Psychometric Characteristics of the Mathematical Fluency and Calculation Tests "MFaCTs" for Primary Stage Students in Jordan

Khalid Moh'd Khaled Abu Nahleh
Ferial Mohammad Abu Awwad

The University of Jordan

ABSTRACT

The aim of this study was to extract psychometric properties of the mathematical fluency and calculation tests for students of the primary stage (level) in the Jordanian environment. To achieve this goal, the test instructions were translated, and the mathematical writing was modified to suit the target sample. The test consists of two basic tests, including the calculation of the calculation (50) item, and the test of mathematical fluency (100) items. The study sample consisted of 3160 students - ordinary students - from grades 2 to 5, who were selected according to the random sampling method of Jordanian schools. The results of the study showed that all the values of the consistency coefficients / item statistics for the MFACTs for all grades in the standardization sample, and for the overall test score were greater than or equal to 0.699. On the other hand, mathematical fluency test was greater than or equal to 0.890. The values of the reliability coefficients ranged within the internal consistency / item statistics using the Cronbach Alpha formula to test the calculation between 0.699 for the second grade, and 0.876 for the fifth grade. Similarly, the reliability coefficients ranged from 0.890 for the second grade and 0.901 for the fifth grade. The coefficient of repeatability (Test- Retest) of the test for the total sample was 0.87 in the calculation test and 0.90 in the mathematical fluency test. The results further implied that there were no statistically significant differences between the two groups in the performance of the test according to the gender. As for the performance of the test, the average performance of the study sample steadily increased in the different grades. The correlation between the MFACTs and the mathematics student average in the previous year was 0.905 for the test and 0.486 for the mathematical fluency test.

Keywords*: MFaCTs psychometric properties, Mathematical Fluency and Calculation Tests, mathematical fluency (procedural)*

1. INTRODUCTION

Creative thinking is one of the most important educational goals of the advanced human societies, which sees the foundation of wealth and the path of its development in all educational, social, and scientific fields, along with the technology, since mathematics is the language of reason, development, and construction. As the most important human input to the teaching system, the roles and responsibilities of facilitating learning processes have changed by stimulating thinking and leadership of creative learners. This helps in directing them to overcome academic failure, motivate their learning, pay attention to the needs and aspirations of their students, engage them in decisions about their educational activities, and take into calculation the diversity in their cognitive characteristics.

The whole world is living a life that depends on the science of mathematics in everything. This implies that mathematics has become the basic material in most modern school curricula, because these abilities are of great importance, both in theoretical terms through the years of study in which the student attends, and in practice. Thus, most of the societies live by the fact that mathematics is used in the most basic needs, which is essential for most of its individuals (Catfish, 2015).

Despite the importance of mathematics in our contemporary life, however, our curricula still need to be reviewed and scrutinized. Moreover, everything that is new and useful in this aspect must be introduced, in order to improve the athletic abilities of students. Additionally, the need to raise the efficiency of curricula by looking at the standards, issued by the National Council of American Teachers of Mathematics (NCTM), is adopted at all levels of education. Through this method, it aims to achieve these standards, which is the basis of the main objectives of mathematical knowledge (NCTM, 2000). These include

- Ability to deal with symbols, different mathematical relationships, and mathematical problems.
- Ability to solve mathematical issues.
- Mathematical reasoning and the use of proofing methods.

As technology and web design have evolved, researchers have created and compiled rules and heuristics to enhance web design usability's attributes, such as navigation, accessibility, efficiency, and design. According to Sandoval (2016), these rules "give the direction to the designer to produce usable systems" (p. 88). Usability rules have been also applied in e-learning to evaluate online courses' usability. Researchers using heuristics have conducted several usability evaluations of e-learning settings. These evaluations focused on the web design aspects of the courses. However, since the purpose of e-learning is not only to provide an interface for an online learning environment, but also to support the acquisition of

knowledge through it, the traditional usability instruments are not sufficient.

Mathematics has tended to develop a general understanding of various mathematical issues and their use in practical life, as well as in solving mathematical problems through mental strategies (Mathematics, mathematics, & Dowker, 1992). This difference in the two views, concerning the range to what mathematics led to the existence of performance standards are clearly defined, as agreed by the National Council of American teachers of mathematics through the standards issued in the years (1989, 1991, 1995, 2000). This further applies to school mathematics, which had a great impact in many countries, including the Hashemite Kingdom of Jordan, in accordance with the educational trends in keeping with the development pursued by the Ministry of Education, development of mathematics curricula in various school stages in light of the international standards of mathematics, and the activation of mental aspect in this regard With regard to development, it has also emerged in the Arab world , calling for the need to reconsider the school math and re-formulate in the light of those standards (Alqtathh, 2015).

