The level of mathematical enlightenment for pre service teachers in the West Bank

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Abstract

Enlightenment in general and in particular mathematical enlightenment is extremely useful. In this study we prepared a specially designed test for pre service teachers in West Bank (Palestine) in order to determine the dimensions of mathematical enlightenments and to determine the level of mathematical enlightenment for pre service teachers, where we applied it to a sample of 452 students. The result leaded to six dimensions for mathematical enlightenment and that the level of mathematical enlightenment is above the predetermined score. We also noticed that females were more enlightened than males. Finally some recommendations were stated.

 Keywords: Mathematics, Enlightenment, Palestine.

1. INTRODUCTION

should have the knowledge and skills that help us to adapt with these developments. (Baksh 2004).

Enlightenment, in the beginning, indicated the ability to read and write and do simple calculations. By the time, the word developed to indicate the ways in which the person expresses himself and his understanding of his world. It's a reflection of one's life including his language, his knowledge, his belief and social values (Gee 1989).

There are two kinds of enlightenment; the general one and the one that is related to specific fields such as mathematical and technological enlightenment. Anyone who has knowledge, skills and ways of thinking that help him to deal successfully with problems in life will be generally enlightened. However, the one who is professional in his specialization or job will be considered as enlightened in that specific field. (Almufti et al.1990, Faraj 1996).

In one way or another, the specific enlightenment is part of the general one. Each specialization has its own enlightenment. In accordance with the Egyptian association (1990), the following dimensions are important ones while considering the specific enlightenment:

1. Deep knowledge of the nature of specialization and its aims through different stages.
2. Differentiation between concept, principle, theory, generalization and rule.
3. Knowledge of research methods.
4. Knowledge of learning strategies.
5. Recognition of social and technical applications of the science, in addition to the related theories.

The scientific enlightenment has two aspects (Eid 2009), the first one that is related to knowledge in different branches of science such as mathematics, physics and geology. The other one that relates to behaviors and attitudes in daily life.

Showalter (1974) determined the

elements of the scientific enlightenment as the basic concepts, nature of science, values, science operations, and science and society, while the standards of the scientific enlightenments are the following:

1. Knowledge of basics of science.
2. Recognition of the relationship between science, technology and society. In addition, the social importance of science.
3. Awareness of scientific and technological applications of science, locally and globally.
4. Recognition of nature of science and its ability to develop and change.
5. Knowledge of important scientific discoveries and achievements.
6. The ability to use methods of scientific research.
7. Recognition of technological developments and the ability to use technological devices and equipments.
8. Appreciation of scientists and their achievements that play a great role in society.

Enlightenment is a changeable continuous process that is affected by internal and external changes in one's life. It's about living an ambitious life (Pisa 2003, Rong 2005).

Enlightenment should take place in all aspects of life. Mathematics is an important one of these aspects. Mathematics is not only a pure science; it's also an activity we do in different fields of our life such as medicine, trading and science. It spreads widely after the appearance of computer. Mathematics is a comprehensive system that consists of mathematical structures and helps to develop thinking, solve problems and make decisions. (Salameh 1995, Alameen 2001, Abuaqeil 2014).

On the educational level, to create mathematical enlightenment for students becomes an important dimension while teaching mathematics. This will be through teaching them the basics of mathematics. The mathematical enlightenment helps individuals to think in a creative way while dealing with scientific and technological developments, it creates people who are able to analyze, induct, deduce, predict and explain while thinking about issues related to their societies. Enlightened people are able to adapt with their societies and improve the life in their societies.

This makes mathematical enlightenment a main aim of curricula of mathematics and its teaching (Almuhtaseb 2006, Albadrawi 2012).

The American National Council of Teachers of Mathematics (NCTM, 2000) presents a vision of mathematical enlightenment through the scientific and technological developments in teaching and learning mathematics. It clarifies that mathematical knowledge in primary classes creates a generation who is able to use mathematics in all aspects of life(NCTM, 2000). To make the change, we should focus on studying the present situation while having a clear vision for the future. If a teacher is mathematically enlightened then his students will be mathematically enlightened.

On the contrary, we can't create mathematical enlightenment for students if the teachers don't have it (Asqool and Abu Odeh 2007).

