

## **The effectiveness of Using Educational Software in Developing Some Concepts among First Grade Student in Jordan**

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### **Abstract**

This study aimed to address Collins mathematical curriculum for the first basic grade in shadow of COVID-19 Pandemic, and the effect of using the educational software in facilitating and implementing the curriculum for the first basic grade students in Jordan. Study sample consisted of three branches from the basic first grade in Al-Hussein Ben Talal University School, their number reached (70) student, and the study sample was classified into two groups: the experimental group which consisted of (35) male and female students, and the control group which consisted of (35) male and female students. Results of the study showed the presence of difference with statistical significance at significance level ( $\alpha \leq 0.05$ ) between means of the two groups' scores on post-test of the mathematical concept and in favor of the experimental group, which studied the mathematical concepts according to Collins curriculum using the educational software. Also, the results showed the absence of difference at significance level ( $\alpha \geq 0.05$ ) of effect of gender variable in making the differences in degree of the sub-dimensions and the total degree at the post-test degree to test the mathematical concepts of Collins developmental mathematical curriculum. The study recommended the necessity of using the educational software in teaching the children, also

holding the training courses for the female teachers on turning the educational subject to educational software and use them in the classroom.

**Keywords:** *Educational software, Mathematical concept, First grade.*

## **Introduction**

With the increasing investment in education and the challenges it is facing in the 21<sup>st</sup> century, the interest has increased in selecting the teaching strategies, which care about the learner and the teacher, and in accordance with their new roles, in shadow of this developmental and cognitive development. So, the view has developed starting from the new teaching strategies, used by the teacher which is based on self-learning (Al-Wraikat and Al-Shaw'a, 2016).

In Jordan, at the beginning of this scholastic year, the decision has been made about the textbooks according to a curriculum called Collins from the first till the fourth basic grades, after the general perception about the need for changing the curriculum and improving the teaching methods after the bad results of the kingdom's students on the international tests (TIMSS, PISA) (Arab Organization for Education, Culture and Science 2014), and recommendation from the National Council for Developing the Human Resources in the Kingdom that the current curricula are out of date. The rank of Jordan in education has dropped to the fifth at the Arabic level after being the first and the Bank ranked Jordan at the (52) rank in education poverty ( Ministry of Education,2018).

Because of the cognitive development and its reflection on the students and on the teaching methods, it has become necessary to use the new and modern strategies based on best design principles helping in facilitating the delivery of information, support the interaction and communication between the teacher and his students (Abu-Zaina, 2010).On the other side, COVID-19 Pandemic has motivated the innovation and search for methods and strategies inside the education sector to develop solutions regarding the distant teaching with the focus on the scientific curricula like mathematics and sciences to support continuity of the education, (Ministry of Education ,2020).

## **Statement of the Problem**

Jordanian curricula twenty years ago were prominent curricula among the Arab countries curricula, and many of the countries have benefited from the Jordanian experiences

to develop their curricula. The chaos of teaching policies and our dependence on omitting difficult topics focusing on the upper mental processes year after year have led in Jordan to aggregation unable to innovate, adjust and solve the problems (Al-Na'was, 2010).

When asking the teachers about Collins' curricula, it became clear that there is confusion between the teachers that has led to the creation of educational crisis, including difficulty in delivering same topics to the first grade students in mathematics.

### **The Problem of this Study is presented in the Three Questions**

- 1- What is the effectiveness of educational software in acquiring the mathematical concepts in Collins developmental mathematics curricula for the first basic grade children in Jordan?
- 2- Are there differences with statistical significance at significance level ( $\alpha \leq 0.05$ ) between the mean of the students' performance on the mathematical concepts dimensions as a whole (Balancing Act, Arithmetic, Integer, Unite Rate, Number Line, Area Model Decimals, and Quality)?
- 3- Are there differences with statistical significance at significance level ( $\alpha \leq 0.05$ ) between the means of the first basic grade students on the dimensions of the mathematical concepts attribute to gender variable?