According to the importance of developing skills of creative thinking, it has become one of the most important target areas in the teaching of mathematics. Furthermore, it is seen to mathematicians as a key element in building a creative thought among students (Russel, 2000). It stresses that the document of Standards Global Mathematics is a necessity. Thus, according to Determination Standards, it must include platform mathematics for all stages of study, which represents the standards of the quality, from the events of change and reform. Within this respect, individuals are educated and capable of using Mathematics in daily life, where they are focused on their goals. These goals are important for the development of Capacity Fluencies, which includes an understanding of the concepts of fluencies, procedural knowledge, solving mathematical problems, making up students skills. This occurs under the influence of athletic communication and its relationship with fluencies, in addition to the fields of athlete content and fluencies operations (NCTM, 2000).

It has been found that many life tasks are associated with mathematics, which require performance in algorithms and arithmetic, either mentally or in writing. Some algorithms are concerned about concepts (Hiebert, 1999), and about the relationship between understanding theoretical and fluency procedures of these mathematical tasks. Utilizing these techniques, students manage to solve situations that are non-familiar, through different development measures. On the other hand, in case of resolving familiar issues, students need to have a perception that measures can be developed to solve situations. Moreover, students can attempt to solve problems through algorithm measures which are specially crafted as special tools that can help to complete task routines (Tractor, 2013; Rammona, 2015).

Concept of procedural fluency indicates that knowledge measures regarding how to use appropriate format and skill at the performance, requires flexibility and efficient accuracy. However, it is necessary to acknowledge that speed and accuracy does not indicate fluency, and that speed in not the main factor in terms of fluency (Bruch, 1989). It asserts that procedural fluency includes three thoughts, including flexible efficiency and accuracy; student does not get involved at steps or loses track easily, logical strategy; choosing strategy for the attainment of effective solution, and secondary education; benefit from results to solve the problem. As for Precision, it is adopted on several aspects, notably for solution of problems, like Flour Register. This helps in the preparation of finding out facts about the relationships of numbers. In addition to this, results can be verified from the levels of its validity. Thus, the student need to flexibly analyze selection strategy, which is relevant for these kinds of problems, and method that can be used to verify the solution (Zayat, 2009; Russell, 2000). To initiate this procedure, it is required to plan the procedure on the basis of three parts of, namely [1; Nashif, 1988):

- Understanding meaning of Processes and their one-way relationship others. For example; reverse relationship between beating and division.
- Preparation of big knowledge reference including facts about beating and combination.
- Understanding the comprehensive system for the preparation of decimal, and how numbers are structured at this system.

2. PROBLEM STATEMENT AND ITS QUESTIONS

In light of modern global directions, in relation to the field of education for mathematical learning and increase in knowledge, it is essential to reconsider development techniques that may help to submit curricula content. With the help of developmental abilities and potential mentality of students, attitude problems can be dealt to keep up with renewable global measures, to ensure education needs of interview system and requirements of the world (Jacob, 2008). Since mid-twentieth century and start of atheistic twentieth century, institutions, specialized in education, were established that were interested in progressing mathematics by using academics as an effective tool. It has been experienced that science and technology is progressing, except that there does not exist any educational satisfaction. Thus, education that teaches mathematics suffers from negative content and style. Education learning activities and evaluation output are collectible for learners at all stages of study. However, in the direction towards study, richness and luxury objectives are declared and approved in education and education-linked institutions (Catfish, 2015).

Mathematical calculations is no longer regarded merely as arithmetic or textbook-solving exercises. In fact, it extends to procedural knowledge that refers to the ability of an individual to perform mathematical actions in a mental way associated with solving the problem by employing knowledge in the new situation. Nevertheless, it has become a pattern of thinking that supports in resolving the situations we face (Carter, 1992).

Thus, these patterns are seen as an important tool in organizing and presenting ideas, and understanding the surrounding world. Due to our interest in revealing mathematical fluency and calculation, the present study specifically aims to codify the mathematical fluency test and arithmetic Mathematics Fluency and Calculation Tests (MFaCTs), on a sample of primary school students in the Hashemite Kingdom of Jordan. Therefore, this study seeks to answer the following questions:

1. What are the indications of validity for Mathematical Fluency and Calculation Tests (MFaCTs), to the primary school students in Jordan, expressing the validity of the content, criterion validity, and factorial validity?
2. What are the indications of reliability for Mathematical Fluency and Calculation Tests (MFaCTs) in primary school students in Jordan, expressed by the reliability of repetition, and the internal consistency between the items?

2.1 Objective of the study

The aim of this study is to extract the psychometric characteristics of the Mathematical Fluency and Calculation Tests (MFaCTs).

2.2 The Importance of Study

The importance of this study is due to the relation of this type of fluency to the significance of education. It provides students through the mathematical content that is provided to them during the study in the absence of the standards of mathematical accuracy and mathematical calculation in the Jordanian environment for different stages of school. Therefore, the attempt to develop and calibrate the mathematical fluency scale for this group is important. This study can contribute to the development of mathematics curricula and methods of teaching and evaluation of student achievement, and to develop mathematical fluency, mathematical thinking and problem solving in students.