In mathematics, enlightenment means that the teacher of mathematics should be aware of basics of his subject that

includes concepts, principles and skills. He/she should also be aware of the nature of mathematics, the history of its development and the mathematical achievements of scientists. In addition, to be able to use mathematical thinking methods (Shi and Chun, 2009).

Alrayashi (2001) certifies that mathematical enlightenment is that pre service teachers should have knowledge of the basic mathematical concepts and skills, and to have methods of mathematical thinking.

Thomas (2001) asserts the same, that the person who has mathematical enlightenment should have basic mathematical skills and knowledge in accordance with the standards of the NCTM. In addition, he should be able to apply mathematical knowledge in all aspects in life. The word enlightenment means literacy which is the opposite of illiteracy.

Almuftiet al. (1990) presents basic dimensions of mathematical enlightenment which are: mathematical thinking methods, basic mathematical concepts, principles and skills, nature of mathematics and the history of its development.

Ohio state department of education, 1993 has presented a test to measure the mathematical enlightenment for high school students in the aspects that are related to levels of knowledge, application, skills, solving problems and understanding which are: calculations, analyzing data, algebra, functions and geometry.

To measure the mathematical enlightenment for a group of adult students, (Giordano, 1995) has sit the dimensions of mathematical enlightenment which are: mathematical evaluation, mathematical communication, trust of mathematical ability and the ability to solve problems.

The mathematical enlightenment depends on the curriculum of mathematics (Qin and Wei, 2008) .The curriculum of mathematics helps to achieve mathematical enlightenment when it is based on the right basics and principles of mathematics. It helps students to live a better life after using skills of mathematical thinking such as explanation, induction and measurement (Shi and Chun , 2009) .Therefore they will be constructive people in their societies (Bader, 2010).

1. The issue of the study

Modern education considers the use of technology to be an important element in teaching process. In order for the teacher of mathematics to be able to enlighten his students he should have a comprehensive vision of mathematics, its philosophy, its basics and the methods of its teaching. He should also be aware of mathematical applications and systems such as, algebra, logic, geometry, probability and statistics.

Researchers, through the experience in teaching courses related to mathematics such as methods of teaching mathematics and practice teaching have noticed that pre service teachers make great mistakes. In addition, students are ignorant of many basics of mathematics, these basics that are important in understanding the structure of mathematics. This is a negative sign for pre service teachers who should have the mathematical enlightenment (which is the basis of pure, applied and education of mathematics).

In this study, we'll discuss the concept of mathematical enlightenment. If we understand the concept we'll be able to

understand the present situation and to explore a vision about the enlightenment of our future teachers of mathematics.

The issue of study is the level of mathematical enlightenment for teachers of mathematics before they experience teaching:

The following questions are related to the main issue:

1. What are the dimensions of mathematical enlightenment?
2. What is the level of mathematical enlightenment for pre service teachers?
3. Does the level of mathematical enlightenment differ from one university to another or from one gender to another?
4. Is there a relationship between the accumulative average in college and the level of mathematical enlightenment?

Teaching process is important and mathematics is an important subject. This study discussed mathematical enlightenment of students as a responsibility of teachers of mathematics. It certifies that the teachers of mathematics should be aware of the basics of his subject, these basics that were determined by(NTCM, 2000). In addition this study is important because it aims at measuring the mathematical enlightenment for teachers of mathematics before they experience teaching.

This study aims at determining the level of mathematical enlightenment and its dimensions for teachers of mathematics before they experience teaching. Also, determining differences in the answers of the group of study in accordance with university and gender. Then the decision makers will be notified of the results in order for them to take the necessary decision and actions to improve the educational process of mathematics.

2. Previous Studies

In as much as we are concerned previous studies highlighted two subjects, the scientific enlightenment and the mathematical enlightenment. While concerning the scientific enlightenment we'll talk about Bardawi's study (2012) that discussed the relationship between the level of enlightenment for teachers of science and the scientific enlightenment for their students. His group of study included 1025 students, males and females. The results showed that 65.5% of students have scientific enlightenment. It also showed that there is a significance relationship between the level of enlightenment for the science teacher and the enlightenment of his students and that there is a significant relationship where the more enlightened the teacher was reflected positively on students understanding of the scientific concepts and skills.

