government schools
8. Al omeray, Hasan : teacher of mathematics in basic and secondary government schools
9. Mofeed, Hazem : teacher of mathematics in basic and secondary government schools

The interview with Mr. Joun'ah, Moustafa

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

Yes, the mathematical curriculum and the methods of teaching mathematics in Jordan witnessed continuous developments by MOE since 1964.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed change and development?

Yes, the Mathematics curriculum and the methods of teaching witnessed three stages of developments. First stage was in the 1960s, after the educational law was issued in 1964 by MOE. The Second stage was in the 1970s, when the modern mathematics inserted and replaced the traditional mathematics. The third stage was at the end of 1980s, due to the educational reforms, which has been done by the MOE.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding of the development of learning objectives during these periods?

The Aims of teaching mathematics in the 1960s concentrated on: supplying students with sufficient amount of mathematical knowledge; and understanding the logical structure of mathematical knowledge and methods of proof and performing calculations skills with understanding, accurate and efficiency, and acquisition the capability on solving mathematical problems. The aims of teaching mathematics didn't take into consideration the individual differences between the students' capabilities.

The aims of teaching mathematics in the 1970s, focused on teaching structure and mathematical systems, also aims of teaching mathematics of educational stages were identified in clear form among the mathematical topics for grades. Moreover, the aims of mathematics curriculum were derive

through properties of students' growth, and in light of the views of specialist experts in mathematics, and the natural of mathematics material.

The aims of teaching mathematics at end of the 1980s focused on developing the higher skills of thinking, and problem solving; and reflecting the social and economical needs, also concentrated on the applications side of mathematics.

4. What are the characteristics of the developments witnessed by the curricula in respect of the content, during these periods?

During the 1960s, Curriculum Content of teaching mathematics stand-up on the scientific material, which at most consists of information, facts, mathematical ideas, have been chosen by curriculum designers. Mathematics topics presented without taking into consideration the experiences, and students' needs; also the role of student receiving the mathematics knowledge. The Content of teaching mathematics were concentrating on the efficiency of arithmetic skills and without taking in consideration the balance between the concepts and mathematical skills.

During the 1970s, Curriculum Content of teaching mathematics was represented with the mathematical topics that included in the textbooks, and the role of teacher taught these topics to the students. The content topics of teaching mathematics was organized by using the logical (the logical order of topics) and psychology (stages of student growth, experiences, and capability) method, and the content organized through comprehensive and correlative units for all sides of unit subject. Also, the scope and sequence, and integration were taken into consideration, and the topics were presented in a clear language, whereas the middle students could understand after reading it.

At end of the 1980s the Content of teaching mathematics witnessed development according to the first educational conference in 1987 and focused on the importance of developing the critical thinking, and problem solving, and concentrating on applications through some of mathematics topics. Also the content organized and presented in an integrated form with experience. Also the curriculum considered as a method of learning and concentrated on roles of teacher and student through the process of teaching and learning the curriculum units.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

The Methods of teaching mathematics in the 1960s, focused on providing students with mathematical knowledge and the methods of teaching were used by teachers depending on the experience and personal efforts of the teachers. MOE founded the Community colleges, which played an important role in the orientation of raising the level of teachers' efficiency through providing teachers with technical skills of teaching. Interaction in the class, and solving the activities in general depended on participating the students of high level of intelligence through discussing and solving mathematical problems. In the 1970s, New curricula for teaching mathematics were stated and unified the branches of mathematics according to new trends for teaching mathematics, which required training both of supervisors and teachers on the methods of teaching the new mathematical content.

At the end of the 1980s, MOE identified the qualifications for teaching in basic stage and secondary stage. The first certificate degree for teaching in basic stage, and first certificate degree, followed with two years in the educational science for teaching in secondary stage, also the MOE focused on training teacher on methods of increasing the interaction in the class and problem solving, and developing the critical thinking, also MOE trained teachers and supervisors on methods of teaching new curricula which were stated for educational stages.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

Before the 1980s, The Methods of evaluation which were used by teacher, could be described as traditional methods due to the concentrating on cognition domain through the tests were prepared by teachers. And measuring the student's achievement and the low levels of thinking. But during the 1980s as result of developing in aims of teaching mathematics, and the concentrating of MOE on qualitative Education, through developing critical thinking, investigation and strategies of problem solving. MOE trained supervisors and teachers on how to measure thinking skills, and diagnostic evaluation through short courses, and test constructions. Also MOE participated in international tests to compare the performance level of students in Jordan with the performance of the other countries, and took the feedback in light of analysis results of the students' performance. Supervisors and

teachers were trained on how to treat the weak points in mathematics. Moreover, the National Center of Human resources of development provided and issued a guideline, which explained the weak and strong points for students in the test.

7. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

The concept of curriculum in the 1960s, focused on teaching the mathematical topics, which were in the textbooks. Then, the concept of curriculum developed and included all the experiences or activities which provided for students under the school controlling, also consisted of four elements: objectives, content, instructional methods and evaluation, and all the elements correlated with each other.

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

The reasons behind the developments of the mathematics curricula and methods of teaching are the development in the structure of Educational System in Jordan, and modifying the educational ladder. The cooperation between Jordan and the Arab countries to design unification curricula. Establishment and foundation the governmental universities in Jordan. Also in light of the developing experiences of the Jordanian national team for developing mathematics curriculum and methods of teaching. The new trends for mathematics and methods of teaching (modern mathematics) in the world.

9. Did the developments in the curricula of teaching mathematics coincide with international?

Yes, In light of the developments which witnessed the mathematics curriculum and methods of teaching mathematics among the five decades ago, we can say: the developments are coinciding the international developments.

The interview with Mr. Al smady, Mohammed

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

Yes, Ministry of Education has done many educational reformations since 1960s, specially the mathematics curricula.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed change and development?

- The first period during the 1960s, the traditional mathematics curriculum was used by MOE (disciplines: algebra, geometry and arithmetic...).
- The second period during the 1970s, modern mathematics curriculum was used by MOE (unification of disciplines of mathematics).
- The third period during the 1980s, new mathematics stage was used by MOE (focusing on problem solving, critical thinking).

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding of the development of learning objectives during these periods?

1. The aims of teaching mathematics during the first period (1960s) focused on the cognition domain; and the aims of teaching branches of mathematics were not clear for educational stages and grades' it took the abstract style; linking and integration between the mathematical branches were weak.
2. The aims of teaching mathematics during the second period (1970s) includes the cognition domains: mental, affective, and psychometric. The documents of teaching mathematics includes the special objectives for each grade of the stages; the linking and scope and sequences between the aims of stages and grade are weak.
3. The aims of teaching mathematics during the third period (1980s) witnessed developments, it concentrate on developing critical thinking, problem solving, and mathematical communication; also the abilities of students and methods of teaching taking into consideration.

4. What are the characteristics of the developments witnessed by the curricula in respect of the content during these periods?

- The content of teaching mathematics during the first period (1960s) focused on teaching discipline (geometry, algebra, and arithmetic), and concentrated on the organization of the topics among the branches of mathematics. The process of development of the mathematical content consisted on omitting or adding some topics, or modifying the number of periods in teaching mathematics, and the capabilities of students were not taken into consideration.
- The content of teaching mathematics during the middle of 1970s witnessed a unification of mathematics branches; and the sequence, integration and scope were taken into consideration. Further, teaching mathematics focused on teaching mathematical structures.
- The content was organized and presented for students in away to increase the students' interaction. the content was built in light of dividing the content into topics (axes) and the concepts and skills were distributed among these topics. The content also included new topics, but the concentration was on the abstract structures. The content was also overcrowded with abstract topics.
- The content was built to increase the interaction between the students and the ability of the students.
- The content of teaching mathematics during the period 1980s focused on the basic skills, and decreasing the abstract topics, on increasing the students' abilities in solving real life and mathematics problems. The content distribution took into consideration the scope and sequences of the topics. Also, the content of mathematics for secondary stage was overcrowded with the topics; whereas the numbers of periods, for teaching the mathematical content were not sufficient.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

- The methods of teaching mathematics during the first period considered the teacher as the main role and the unique resource of knowledge. the objective of teaching mathematics were concentrated on providing students' with mathematics knowledge, and focusing on the proficiency of arithmetic skills.
- In the second period, the training of teachers on the new content of the mathematics curricula was taken into consideration, but the teacher was still the resource of the knowledge; in addition the number of the governmental universities established in Jordan was limited.
- In the third period as a result of establishing multiple governmental universities and development the mathematics curriculum, the ministry of education trained teachers on how to teach the new curriculum, and on methods of developing thinking skills, and procedures of teaching using groups.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