The study can also help teachers identify strengths and weaknesses in students' mathematical fluency, and document student progress in educational programs or teaching plans to ensure the effectiveness of these programs. The test can also be used after its psychometric properties, which are extracted to the Jordanian environment by researchers who wish to study the relationship between athletic ability and other features such as collection, creativity or any other personality traits. It further provides an objective measuring tool to help teachers organize classes, redistribute students in groups according to their athletic abilities, and identify their strengths and weaknesses for therapeutic and creative learning.

2.3 Study terms and definitions

Performance standards of standard scores, class equivalents and percentiles.

2.3.1 Procedural Fluency (Mathematical)

It is a critical component of athletic competence. Procedural fluency is the ability to apply procedures accurately, effectively and flexibly. This helps to transfer actions to multiple problems and contents, to apply procedures based on past actions, and to organize them when there is a strategy or action more appropriate for the application than the other.

2.3.2 Mathematical Fluency and Calculation Tests

The mathematical fluency is defined as the degree to which the student obtains the mathematical fluency tests and the calculation applied in this study. This test is derived from the standardized national curriculum standards and recommendations of the National Council for Teachers of Mathematics (NCTM) and the National Research Council, which is a repeatable test that includes logical calculation skills for ages (6-11 years). It includes three equal and unambiguous models, applied individually or in groups, and aims to assess arithmetical calculations and arithmetic.

2.4 Study limits

This study is limited to the codification of the mathematical fluency and calculation tests (MFaCTs), for the primary stage in Jordanian schools from the first semester of the academic year 2016-2017. As for the variables of the study, it was limited to several variables related to the rationing of the test on the Jordanian environment, namely the sex of the student and his age. The results of the present study were determined by the procedures that will be followed in determining the study population and sample, the procedures that will follow in the application of the test after it is developed for the Jordanian environment and what it achieves from significance validity, reliability and effectiveness of items, as well as the statistical methods that will be used to answer the questions.

3. LITERATURE FRAMEWORK

Mathematics is one of the most important cognitive fields of a particular nature and methodological methods. It has been an independent subject of human knowledge. It is an intellectual subject that develops the talents of the individual and contributes to scientific and technical progress. As a result, (Storm & Storm, 2002), the knowledge-based capability in the process of creating ideas and achieve high levels of quality, is necessary to implement activities efficiently and effectively. Creativity is thus become a remarkable human phenomenon remarkable, which has become one of the important areas of concern to researchers in psychology and education science in general (James, 2008; Nashif, 1988). It is the developed nations that seek to find and innovate innovators in every field of knowledge, to guide them and to facilitate their creative work, and to give them an interest and encouragement that allows them to leap the horizons of invention, discovery and progress (Al-Sharqawi, 2006).

Creativity is an out-of-the-ordinary thinking in the methods of research and analysis, a mental ability that drives the individual to seek out and find everything new (Jarrar, 2013). It is further regarded as a complex mental activity, directed by

a strong desire to seek solutions or arrive at ideas and results that were not known in advance [1]. The process of creative thinking is not a random process; it is a process that needs training and practice, bringing the individual to new and useful results. The aim of thinking and training is to run the mind more quickly to give information faster than it is (Rammona, 2015).

3.1 Elements of Creative Thinking

Creative thinking consists of three main elements (Al- Zayyat, 2009; Yusuf, 2011; Al-Atoum, 2010; Al-Aseer, 2000):

1. **Originality**

Excellence in thinking and the ability to direct access to the fashionable ideas.

2. **Fluency**

The ability to produce verbal ideas. However, the performance of the problem of its end is unclear and open, which are of four types:

- Verbal Fluency: speed of thinking of an individual, in giving words and generation in a new style.
- Ideas Fluency: large number of ideas in a specific time.
- Shapes Fluency: introducing certain additions to certain forms to create real drawings.
- Procedural Fluency: ability to apply certain procedures accurately, effectively and flexibly, a critical component of athletic competence (Notes from Arab and foreign studies that they focus on this labeled fluency rather than the so-called mathematical fluency).

3. **Flexibility**

Change in the mental state of the individual to change the situation. It has two features:

- Automatic Flexibility: giving a number of different ideas that relate to a specific situation.
- Adaptive Flexibility: solving the problem or situation in light of the feedback that comes from that position.

3.2 Previous studies

Christian, Schlesinger and Varn (2008), conducted a study that aimed at verifying the relationship between the cognitive ability and mathematical fluency of first and second graders at the school of Nlengo in the city of Nuremberg, located in northern Bavaria, Germany. The sample consisted of 38 children (22 females, 17 males, 17 first grade and 22 second graders) and the Wood Cook Johnson test was applied to the target population. The results showed that pre-operative children are less rapid than children in physical operations, but have achieved comparable levels of accuracy when mathematical matters are completed and completed.