Alzugbi (2011) study aimed at measuring the level of enlightenment for teachers who signed in education program (Diploma) in Jordanian universities. The group of study included 130 teachers, males and females. Results showed that the level of scientific enlightenment is acceptable. The study also proved that the level of enlightenment is affected by the nature of specialization. Those who are specialized in scientific fields are more enlightened than those in other fields. The study also showed that gender and university had no effect on enlightenment.

Eid (2009) submitted a study that was

entitled "The level of physics enlightenment for eleventh grade scientific stream students at Amman province" using specially prepared test. The results showed that the level of enlightenment in physics is under the acceptable range which is 75% and that there are differences between males and females. Females are more enlightened than males in physics.

Asqool and Abu Odeh (2007) studies discussed technological enlightenment. The dimensions of technological enlightenment were set in 38 main points from which 145 minor ones evolved. The studies analyze the material of technology culture curriculum for 11-th grade and that curriculum covered 34 out of 38 major points.

Almuhtaseb study (2006) aimed at knowing the level of scientific enlightenment for high school students in Amman. The group of study included 1173 students, males and females. The results showed that the level of enlightenment in private schools is more than that in state schools. They also showed that females are more enlightened than males and students who are specialized in fields related to science are more enlightened than others. In general, the studies showed that pupils lack scientific knowledge.

Baksh study (2004) aimed at knowing the level of scientific enlightenment for students in pre-college phase in the kingdom of Saudi Arabia. The group of study included 200 students males and females. Results showed that females are more enlightened than males and students who are specialized in scientific fields are more enlightened than those who are specialized in other fields.

As for Studies related to mathematical enlightenment, Bader (2010) study discussed the mathematical enlightenment for pre service teachers in college of education. The dimensions of mathematical enlightenment were determined as the following: mathematical knowledge and the nature of mathematics and the history of its development. Results showed that the level of mathematical enlightenment was under the minimum (80%).

Lee study (2010) aims at knowing the efficiency of mathematics curriculum in achieving mathematical enlightenment. Results showed that the curriculum should be designed in accordance with specific features to achieve enlightenment.

Shi and Chun (2009) study discussed the process of enlightenment, modernization and integration of curriculum of mathematics for primary and secondary classes. Results showed that the enlightenment in mathematics and integration of curriculum reflect on the criteria of the curriculum. Standards of mathematical enlightenment of the curriculum were set as the following: curricula should be comprehensive, integral and based on basic mathematical concepts. Materials should also be presented in sequence. Eventually, the process of designing curricula should benefit from the experience of other countries.

Qin's and Wei's (2008) study focused on social, cultural and political factors that affect learning of mathematics. It discussed the mathematical enlightenment for primary and secondary stages through focus on the understanding of basic mathematical concepts.

Hai's study (2004) presented a project

that clarifies how to create learning environment outside classrooms through mathematics enlightenment. It aims at using family and society sources instead of in class learning.

Rong's study (2005) discussed the basic Mathematical knowledge. Individuals presented their knowledge in accordance with specific criteria and dimensions. Results showed that mathematics enlightenment relates to ability of adaptation. The person who is enlightened can improve his students learning through organizing knowledge. This leads to a better managing of classroom.

4. Procedures and methods

4.1. Study approach

The researchers in this study used the descriptive analytical approach which is useful in descriptive studies. It helps to understand the present situation and to make plans for future. It also gives an idea about the level of mathematical enlightenment for pre service teachers of mathematics. Eventually, it determines the dimensions of mathematical enlightenment. The study consists of two parts; theoretical and empirical one.

In the theoretical part the dimensions of mathematics enlightenment are determined through presenting related studies. While the empirical part depends on measuring mathematical enlightenment. The measure is done in away where the descriptive analytical method fits the way of collecting data. The reliability of this measurement depends on the sincerity of people in the group of study and their preferences.

4.2. Group of study

The group of study included all senior students in departments of mathematics in Palestinian universities during the first semester of the academic year 2014 - 2015.

Where it was demanded officially by the authors that the instructors at the Palestinian universities distributes and applies the research tools is monitored by the stuff at math department as if it was in class test. A random sample is selected in accordance with gender and university as clarified in Table 1:

Table1: Frequency table of male and female grouped by the university

University		Hebron	Polytechnic	Al-Quds	Birzeit	Al-Najah	Total
Gender	Males	32	51	48	41	52	224
	Females	71	38	39	37	43	228
Total		103	89	87	78	95	452

4.3. Tool of study (measurement of mathematics enlightenment)

The measure was built through the following stages:

i. Analyzing material:

Researchers have done surveys about previous studies that are related to mathematical enlightenment. In addition they have analyzed the material of the Palestinian curriculum of mathematics in pre-college education (from first to twelfth grade). Basic mathematical concepts were observed and some concepts may be repeated in more than one grade.