- Methods of students' assessment during the periods (1960s and 1970s) focused on measuring the cognitive domain, remembering and memorizing mathematical concepts, facts and relationships, and solving mathematical problems. the process of evaluating students was carried out by tests prepared by teachers. Also the programs of training teachers on methods for evaluation, and on properties of constructive tests during the periods 1960s, and 1970s were a scarcity.
- According to the developing mathematics curricula in the early of 1990s, MOE trained teachers on applying the new curricula with respect to the content, increasing the interaction, developing the levels of thinking, using the scientific method in solving mathematical problems, and on mathematical communications, and on connecting the mathematics problems into real life situations

7. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

- The concept of mathematics curriculum during the period 1960s and in the middle of 1970s was limited on teaching the mathematical topics, which were represented in school textbooks. After that, it included the objectives of teaching mathematics, content, methods of teaching, methods of evaluation, textbooks, and became interested with teachers' training to achieve the aims of teaching mathematics for students.

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

- The educational reforms, which happened in Jordan and the special importance that are given to curricula development.
- Establishing the section of curricula and school textbooks by the Ministry of Education in the later of 1960s, which in turn took the responsibility of preparing the textbooks, development, printing and providing the students with it.
- The developments which are witnessed in the mathematics, and in the domain of educational sciences.
- The new attitudes, which are interested in preparing, and qualifying students and teachers.
- Cooperating with the Arab neighborhood countries to set out unified curricula.

9. Do the developments witnessed by the mathematics curricula teaching coincide with international developments?

There is a development in curricula and methods of teaching mathematics; but these developments are not as in the advanced countries. We can say that these developments are acceptable in light of the limited resources in Jordan.

The interview with Mr. Al kaleel, Ahmad

1. Have the mathematics curricula in Jordan witnessed change or developments since 1964?

Yes, curriculum and teaching mathematics in Jordan witnessed development since 1964.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed a change and a development?

We can say that the curricula and teaching mathematics in Jordan faced three periods of development: the first was during 1960s, the second was in the 1970s and the third period was at the end of 1980s.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding the development of learning objectives during these periods?

The major property of the first period was that the branches of mathematics were taught to students separately, and the objective of teaching mathematics focused on the cognition domain. Also the linking and integration between the branches through the grades of educational stages were weak. The objective of teaching mathematics at the second period became clear and specific, and it included cognitive, affective, and psychomotor domains. Also the interest with learners' growth was considered one of the elements of the educational process, which is taken into consideration through building the curricula. The third period witnessed clearance and identification of the objectives of teaching mathematics, and the concentration was the development of thinking skills and solving mathematics problems. Also the objectives of teaching mathematics included decreasing the on real life and mathematical applications instead of the abstractness, taking into consideration the coherence of the objectives across the grades and stages.

4. What are the characteristics of the developments witnessed by the curricula in respect of the content during these periods?

The mathematical content during the first period was taught for student in a separate form: each branch was independent from the other. Also there isn't any linking or integration between teaching these branches across grades of the educational stages. The content used the logical method through organizing the content, without taking into consideration the students' abilities. The content during the second period contained modern topics; the branches of mathematics became unified, taking into consideration the students, growth and abilities; but the content topics of teaching mathematics were plentiful with mathematics topics, which focused on the abstractness. The content of mathematics during the third period was organized to care about students' abilities and growth. The content also focused on problem solving, developing skills of thinking, and adding new topics that includes on applications. The scope and sequence and coherence were taken into consideration through grades of educational stages. The continued development for the curriculum content has done by MOE. Moreover, the number of lesson identified to teaching the content for grades was not sufficient.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

Methods of teaching were characterized by focusing on methods of presentation, providing students with mathematical knowledge, and a scarcity in the domain of teachers' training on methods of teaching mathematics. The teachers during the second period were trained on the new curriculum, but in an insufficient form; and the qualifications of teachers were not available for teaching modern mathematics. The teachers during the third period took different courses in training on how to teach the new curriculum, methods of teaching problem solving, developing skills of thinking, cooperative learning, and methods of increasing the students' interaction through the educational process.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

The methods of evaluation during the first and second period depended on the test that was prepared by teachers; these tests focused on measuring and assessing the knowledge of students in mathematics, and on measuring the low level of thinking skills. But the methods of evaluation during the third period witnessed developments through training teacher on different methods, such as: investigation, diagnostic evaluation, critical thinking, test construction and preparing and supporting teachers with manual-book. Moreover, MOE prepared tests by specialized committees, and the MOE distributed the tests on the educational departments in Jordan.

7. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

Yes, the concept of mathematics curriculum during the first period referred to the subjects or topics, which were included in the mathematics textbooks and taught to students. But the concept of mathematics curriculum during the second and third period witnessed a development and consisted of four elements correlated with each other (objectives, content, activities and methods of teaching, and evaluation).

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

The reasons behind the developments of curricula and teaching mathematics in Jordan are: the development of the educational system, modifying the educational ladder in light of the educational law which was issued by MOE in 1964, the developments witnessed in the mathematics science, the applications that happened as a result of these developments, the special concerns of the political leaders in Jordan, the increased experiences of the Jordanian National team in the domain of curricula development, and the new view to the learner (student) as a result of the educational theories which take Care with learners and consider them to be the major elements of the educational process.

9. Do the developments witnessed by the mathematics curricula teaching coincide with international developments?

Yes, we can say that mathematics curricula witnessed developments and that teaching mathematics coincides with the international developments particularly in the last period.

The interview with Mr. Ta'mneh, Akrum

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

Yes, the Mathematics curriculum and methods of teaching mathematics witnessed development from 1964 up to now.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed change and development?

Mathematics curricula and methods of teaching mathematics in the 1970s witnessed drastic changes and developments, when the traditional mathematics replaced in the new content and topics "modern mathematics". Also, the process of developing and changing the curricula and the mathematical content has continued in the 1980s.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding of the development of learning objectives during these periods?

During the 1960s and the 1970s The characteristics of learning objectives which related to the curriculum of teaching mathematics were: concentrated on the cognition domain. And the learning objectives of educational stages was not clear for teachers and students, also the learning objectives didn't include the concentration on development of thinking skills, problem solving, and the scope and sequence didn't take into consideration among the learning objectives of branches of mathematics. Moreover, the linking between learning objectives of educational stages was weak.

4. What are the characteristics of the developments which witnessed by the curricula in respect of the content, during these periods?

The content of teaching mathematics in the 1960s was distributed on branches (Algebra, geometry, and arithmetic skills,...) . Each topic of mathematics branches was taught for students as a separated form. Also teaching mathematics in elementary and preparatory stages focused on arithmetic skills. But the secondary stage at the end of 1960s witnessed developments through Inserting new concepts and topics for the mathematical content, and collecting branches of mathematics in one book for each grade (uniformed the topics of content) within the UNESCO project for developing mathematics teaching in Arab countries, whereas mathematical content focused on teaching mathematical structures through introducing a unified topics and concepts, such as set, group, and properties of operations. Also the content of teaching mathematics for all stages of education was changed and developed by the National team of developing mathematics curricula and methods of teaching in Jordan. Also the branches of mathematics unified in one book, and the topics of content for each grade was organized by using the explorer method. Moreover, the content of grades of educational stages crowded with the concepts and mathematical topics which focused on teaching mathematical structures.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

The Methods of teaching mathematics in the 1960s were used by teachers in teaching mathematics, could be described as a traditional methods, concerning to the focusing on development of higher levels of thinking skills. Moreover, the methods of teaching mathematics were used by teachers depended on the personal experiences of teachers due to the scarcity of short courses of training. Also the most methods of teaching mathematics were used by teachers, were concentrated on presenting the mathematical topics and proficiency of the mathematical skills, in explaining the topics, examples, and solving mathematical problems. But in the 1970s and because of the development in content of mathematics curriculum; teachers took short course of training on methods of teaching the new

content. Moreover, the MOE suffered from the scarcity of teachers' qualified to teach the new topics of mathematical content.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

The Methods of evaluation in the 1960s focused on measuring the mathematical knowledge. Teachers focused on prepared the tests: on memorizing the concepts and proficiency of the mathematical skills; also these tests concentrated on measuring the lower levels of thinking skills, and didn't take into consideration the individual differences between the students' capabilities. The MOE in the 1970s took into consideration of the importance of students in the educational process, and gave teachers short courses of training on test constructions. Moreover, the MOE issued teachers manual books that included on samples of tests of mathematics topics for grades of preparatory stage.

7. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

Yes, the concept of mathematics curriculum witnessed development, so during the 1960s and before 1975, it could be described as a traditional curriculum concerning to the concentration on developing the higher level of thinking skills. But the concept of curriculum of teaching mathematics during the 1970s developed in light of the new trends of teaching mathematics, and due to the unification of branches of mathematics topics. Also the curriculum of teaching mathematics consisted of aims of teaching mathematics, content, instructional methods, and evaluation. And all activities support to achieve the aims of educational process.