A study by Miller, Skner, Jepi, Miller, Skinner, Gibby, Galiyon & Allen (2011), aimed at assessing the fluency of the fact of collection using the problem solving procedure in writing for second grade students. The sample consisted of 19 students (10 females and 9 males) in the southern countryside of the United States of America. The results showed that fluency increased over time in students, and the results showed that these increases (in average student scores per minute) were circulated to the set of questions related to mosquitoes.

Nezoloman (2013) carried a study in Nigeria that aimed at revealing the relationship between athletic ability and achievement in mathematics among high school students in Bayelsa State. To achieve the objectives of the study and data collection, Mental Ability Tests (MATs) were used, along with a test in secondary fluencies achievement. The study sample consisted of 121 students, who were rural high schools, and 141 students, who were from urban high schools. The results of the study showed a statistically significant positive relationship between athletic ability and achievement in mathematics. The results also indicated that athletic ability has a significant effect on achievement in mathematics.

Wismuth Warall (2015) also conducted a study in the United States of America to reveal the mathematical ability of students, and how to improve and improve their perception of mathematics. In order to achieve the objectives of the study and data collection, the test of mathematical thinking skills and the ability of fluencies was used. The study sample consisted of 62 students from the University of Florida. The results of the study showed an improvement in the athletic abilities of the students after they joined the cycle of mathematical thinking, where the low level of anxiety, and increased self-confidence, and the results indicated that there were no significant differences in the perceptions of students towards mathematics before and after the cycle of thinking.

Qatasha (2015) conducted a study aimed at investigating the effect of a procedural strategy based on procedural fluency in the development of mathematical thinking, conceptual comprehension and attitudes towards mathematics. The sample consisted of 108 students of the fourth grade students in the schools of the Directorate of Basira in the province of Tafila. The sample was divided into two groups equally. An experiment was taught using a strategy based on procedural fluency, and a control was taught in the usual way. The study concluded that there are statistically significant differences in mathematical thinking, conceptual comprehension, and attitudes towards mathematics between the two groups and for the benefit of the experimental group.

4. METHODOLOGY

4.1 Study Population

The study community consists of all students in the primary stage of the Hashemite Kingdom of Jordan Schools, estimating to 1513653. According to the statistics of the Jordanian Ministry of Education, students were distributed according to sex as follows, with 768265 males and 745388 females.

4.2 Standardization Sample

The study sample consisted of 3160 students, were chosen randomly. Stratified ratios were setup in the regions, and then stratified random sample of rationing was done to choose members of the study population of both the gender,

students of primary stage (first grade to the primary fifth grade) in Jordan during the 2016/2017 school year .Table shows the distribution of a sample of rationing individuals by grade and gender.

Table (1): Distribution of the subjects of the standardization sample for the tests of mathematical fluency and calculation according to the main variables of study (gender, grade level)

Grade	**Males**	**Females**	**Total**
Second primary	680	670	1350
Third primary	300	300	600
Fourth primary	310	300	610
Fifth primary	297	303	600
Total	1587	1573	3160

4.3 Tool of Study

The study tool consisted of Mathematical Fluency and Calculation tests. Mathematics Fluency and Calculation Tests (MFACTs), which was described in the second chapter of this study. In this study, the first level tests were applied to the second grade students, and the second level tests on the third, fourth and fifth grade students, after it was adapted and modified to suit the Jordanian environment. The following is a definition of the American image of the test.

4.4 Data Collection

The application of the study and collection of data on society, has been shown to have a smooth performance of subjects on the test. Few questions and inquiries, with the exception of some observations regarding items located above their level, was confirmed to them at the beginning of the test session. This involved that they pass on all items and answer questions that they know within the specified time. This helped to solve the examples together in the first answer sheet, based on the clarity of the way to answer the test questions in the second face of the paper. The time was also set in proportion to the length of the test and the sample response, through the duration of the sample reconnaissance in the answer to the test. It was then calculated to find the average time between the first student to test another student delivery, ranging performance on the test of time 8 minutes and 30 minutes, and an average of 19 minutes to test the calculation. Similarly, the test between 3 minutes, 5 minutes, and an average of 4 minutes was examined to test the fluency of the grades of the four school, which is located within the time range specified in the original image of the tests. The process applied tests of mathematical fluency and calculation during the first semester of the academic year (2016/2017) on a sample of rationing, which amounted to 3160 male and female students, having taken official approvals from the concerned authorities.

4.5 Statistical Treatment

After collecting data through testing on a sample rationing application, data will be inserted as an input into a computer software program using the Statistical Package for Social Sciences (SPSS21). For the purposes of achieving the objectives of the present study, it will be used for the following statistical procedures. To answer the first question and verify the indications of validity:

- ✓ Discrimination Validity.
- ✓ Dimensions Correlations.
- ✓ Criterion- Related validity.