In light of this survey, a group of

concepts and skills were determined. In total, they are 162 mathematical concepts; these concepts were formulated in phrases.

A group of judges, who are teachers of mathematics and supervisors in the Ministry of Education, checked the correctness of phrases. They checked the linguistic and scientific correctness. They also checked if these phrases are sufficient to measure mathematical knowledge which is the first dimension of mathematical enlightenment.

In light of suggestions of judges we arrived at the second stage which is a test of mathematical knowledge.

ii. Test of mathematical knowledge:

A test was prepared to measure the mathematical knowledge which is a dimension of mathematical enlightenment, where after analyzing the contents of the curricula we determined the needed concepts taking into account that there are general concepts that contains some less general ones. The general concept is presented to students as a question.

iii. Questionnaire about trends towards mathematics and its teaching: it consists of ten paragraphs; each one is followed by three choices. When a student strongly agrees (worth 3 points) and agrees (2 points) and disagrees (one point).

iv. A test for mathematical thinking:

A test of mathematical thinking is constructed. It contains 8 multiple choices paragraphs. At the end of each one there are three choices.

v. A test for scientific research in mathematics:

It consists of 10 fill in the blanks paragraphs that included a list of concepts related to scientific research.

vi. A test for solving mathematical problems:

It includes ten mathematical problems. The student finds out and circles the correct answer.

vii. A test for nature of mathematics and the history of its development:

It consists of 8 fill in the blank paragraphs that included a list of concepts related to mathematics and the history of its development.

To summarize, as clarified previously, in its final image it consists of 73 paragraphs divided into six dimensions of mathematical enlightenment (Mathematical knowledge, trends towards mathematics and the methods of its teaching, scientific research in mathematics, mathematical thinking, solving mathematical problems and nature of mathematics and its history).

To verify the validity of the tool of study, it was presented to a group of judges who are specialized in this field .All their notes were taken into consideration. In addition, to check the reliability of the tool it was applied on a sample of students of mathematics, which included 22 males and females other than those in the sample. Table 2 displays the Cronbach alpha reliability measure.

Table 2: Cronbach alpha for each part.

	dimensions	number of phrases	Cronbach alpha
1	Mathematical knowledge	27	0.78
2	Trends towards mathematics and the methods of its teaching	10	0.72

3	Scientific research in mathematics	10	0.69
4	mathematical thinking	8	0.71
5	Solving mathematical problems	10	0.65
6	Nature of mathematics and its history	8	0.70
	All tools	**73**	**0.83**

Before, we present the results of the study, we would like to indicate some important notes.

1. In accordance with determining scores that the experts in mathematics and its teaching suggested and those used in references tests, it was decided that the student who gets 70% in any of the mentioned dimensions will be considered enlightened in it.
2. One grade is given to the right answer and zero to the wrong one or "I don't know" in the following dimensions; mathematical knowledge, scientific research in mathematics, mathematical thinking, solving mathematical problems and nature of mathematics and the history of its development.
3. But for the dimension of trends towards mathematics and its teaching, the results were based on the arithmetical means, where the mean that lies in (1, 1.66) is low, the one in (1.661, 2.32) is intermediate and the one above 2.321 is high and a participant is considered enlightened if he gets a high mean.
4. It is to be understood that the pre service mathematical enlightenment is the needed of mathematical knowledge of concepts, skills and operations that are related to mathematics for pre service teachers. Besides, the ability to use methods of mathematical thinking and solving mathematical problems. Finally, having awareness of nature of mathematics and the history of its development. This kind of enlightenment is measured in accordance with the mathematical enlightenment measure (see the Appendix).

It is also beneficial to remind the readers that mathematics is a group of mathematical systems that consists of deductive structures that are based on assumptions and axioms and it is the science that deals with abstract quantities, such as symbols, numbers, shapes, operations and logical study of shape and quantity (Abu aqeil, 2014).