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

The reasons behind the developments of the mathematics curricula and methods of teaching mathematics due to the developments that happened in the mathematics science, Unification and integration between branches of mathematics (such as Algebra, geometry, and arithmetic) and taught as one topic. Also The cooperation between Jordan and the Arab counties in preparing unified curriculum, also the development in the structure of Educational System in Jordan, and modifying the educational ladder. Establishing and opening the governmental universities in Jordan.

9. Do the developments witnessed by the mathematics curricula teaching coincide with international developments?

We can say the development, which witnessed the curricula, and methods of teaching mathematics in Jordan coincide the international developments, because of the development in 1970s was under the supervision of UNSCO organization, and experts were participating from international corporations in the development process.

The interview with Mr. Hamadneh, Ahmmad

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

Of course, the mathematics curricula and methods of teaching mathematics witnessed developments in Jordan since 1960s.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed change and development?

There are three periods of developments:

During the 60s and 70s, curricula and teaching mathematics witnessed drastic changes, when the new mathematics took place instead of traditional mathematics (algebra, geometry and arithmetic...).

At the end of 1980s, the curricula and teaching mathematics witnessed development in light of the recommendations of the first National conference for Educational developments in Jordan.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding of the development of learning objectives during these periods?

The aims of teaching mathematics during the period (1960s) focused on the cognitive domain; and the integration and the scope and sequences among the grades of the educational stages were weak, and ignored the affective domain.

The aims of teaching mathematics during the period (1980s) focused on the cognitive domains (mental, affective, and psychometric), and concentrated on developing critical thinking, mathematical communication, and problem solving. Also the linking of aims of teaching mathematics through the educational stages and for each grade in the stage were clear.

4. What are the characteristics of the developments witnessed by the curricula in respect of the content during these periods?

The content of teaching mathematics during the period 1960s was taught to students' as discipline (geometry, algebra, and arithmetic), and concentrated on the organization of the topics among the branches of mathematics; and the sequence, integration and scope between the discipline were not taken into consideration. The process of development (renewal) of the mathematical content was limited on omitting or adding some topics, or modifying the number of periods of teaching mathematics.

The content of teaching mathematics during the period 1980s was organized as a unification for branches of mathematics; integration, scope and sequence were taken into consideration, and concentrated on problem solving, investigation, and developing mathematical thinking. Also the content was interested in presenting the content through including new topics, Shapes and colored diagrams and interpreting it, and through increasing the interaction between the students and the content in light of the ability of the students.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

Methods of teaching mathematics during the first period focused on the traditional methods through teaching mathematics. the teacher was considered to be the main resource of knowledge, and the methods concentrated on how to teach students and to be proficient in the mathematical skills. The role of student concentrated on receiving the knowledge and recalling it.

During the second period, the Ministry of Education was interested in developing the educational process through the concentration and interesting on environment of teaching, training teachers on teaching the new curricula, and how to apply the new methods of teaching mathematics such as: cooperative learning, investigation, using the educational TV, developing critical thinking and students' capabilities to solve mathematical problems.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

Achievement tests in the school during the first period were considered to be the main axis, and the students were assessed in light of these tests. These tests were prepared by teachers, and focused on the lower level of objectives of cognition domain, and measured the mathematical knowledge and skills achieved by students.

During the second period, the methods of evaluation witnessed developments; also the tests are still prepared by teachers, but the Ministry of Education trained teachers on the validity method of test construction, and how to prepare achievement and diagnostic tests, and how to measure the higher level of thinking skills, and the benefit from the analysis results of tests , and presenting the feed-back.

Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

The concept of teaching mathematics curriculum during the first period was considered to be the mathematical content which was taught to the students, and was represented with information, and the mathematical topics (mathematical knowledge) included in the school textbooks.

The concept of mathematics curriculum during the second period, consisted of objectives, content, activity and methods of teaching, and evaluation, these elements with together refer to the curriculum. Also each grade of the educational stage has specific objectives, content, methods and procedures for

achieving the objectives through the content, and methods of measuring and evaluation of the objectives.

7. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

Curricula of teaching mathematics in Jordan effected with the developments, which happened by the mathematics science, and the developments that happened in the Educational Sciences. The development in the structure of Educational System in Jordan and modified the educational ladder. The new trends for mathematics and methods of teaching (modern mathematics). Also the participation in the project of developing mathematics curriculum and methods of teaching in the Arab countries under the UNESCO supervision. And the Establishing and opening the universities (governmental, private) in Jordan.