To answer the second question and verify the indications of reliability:

- Pearson correlation to check repetition reliability in the twice of application.
- Cronbach Alpha Equation to check for internal consistency.

To answer the third question:

- The provision of three types of scores; standard scores, percentiles, class equivalents, so that these can be used flexibly in scores interpretation of performance on the test results.

5. RESULTS AND DISCUSSION

Validity indications for the Jordanian image for Mathematical Fluency and Calculation tests.

(1) The difference in performance on the test according to the variable gender:

Mathematical fluency and calculation tests assume that the original image of the lack of a statistically significant performance is differentiated by depending on the variable gender. To verify this assumption, means and standard deviations on the tests, depending on the gender of the student using a sample of standardization data, was extracted as per test results (T-Test). For independent samples, differences between the scores mean on the tests for both males and females were examined. The following tables show these results:

Table (2): Test results (T-Test) for Independent samples to denote the differences between the means on the mathematical fluency and calculation tests for the primary second grade according to gender variable (male / female).

Test areas	**Gender**	**Number**	**Mean**	**Std.**	**T Val.**	**Df**	**Sig, Value**
Calculation	Males	680	.211	.069	-.240	1348	.809
	Females	670	.212	.083			
Mathematical fluency	Males	680	.502	.166	.048	1348	.962
	Females	670	.502	.153			

Notes from the table (2) imply that the value of (T) denote differences between the study sample between the male and female members of the performance on the calculation test, amounting to -.240. On the other hand, the value of (T) was used to test the mathematical fluency, which amounted to .048 respectively for the primary second grade, which is not statistically significant at the level of $\alpha = 0.05$, which indicates that there is no statistically significant differences between the genders in performance on mathematical fluency and calculation, it shows that the performance means of both genders are closed.

Table (3): Test results (T-Test) Independent samples to denote the differences between the means on the mathematical fluency and calculation tests for the primary third grade according to gender variable (male / female)

Test areas	Gender	Number	Mean	Std.	T Val.	Df	Sig, Value
Calculation	Males	300	.315	.093	.626	598	.532
	Females	300	.305	.114			
Mathem-atical fluency	Males	300	.536	.181	.599	598	.549
	Females	300	.508	.144			

Notes from the table 3 asserts that the value of (T) denote differences between the study sample, that is, between the male and female members. Their performance on calculation test amounted to 0.626, value of (T) to test mathematical fluency is amounted to 0.599, respectively. The primary third grade is not statistically significant at the level of $\alpha = 0.05$, which indicates that there is no statistically significant gender differences in performance on the mathematical fluency test and calculation. It shows that the performance means of both genders are closed.

The table (4): Test results (T-Test) Independent samples to denote the differences between the means on the mathematical fluency and calculation tests for primary fourth grade according to gender variable (male / female)

Test areas	Gender	Number	Mean	Std	T Value	Df	Sig, Value
Calcula-Tion	Males	310	.474	.165	.310	608	.757
	Female	300	.471	.153			
Mathem atical Fluency	Males	310	.516	.131	-.437	608	.662
	Female	300	.541	.151			

Notes from the table 4 stresses that the value of (T) denote differences between the study samples, that is, between the male and female members. Their performance on the test calculation amounted to 0.310, and the value of (T) to test the mathematical fluency is amounted to -.437, respectively. Primary fourth grade is not statistically significant at the level of $\alpha = 0.05$, which indicates that there is no statistically significant gender differences in performance on the test mathematical fluency and calculation. It shows that the performance means of both genders are closed.

Table 5: Test results (T-Test) Independent samples to denote the differences between the means on the mathematical fluency and calculation tests for the primary fifth grade according to gender variable (male / female)

Test areas	Gender	Number	Mean	Std	T Value	Df	Sig, Value
Calcula-Tion	Male	297	.475	.159	-1.274	598	.203
	Female	303	.491	.150			
Mathem -atical Fluency	Male	297	.565	.160	.708	598	.479
	Female	303	.557	.113			

Notes from the table 5 identify that the value of (T) denote differences between the study sample, that is, between the male and female members. Their calculation performance testing amounted to -1.274, and the value of (T) to test the mathematical fluency is amounted of 0.708, respectively. The primary fifth grade is not statistically significant at the level of $\alpha = 0.05$, which indicates that there is no statistically significant gender differences in performance on the test mathematical fluency and calculation. It shows that the performance means of both genders are closed.