5. Results of study

Firstly: Results related to the first question which is, what are the main dimensions of mathematical enlightenment?

The dimensions of mathematical enlightenment are derived from its definition. These dimensions that are related to teachers of mathematics before

they experience teaching and which are the following:

The first dimension:
Mathematical knowledge which includes the necessities the teacher of mathematics should know, namely:
-Knowledge of basic mathematical concepts.
-Doing basic mathematical skills.
The second dimension:
Methods of mathematical thinking, this means that the teacher of mathematics should be able to use methods of mathematical thinking, while solving mathematical problems such as logical thinking and deductive thinking.
The third dimension:
Solving mathematical problems, that the teacher faces in life, which means that he/she should be able to use mathematical concepts and skills when solving mathematical problems while dealing with them in daily life.
The fourth dimension:
Scientific research in mathematics. That is,

the teacher should be aware of methods of scientific research in mathematics.
The fifth dimension:
Trends towards mathematics and methods of its teaching. This means that the teacher of mathematics should have positive attitudes towards mathematics and have knowledge of its teaching methods.
The sixth dimension:
Nature of mathematics and the history of its development. That is, the teacher of mathematics should be aware of nature of his subject, the history of its developing and the mathematical achievements of scientists.

Secondly: Results related to the second question which is, what is the level of mathematical enlightenment for pre service teachers?
Here the means and the standard deviations were calculated according to the dimensions of mathematical enlightenment as shown in Table 3.

Table 3: Mean and standard deviation of the sample respondents.

		number of phrases	Mean*	Standard deviation*	Percentage %	Rank of dimensions
	Mathematical knowledge	27	3.579	0.567	71.58	2
	Trends towards mathematics and its methods of teaching	10	3.505	0.391	70.10	3
	Scientific research in mathematics	10	3.486	0.940	69.72	4
	Mathematical	8	3.253	0.791	65.07	5

thinking					
Solving mathematical problems	10	3.199	0.810	63.99	6
Nature of mathematics and its history	8	4.200	0.622	84.01	1
All tools	**73**	**3.536****	**0.657****	**70.72****	

*For easy scaling we unified all means and standard deviations to be out of 5, where the mean for mathematical knowledge was19.327, trends towards math was 7.01, scientific research in mathematics was 6.972, that for mathematical thinking was 5.206, for solving problems was 6.399 and for the nature of mathematics was 6.721.

**as for the weighted mean and the weighted standard deviation, we notice from Table 3 that the mean performance (percentage mean) of the sample on the enlightenment measure was (70.72) which is higher than the determining score which is 70 in spite of the fact that 285 of the total sample (63%) scored higher than 70. This result agrees with some previous work such as that of Almuhtaseb (2004) which indicated an accepted level of scientific enlightenment while it does not agree with the work done by Bader (2010) and Mofti et al. (1990) which indicated that the level of mathematical enlightenment was low.

Through the information in Table3 , we notice that individuals in the group of study have enlightenment in the nature of mathematics and its history, this is due to curriculum of teaching mathematics and its methods of teaching in universities that include the course (history of mathematics). This course that, contains contributions of Arab and Muslim scientists in mathematics.

Individuals also have enlightenment in mathematical knowledge; this is due to the course basics in mathematics included also in the Palestinian universities curricula which includes general concepts and basics in mathematics. On the other hand, individuals are not enlightened in the dimensions of mathematical thinking and solving problems. This refers to various reasons such as, the deficiency of curricula of Mathematics that lacks activities and discussing problems where teachers depend on the school books as the only source of knowledge while neglecting different activities and applications that help students to experience applications of mathematics. Furthermore, teachers of mathematics sometimes don't have sufficient knowledge of technological and scientific developments.

Results related to the third question which is: Before they experience teaching, does the level of mathematical enlightenment of teachers of mathematics differ in accordance with gender and university?

Concerning gender, t-test was used to determine whether the means differences were statistically significant.

Table 4: Independent samples test

Measure of variation		mean	Standard deviation	number	t-value	p-value
Gender	Male	3.01	0.36	224	15.843	0.000
	female	3.39	0.15	228		

Table 4 shows that the means difference was statistically significant (p-value <0.05).Furthermore, females are more enlightened than males. This is due to social, financial and political reasons. In Palestinian society, there are many social restrictions in dealing with women. In general they are not allowed to join clubs and do different kinds of sports in public. They are prevented from visiting parks and wandering alone. Therefore, females focus their efforts on studying. Education is the main way to achieve their ambitions.