8. Do the developments witnessed by the mathematics curricula teaching coincide with international developments?

Yes, I see the developments coincide with the international developments in light of the limited resources of Jordan.

The interview with. Dr. Namarneh, Ibrahim

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

Yes, the mathematics curricula and teaching mathematics witnessed developments in Jordan since 1960s.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed change and development?

During the 60s, curricula and teaching mathematics witnessed development, when the new mathematics took place instead of traditional mathematics (algebra, geometry and arithmetic...). In the middle of 1970s and after, this period was called modern mathematics. As a result, the curricula and teaching mathematics witnessed drastic changes like unification of the branches of mathematics.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding of the development of learning objectives during these periods?

The aims of teaching mathematics during the period (1960s) focused on the cognitive domain; and the aims of teaching geometry were not correlated with the aims of teaching Algebra or arithmetic.

The aims of teaching mathematics during the period (1960s) focused on the proficiency of the arithmetic skills, and the aims were general for the educational stages, and were not identified for each grade.

The linking of aims of teaching mathematics through the educational stages and for each grade during the 1970s stage was clear. Also the documents of mathematics curricula included the general aims of teaching mathematics for the educational stages. The documents contain the special objectives related to the topics of the content, and the aims for developing the positive attitudes for teaching mathematics, and skills of thinking.

4. What are the characteristics of the developments witnessed by the curricula in respect of the content during these periods?

The content of teaching mathematics during the period 1960s focused on teaching discipline (geometry, algebra, and arithmetic), and concentrated on the organization of the topics among the branches of mathematics. The process of development of the mathematical content consisted of omitting or adding some topics, or modifying the number of periods of teaching mathematics.

The content of teaching mathematics during the middle of 1970s and after, focused on unification of branches of mathematics; the scope and sequence, integration were taken into consideration.

The content was organized in away to increase the students' interaction; and the content was built in light of dividing the content into topics; the concepts and skills were distributed among these topics; and the content included new topics, but the concentration was on the abstract structures.

Also the content was built in light of increasing the interaction between the students in light of the ability of the students.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

Methods of teaching focused on developing skills of thinking and researching and methods of problem solving instead of recalling and receiving the mathematical knowledge. Also the methods focused on preparing students on methods of researching about the knowledge. Student was viewed as the axis of the educational process. Also the Ministry of Education trained the teachers during the second period on methods of teaching the new curricula , and trained the teachers on methods of how to develop the skills of thinking, methods of problems solving for students, and how to increase the students' interaction through teaching mathematics, and developing the positive attitudes for mathematics.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

Teachers' Assessment focused on one or two types of written question, or multiple-choice questions. The main task of teachers was to prepare students to take the general examination at the end of the secondary stage, and pass the final examination at schools. Moreover, the methods and technique of evaluation did not measure recall the mathematics knowledge, but the assessment focused on comprehensive evaluation for each aspects of the personality in light of the capabilities of students depending on the notes and investigation instead of focusing on the achievement in the examinations as it was the previous period.

7. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

Yes, the curriculum concept for teaching mathematics was considered to be the mathematical content which was taught to the students during the first period, but the curriculum concept after that was developed and included all the activities and experiences which were prepared and organized for students through the educational process, and it also included the objectives, content, methods of presenting and teaching the activities, and methods of measurement and evaluation in light of the achievement of the objectives.

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

- the development of the structure of the Educational system in Jordan
- establishment and foundation of the governmental universities in Jordan
- the scientific developments in general, and in mathematics in particular
- in light of the results of the evaluation studies which were conducted by the Ministry of Education in Jordan

9. Do the developments witnessed by the mathematics curricula teaching coincide with international developments?

I can say; yes in light of the limited resources of Jordan, and comparing with the neighborhood Arab countries.

The interview with Mr. Na'mneh, Mohammed

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

Yes, it witnessed more than one development and change.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed change and development?

At the beginning of the 1970s, teaching mathematics changed from traditional to modern, and in the 1980s, the development of mathematics curricula started continuously up to now.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding of the development of learning objectives during these periods?

Each lesson consists of major objective; and the major one is branched to number of special learning objectives in the domains of knowledge, thinking, mathematical skills and arithmetic.

4. What are the characteristics of the developments witnessed by the curricula in respect of the content, during these periods?