Table (6): Test results (T-Test) for independent samples to test mathematical fluency and calculation of the sample according to the variable sex college (male / female)

Test areas	Gender	Number	Mean	Std	T Value	Df	Sig, Value
calculation	Males	1587	.312	.170	0. 082	3158	.935
	Females	1573	.381	.177			
Mathem-atical fluency	Males	1587	.525	.164	1.067	3158	.286
	Females	1573	.519	.145			

Notes from the table 6 imply that both the value of (T) to test the calculation is amounted to 0.082, and the value of (T) to test the mathematical fluency is amounted to 1.067, for the total sample, respectively. However, it is not statistically significant at the level of $\alpha = 0.05$, depending on the gender variable. It indicates that there is no statistically significant differences between the genders in performance differences on test mathematical fluency and calculation. Thus, it shows that the mean of both genders are close to a large extent. This corresponds with the results of discrimination validity to indicate the gender test in its original form, which pointed to the lack of differences in performance between the genders on the tests.

(2) Difference in performance on the test according to the class variable:

Mathematical Fluency Test:

To find out the differences in the performance of students on the mathematical fluency test, means and standard deviations for the performance of students across school levels in different grades have been calculated. Table 7 shows these results.

Table (7): Means and standard deviations of the scores on the test sample mathematical fluency in different grades

Grade	Number	Mean	Standard Deviation
The second	1350	0.500	0.159
The third	600	0.521	0.164
the fourth	610	.528	.141
Fifth	600	0.560	0.138
The total sample	3160	0.521	0.152

From the table 7, it can be seen that the performance means of the study sample steadily increases with the class, where the performance mean of participants in the second grade amounted to 0.500. Its standard deviation (0.159), which is lower than the means of all the other grades. On the other hand, the performance mean of students in the fifth grade amounted to 0.560, with its standard deviation (0.138) higher than the means of all other grades.

By tracking the means across the grades toward larger grades, we find that the means take a slight increase in some grades, while it takes a large increase in other grades, in some cases. To know whether these differences and variations in the means are statistically significant according to difference between grades, one-way analysis of variance (One way-ANOVA) had been done. Table 8 shows these results.

Table (8): Results of variance to test the mathematical fluency to examine the significance of performance on the test according to the classroom variable analysis

Sources of variation	Sum of squares	DF	Mean of squares	Value (P)	Sig level
Between groups	1.481	3	.494	20.989	* .000
Within groups	74.249	3156	.024		
Total	75.730	3159			

* Statistically significant at the level of $\alpha = 0.05$

From table 8, it can be seen that the value of 'P', amounting to 20.989, is statistically significant at the level of the value of $\alpha = 0.05$. This indicates that there is a statistically significant difference between the performance means of students on the test of mathematical fluency in different grade. To find out the direction of the differences between the means of the grade, Scheffe Post Hoc test is used. Table (9) shows the results of multiple comparisons using the Schiffe test.

Table (9): Test results of Scheffe test for multiple comparisons of the performance of students to test mathematical fluency across different grades

Grade	Grades Compared	Differences between Means	Standard error	Sig level
The second	**the third**	-.02009	0.00753	.068
	the fourth	-.02617 *	0.00748	.007
	Fifth	-.05912 *	0.00753	.000
the third	**The second**	0.02009	0.00753	.068
	the fourth	-.00608	0.00882	.924
	Fifth	-.03903 *	0.00886	.000
the fourth	**The second**	0.02617 *	0.00748	.007
	the third	0.00608	0.00882	.924
	Fifth	-.03295 *	0.00882	.003
Fifth Grade	**The second**	0.05912 *	0.00753	.000
	the third	0.03903 *	0.00886	.000
	the fourth	0.03295 *	0.00882	.003

Notes from the table 9 indicates that the performance means of students on the test mathematical fluency increase across the higher grades. These differences and variations in the means for the fifth grade demonstrates that the performance is better in higher grades. It is further noted that the differences in means between the third and fourth grade is not significant, and that the mean for fourth grade was slightly higher than the third grade. The extent of the increase in the performance means on the mathematical fluency test is illustrated by the graph, as represented in Figure 1.

Figure (1): Graphic representation lines for the performance means of students on the mathematical fluency test according to the grade variable.

Notes from Figure 1 indicates that the performance mean of students on the test of mathematical fluency increases steadily higher in the grade. This supports the basic assumption that the higher the level of grade, better in the performance of students.

Calculation Test:

To find out the differences in the performance of students on calculation test, means and standard deviations for the performance of students across school levels in different grades have been calculated, which is indicated by Table 10.

Table (10): Means and Standard deviations for the participants' scores on the calculation test according to grade difference

Grade	Number	Mean	Standard Deviation
The Second	1350	.212	0.237
The Third	600	.312	0.244
The Fourth	610	.472	0.182
The Fifth	600	.482	0.182
The total sample	3160	.381	0.172

From the table 10, it can be seen that the performance means of the study sample on the test calculation increases steadily in higher levels of grade, where the performance mean of participants in the second grade amounted to 0.212. additionally, its standard deviation amounted to 0.237, which is lower than the means of all the other grades. The performance mean of students in the fifth grade estimated to .482, with a standard deviation of 0.182, which is higher than the means of all other grades. By tracking the means across the grades toward larger grades, it has been found that the means take a slight increase in some grades, while it takes a large increase in other grades. To know whether these differences and variations in the means are statistically significant according to difference between grades, one-way analysis of variance (One way-ANOVA) had been done. Table 11 shows these results.