Also, since Palestinian families face (mostly) financial difficulties females feel that they have to share the responsibility of improving the financial situation of the family. In addition, the political situation affects females more than males especially those who have tough experiences. It is important to notice here that Tawjihi (high school) exams assert that females are more enlightened in mathematics than males. The first ten students in Tawjihi are mostly females.

As for the variable universities: One Way ANOVA was used to determine whether the means differences were statistically significant (Table 5).

Table 5: One way ANOVA for the variable univesity

Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F-Statistic	p-Value
Between Samples	31.704	4	7.926	1.952	0.031
Within Samples	1819.173	448	4.06		
Total	1850.877	452			

One concludes from Table 5 that there is no statistically significant difference related to the variable university, where F-value was 1.952 which is not statistically significant at $\alpha = 0.05,$ which we think may be due to:

1) All Palestinian universities are abiding by the same instructions of the ministry of higher education.

2) Since Palestine is a small country, conditions of raising children are similar in most families.

3) Technological equipment's and devices are almost the same in all Palestinian universities.

4) Palestine is under occupation which unifies the difficulties that Palestinian universities face.

Results related to the fourth question which is: Does there a relationship between the level of mathematical enlightenment and the accumulative **average in university?**

Here we used ANOVA of regression only for enlightened pre service teachers (285) as presented in Table 6 below.

Table 6: Linear regression for the grade point average

Sources of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F-Statistic	p-Value
regression	231.159	1	231.159	160.862	0.000
residuals	408.195	284	1.437		
Total	639.354	285			

Table 6 shows that there is a statistical significance at level ($\alpha = 0.05$) where F-statistic test equal 160.862 which indicates that mathematical enlightenment affects grade point average for pre services teachers.

We now present Table 7 below which is an important one, as it gives us the measures of how well our overall model fits, and how well our predictor, mathematical enlightenment, is able to predict accumulative average in university.

Table 7: measure variation of the model

Model	R	R^2	Adjusted R^2	standard error of the estimate
1	60.13%	36.15%	36.21%	1.201

Table 7 indicates that mathematical enlightenment was affected by 36.15% which means that mathematical enlightenment is not the only factor in raising the grade point average and other factors such as adaptation with university, psychological and sociological factors may affect the GPA.

6.a Suggestions and recommendations

In light of the results of study, the following recommendations are in place:

1) To reevaluate the school curricula of mathematics and find out if they are able to enlighten students.
2) To create technological educational environment in accordance with technological advancements and to allocate budgets for that.
3) To set the course of (learning of thinking and solving problems) that describes type of thinking, mathematical riddles and mathematical problems and the ways of figuring them out.
4) To emphasize on the dimensions of mathematical enlightenment as qualifications of teachers of mathematics and as a term of employment.

6.b Suggestions for future work in this area:

1) Mathematical enlightenment and its relation to different kinds of thinking.
2) Trends towards mathematical enlightenment.
3) The influence of mathematical enlightenment on the academic attainment.
4) The relationship between

mathematical enlightenment and different resources of learning.

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مستوى التنوير الرياضي لدى المعلمين ما قبل الخدمة في الضفة الغربية

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كلية للعلوم والتكنولوجيا، جامعة الخليل، فلسطين

المُلخَّص

تعتبر معرفة مستوى التنوير الرياضي لدى المعلمين قبل الخدمة هام جداً لغايات التوظيف، ففي هذه الدراسة قمنا بإعداد اختبار مصمم خصيصا للمعلمين الخدمة قبل في الضفة الغربية (فلسطين) من أجل تحديد أبعاد التنوير الرياضي ولتحديد مستوى التنوير الرياضي لديهم، وتم تطبيق أدوات الدراسة على عينة مكونة من (٤٥٢) معلما ومعلمة ما قبل الخدمة، وتم تحديد ستة أبعاد للتنوير الرياضي، وقد تبين أن مستوى التنوير لدى الإناث أكثر منه لدى الذكور، وأخيرا تم تقديم بعض التوصيات.

الكلمات المفتاحية: الرياضيات، التنوير الرياضي، فلسطين