At the first period the mathematics curriculum changed from traditional to the modern: from more than one book taught to students separately (geometry, algebra, and arithmetic skills) to one book consisting at units including all branches. Through the second period, methods of content presentation were developed and focused on fundamental concepts, the pre-learning of the student, and motivating the students to think and discover. Also, the mathematical knowledge is displayed and presented in a simple and easy method, and used the colorist of figures and shapes.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

Methods of teaching mathematics developed and became far from concentrating on memorizing the mathematics knowledge and skills proficiency. And the big role through the educational process was for teacher, who is considered to be the resource of the knowledge. The role of student was to receive the knowledge and remember it during the examinations. But the role of student through the second period changed and the concentration was on the role of student in the educational process. the method of presenting the content indicated and focused on the student's role, and the use of cooperative learning and investigation.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

the evaluation methods Focused on all the cognition domains through, and focused on the higher level of thinking, feed-back, the methods also concentrated on test construction, test analysis, on presenting the feed-back for students, and putting the clinical plans in light of the results of test analysis.

7. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

Yes, the curriculum concept consisted of four elements: objectives, content, methods of teaching, and evaluation, and became interested with each elements correlated with the educational process.

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

The reasons behind the developments of the mathematics curricula and methods of teaching are: Developing teaching mathematics for the best; the progress in the technological development in the world, and the results of scientific researches.

9. Do the developments witnessed by the mathematics curricula teaching coincide with international developments?

Yes; we can say the developments witnessed by the curricula of teaching mathematics in Jordan, coincide with international developments

The interview with Mr. Al omeray, Hasan

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

Yes. Mathematics curricula and Methods of teaching mathematics in Jordan witnessed development.

2. Can you identify the periods during which the mathematics teaching curricula have witnessed change and development?

- At the end of the 60s, curricula and teaching mathematics in Jordan witnessed drastic changes, especially when the new mathematics replaced the traditional mathematics (algebra, geometry and arithmetic...).
- During the 1970s and 1980s, the curricula and teaching mathematics witnessed developments in light of the recommendations of the first National conference for Educational developments in Jordan.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding the development of learning objectives during these periods?

Properties of learning objectives during the 1960s were simple and focused on teaching mathematical knowledge, arithmetic skills, ignoring the abilities of student, also mathematics were taught as topic in disciplines, and these topic were not correlated with each other. Also the learning objectives of mathematics did not take into consideration the scope and sequence. The linking between learning objectives of grades and the educational stages were weak. At the second period of development, the objectives took into consideration the abilities of students, scope and sequence, integration between the topics of mathematics units through grades and educational stages; the learning objectives consisted of developing critical thinking, problem solving, and developing the positive attitudes for teaching mathematics.

4. What are the characteristics of the developments witnessed by the curricula in respect of the content during these periods?

At the first period, the mathematics curriculum changed from traditional to the modern: from more than one book were taught to students separately (geometry, algebra, and arithmetic skills) to one book consisting units including all branches. The topics of content were organized in a logical way, and didn't encourage students on learning mathematics, also it did not take into consideration the application side of mathematics; and the number of lesson periods allotted to teaching the content for grades of educational stages was not sufficient.

Through the second period, methods of presenting the content were developed, and focused on fundamental concepts, and were interested in increasing the interaction among students through mathematics learning, how to increase the motivation of students, developing levels of thinking and discovery, and investigation. Also the scope and sequence, integration among the content across the grades of educational stages were taken into consideration as well as in the previous period.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

Methods of teaching mathematics during the first period were concentrated on memorizing the mathematics knowledge, and proficiency of mathematical skill. But the second period witnessed developments in the instructional teacher was looked not as the unique resource of the knowledge, and the role of student was not to receive the knowledge and remember it to achieve the examinations. But the concentration was on how to teach student to learn, solve problems in mathematics and real life, and encourages the cooperative learning.

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

Methods of evaluation during the first period focused on cognition domain through the tests that are prepared by teachers; they concentrated on measuring the students, achievement, and the lower levels of thinking; and there is a general examination at the end of each educational stages that are prepared by special team in MOE. According to the results of These examinations, students can transference from stage to next stage.

But during the second period, the evaluation methods were developed, and the MOE trained teachers on methods of test construction, diagnostic evaluation, methods of developing thinking and investigation; national examinations were prepared to measure the achievement and performance of

students, and the feed-back was presented in light of the analysis results of these examinations. Also MOE participated in international tests to compare the performance level of students in Jordan with performance of the other countries, and to put the clinical plans in light of the results of test analysis.

7. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

Yes, the concept of curriculum through the first period was represented with the mathematical topics taught to students in the textbooks. But the curriculum during the second period consisted of four elements: objectives content, instructional methods and evaluation; and each element were correlated with each other.

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

The reasons behind the developments of the mathematics curricula and methods of teaching were: The developments which witnessed by mathematics science, and what happened of applications as a result. The new trends for mathematics and methods of teaching (modern mathematics) in the world. The development in the structure of the Educational System in Jordan, and modifying the educational ladder. The special importance and supporting by the political leader in Jordan represented with the Majesty of King Hussein among the history of the educational development.

9. Do the developments witnessed by the mathematics curricula teaching coincide with international developments?

Yes. We can say the developments witnessed mathematics curriculum and methods of teaching coincide with international developments.

The interview with Mr. Mofeed, Hazem

1. Have the mathematics curricula in Jordan witnessed change or development since 1964?

Yes, the mathematics Curriculum and the methods of teaching in Jordan witnessed continuous developments.

2. Can you identify the periods which the mathematics teaching curricula have witnessed change and development?

I can talk about the changes and developments that happened At the end of 1980s, because I lived and coincide these developments and changed in mathematics curricula and methods of teaching mathematics.

3. What are the developments witnessed in mathematics teaching curricula in Jordan regarding of the development of learning objectives during these periods?

At the end of 1980s the aims of teaching mathematics witnessed development, due to the educational reforms by MOE. The MOE focused on the qualitative education through concentration on developing critical thinking and scientific method in solving mathematical and real life problems. The MOE Identified the aims of teaching mathematics for each educational stage according to these aims, also the special objectives of teaching mathematics for each grade of educational stages were identified, too. The aims took into consideration the scope and sequence, integration, stages of students' growth, linking between learning objectives among mathematics topics, and grades of educational stages.

4. What are the characteristics of the developments which witnessed by the curricula in respect of the content, during these period?

At the end of 1980s, the content of mathematics curricula witnessed changes and developments due to the educational reforms of MOE. And in light of the recommendations of the first national conference which held in Jordan on (7-9) September 1987. Also the content was organized to achieve the objectives of the conference which indicated to focus on problems solving, and developing skills of thinking through certain mathematical topics. Whereas the content took into consideration the scope and sequence through the distribution of concepts and the mathematical topics in the content of educational stages and decreasing from introducing the abstract concepts and topics among the content; and concentrated on the applying aspect of mathematics, and linking between the concepts and topics of the content across the grades of educational stages.

5. What are the characteristics of the developments in respect of the development of teaching methods during these periods?

The Instructional methods for teaching mathematics at the end of 1980s were developed by MOE because of the development of mathematics curricula by training the teachers on the methods of teaching the new curricula and concentrating on development of skills of critical thinking, and strategies of solving problem, investigation, and teaching by using method of cooperative learning. Also the MOE prepared and qualified teachers through sending them to the governmental universities to get the first degree of education

6. What are the characteristics of the development in respect of the evaluation methods during these periods?

At the end of the 1980s because of the educational reforms and developing the content of mathematics curricula, MOE gave the educational evaluation high degree of the importance through short courses of training on methods of assessment the achievement, diagnostic evaluation, test constructions and method of building the tests in a right way to measure the thinking skills. Moreover, MOE issued guideline for teaching mathematics “teacher manual book” for each grade of educational stages, which included on enrichment activities according to knowledge level of students’, and sample tests for the units of the curriculum content for grades of educational stages.

7. Did the concept of the educational curriculum in the teaching of mathematics witness development during the phases of change?

Yes, the Concept of curriculum of teaching mathematics witnessed developments by concentrating on developing critical thinking, problem solving, mathematical communications, and taking care of students’ learning. Also including on the aims of teaching across the grade of educational stages and the units of each grade and guideline about the technical and instructional methods of teaching the content to achieve the aims, also the methods of evaluation related to the all elements.

8. What are the reasons behind the developments of the mathematics curricula teaching during these periods?

The reasons behind the developments of the mathematics curricula and methods of teaching were: The new trends for mathematics curricula and methods of teaching in the world. The development in the structure of Educational System in Jordan, and modifying the educational ladder. Also due to the Educational reforms by MOE, and concentrating on the qualitative developments in stead of the quantitative.

9. Do the developments witnessed by the mathematics curricula teaching coincide with international.

I believe that the developments concerning to the mathematics curricula and methods of teaching mathematics in Jordan coincide the international developments.