Table (11): Results of variance to test the calculation to examine the significance of performance on the test according to the gender variable analysis

Sources of variation	Sum of squares	DF	Mean of squares	Value (P)	Sig level
Between groups	13.359	3	4.453	793.167	* .000
Within groups	17.961	3156	.006		
Total	31.320	3159			

* Statistically significant at the level of α = 0.05

From the table 11, it can be seen that the value of 'P' amounted to 793.167, which is statistically significant at the level of the value of α = 0.05. It implies that there is a statistically significant difference between the performance means of students on the mathematical fluency test according to grade difference. To find out the direction of the differences between the grade means, Schffe Post Hoc test is used. Table 12 shows the results of multiple comparisons using the Schiffe test.

Table (12): Test results of Scheffe test for multiple comparisons of the performance of students to test calculation across different grades

Grade	Grades Compared	Differences between means	Standard error	Sig level
The second	**the third**	-.10033 *	0.01234	.000
	the fourth	-.26072 *	0.01184	.000
	Fifth	-.27062 *	0.01126	.000
The Third	**The second**	0.10033 *	0.01234	.000
	the fourth	-.16038 *	0.01215	.000
	Fifth	-.17028 *	0.01158	.000
The Fourth	**The second**	0.26072 *	0.01184	.000
	the third	0.16038 *	0.01215	.000
	Fifth	-.00990	0.01104	.849
Fifth	**The second**	0.27062 *	0.01126	.000
	the third	0.17028 *	0.01158	.000
	the fourth	0.00990	0.01104	.849

Notes from the table 12 indicates that the performance means of students on the calculation test increases at higher grades. The differences and variations in the means for the fifth grade in all comparisons, demonstrates that the performance increases at higher grades. It is further noted that the differences in means between the fifth and fourth grade is not significant, and that the mean for fifth grade was slightly higher than the fourth grade. The extent of the increase in the performance means on the mathematical fluency test was illustrated by the graph, which is represented in Figure 2.

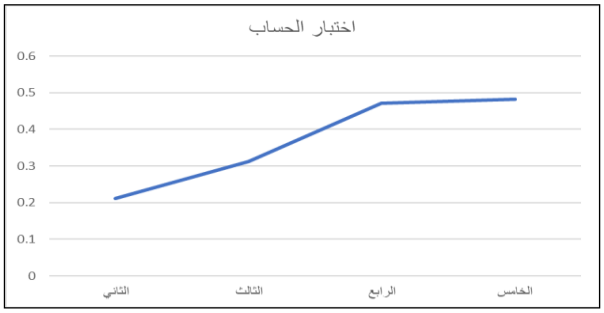

Figure (2) graphic representation lines for the performance mean of students on calculation test according to grade variable.

Notes from Figure 2 implies that the performance mean of students on the calculation test increases steadily across higher levels of grade. This supports the basic assumption that students from higher classes showed better performance.

Criterion- Related validity:

It has been verified in terms of criterion- related validity for grades, which have been obtained through tests (mathematical fluency and calculation). Using the test average of students, in mathematics from the previous year 2015/2016, Table 13 shows these coefficients.

Table (13): Criterion- Related validity coefficients between the scores of participants to test (mathematical fluency and calculation) with the student average in mathematics in the previous year by grade

Grade	Criterion * Calculation Test	Criterion * Math Fluency Test
The second	.858 0	.509 0
The third	.927 0	.499 0
The fourth	.903 0	.434 0
The Fifth	.932 0	.504 0
Overall	.905 0	.486 0

Notes from the table 13 indicates that under the light of correlation coefficients on calculation test values and the average of students in the previous year, the different grades ranged from .858 0 and .932 a high correlation value indicate the calculation tests own criterion-related validity, while the correlation coefficients values between the scores on the mathematical fluency test and the average of students in the previous year ranged between .434 0 and .509 0 for the different grades. This indicates that the test owns an acceptable criterion validity.

It is possible to derive psychometric validity significant for mathematical fluency and calculation in several ways. Consistent with the methods that were in the American image of the tests, reliable base provides that these tests may be prepared according to the readings that have been reached. Thus, they were prepared only to measure mathematical fluency and calculation. Therefore validity testing procedures have adopted the merits to reach the validity significant, to rid the test of any operations of mind. The aim is to intervene into mathematical fluency for students and their calculation.

The procedures have been adhered to, in order to reach indications of reliable validity. This has been carried out through preliminary procedures by testing students' understanding of the questions, without the intervention of the examiner or applied test. This was further conducted within the researcher's purity testing and specialization in the target, which was prepared for him. This has been the objective of the researcher to focus on student, to answer all the questions and pass them within the specified time, even if the items fall outside the framework of their abilities and skills.

On the other hand, the results showed that there is no difference between male and female students on their performance in mathematics, in terms of levels of performance of mathematics. Thus, it was found that there are no differences between males and females. These results agreed with the original test in the American image results, and was given to the fact that the differences in mathematical fluency and calculation may not be essential at this stage. Studies further show that there are differences in performance; because student learning and performance at this stage is dependent on the ability not on effort. This explains the justification for automatic promotion, which demonstrates the lack of sensitivity of this test to detect the performance of students. This problem is not related to the test or its results, but problem may be of developmental nature, as the male and female children pass through similar circumstances and experiences. Within this respect, similar educational opportunities may not contribute to show differences or variations in their performance, especially in the upper stages. The studies and the results showed tests of mathematical fluency and calculation of discriminatory ability among students, according to their grades. This shows the ability of test to distinguish between the students whenever ascended in the grade. Thus, it can be said that the sensitivity of the items of the test and the test as a whole provide the ability of the test to distinguish between levels of grade, associated with it, to examine the differences between students in different grade levels as grades (Second, Third, Fourth, and Fifth).

Content validity is accepted by reviewing the availability of previous literature, and the judgments and opinions of rulers. Moreover, it may provide a representation of the test items, used to measure the test content. When these representations were linked to students' marks in the test with grades achievement in the previous year, the criterion- related validity provided a high correlation coefficients. This was regarded as statistically significant, especially in the calculation test. However, a slight decrease in the fluency test demonstrates that the Jordanian students, who were the sample members of the study, were more related to calculations in their classrooms compared to mathematical fluency. Additionally, it has been shown to guide the curriculum to the processes of thinking mechanism, which has not been achieved in the like fluency.

With regard to the reliability significant for mathematical fluency and calculation tests of the primary school students in Jordan

The results showed all values of reliability coefficients through internal consistency/ item statistics, to mathematical fluency and calculation tests for all grades in a standardization sample. The total sample to the calculation test was more than or equal to 0.699, while mathematical fluency was greater than or equal to 0.890. The values of reliability coefficients ranged in internal consistency/item- statistic using Cronbach's alpha equation to calculation test between the 0.699 for the primary second grade, 0.876 for primary fifth grade. Reliability coefficients ranged from values through internal consistency/item- statistics using Cronbach's alpha equation to test the mathematical fluency between 0.890 of second grade and 0.960 for third grade.

The results showed that the values of reliability coefficients by using repetition way for all grades in a sample of standardization. The total sample to the calculation test was greater than or equal to 0.71, while the mathematical fluency was greater than or equal to 0.90. The reliability coefficients ranged from values to the calculation test between the second

grade value of 0.71 and primary fifth grade value of 0.85. Similarly, reliability coefficients values for test of mathematical fluency ranged between 0.90 for second and fourth grade, while it ranged to 0.92 for primary fifth grade.

The method of repetition reliability and the method of internal consistency has been significant, which demonstrates that the reliability of the students and their positions are relative of performance. On the other hand, performance with tests items in the both times of application demonstrates that the test indication of reliability in the detection of performance, sites for students to mathematics fluency and calculation tests when they are comparing them with their colleagues in different grades. These results were complied with the results of a study by Faqeeh (2016), which showed that the performance of students kept at the same level after the repetition. In order to achieve the goals of standardization, it had been adopted assuming that the students surveyed tested mathematical fluency and calculation tests. This is considered as the target population representatives and thus, reaching implications acceptable and meaningful reliability, has achieved this goal after the extraction of items reliability significant after considering the gender of the student.

It provided the indications of reliability to accept standardization of this test as presented by both Crocker and Olgina (2012). Jordanian students' performance did not differ in grades from the second and even the primary fifth on mathematical fluency and calculation test for other students in different cultures and countries to reach indications of acceptable reliability, did not make for the researcher to assume that Jordanian students differ in the extent of their keeping in performance and continuity with repetition reliability. Furthermore, it helped to link their performance with a total score measured through internal consistency/. This can provide objectivity and reliability of the results that have been reached on the Jordanian environment, which can contribute to increased confidence. It can then be accessed, all the while, encouraging workers in this field to adopt applying this tool in Jordanian schools.

6. RECOMMENDATIONS

The researcher has addressed the subject of standards of building e-learning systems, to find a definition of e-learning standards, through the explanations related to e-learning, standards of building and evaluating the educational program and the followed steps in this field. He is hoping that this research will contribute in enhancing the scientific addressing of this subject to reach the application of comprehensive quality standards in this field.

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