### **Hypothesis of the Study**

The study seeks to test the following hypothesis:

- H01: There are no differences with statistical significance at significance level ( $\alpha \leq 0.05$ ) in the means at the total degree and the sub-dimensions degree (Balancing Act, Arithmetic, Integers, Unite Rate, Number Line, Area Model Decimals and Equality) to test the post mathematical concepts between the experimental group individuals who studied by using the educational software compared to their peers who learned by the normal way.
- H02: There are no differences with statistical significance at significance level ( $\alpha \leq 0.05$ ) between means of the grades at the first basic grade students on the degree of the sub-dimensions to test the post mathematical concepts attribute to gender variable.

## **The Study Significance**

- 1- Importance of this present study stems from introducing modern strategic solutions to implement Collins developmental mathematical curriculum in anxiety way for the first basic grade children in Jordan, helping them to learn in an easy and effective way through depending on educational software to facilitate the mathematical concepts mentioned in the curricula.
- 2- The age stage addressed by the present study is considered the basic stage at which the child starts to study the preliminary mathematical concepts.
- 3- Information might benefit the female teachers who are willing to apply new strategies like the electronic learning through the use of the educational software to increase the learning effectiveness and children love and derive to learn, increasing their acceptance of the new concepts and information in a way to their cognitive development.

## **Theoretical Frame**

The process of developing the curricula, which took place in Jordan targeted mathematics and sciences topics for the first and fourth grades, came as a result of the international exams which showed great regression in the scientific subjects achievement among the students in Jordan. Ministry of education has introduced a tender for developing the curricula, Collins Harper has won the tender and build and designed this curricula (Badawi, 2012).

## **Advantages of Collin's Curricula**

- 1- It focuses on the modern education strategies considering the differences in the children's capabilities and building knowledge in a gradual way preparing for the next grades.
- 2- Collin's Curricula was diversified educational method to implant the concepts and linking the science with the practical life and the child's environment, characterized by modernization and rich content.
- 3- It is the first time that the Arabic numbers were used instead of the Indian numbers used in the previous books.
- 4- Collin's Curricula was built according to the structural cognitive theory.

## **Mathematical Concepts**

Mathematical concepts have great importance since they are the base for the mathematical knowledge. Although many educators agree that teaching the concepts is one of the most difficult stages in teaching. These should be relevant teaching methods to be used to understand the other concepts (National Council of Teachers of Mathematics, 2000). One of the main aims of teaching the mathematical concepts to the children is to develop the child's imagination and creative capabilities through developing the observation power and training on problem solving (Abrahamson, 2006). Another aim is to develop the engineering sense, and to increase inquiry about the modern inventions (Abu Zaina, 2010).

## **Role of the Female Teacher in Motivating the Acquisition of Pre-School Children of the Mathematical Concepts**

Usiskin, (2001) and Toh(2007) see that the mathematical teacher to teach mathematics in a better way and delivers the mathematical concepts to the teachers should possess the knowledge about the mathematical content and concepts, and his ability to link between the ideas to help in providing innovative solutions and untraditional for the problems in which there are many innovation.

The teacher should acquire principles to make the mathematical concepts lovely, exciting and attracting the children's attention through (Randal et al., 2000):

- 1- Helping the child to feel self-confident.
- 2- Encouraging the child to face the failure in a positive way, making failure a mean for new learning.
- 3- Encouraging the child to use positive enhancement skills, and interest in the child's attempts not in the results.
- 4- Refraining from the use of competitive activities between the children and the focus on cooperative activities.

## **Related Studies**

Al-Khateeb (2018) study aimed to find out the effect of using the educational drama in acquiring the mathematical and scientific concepts among the kindergarten children, the study reached the superiority of the experimental group on the control group in test of the mathematical and scientific concepts. Also, results of the study revealed the absence of

differences with statistical significance attribute to gender in achieving the mathematical and scientific concepts between the males and females children in the experimental group.

Ghanbari & Shariatmadari(2011) study aimed to investigate the effect of the educational groups on learning the mathematical concepts at the basic stage. Study sample consisted of (50) students from the first grade. Results showed the positive effect of the educational games on learning the mathematical concepts in favor of the experimental group. Swearing (2011) study aimed at investigating the effect of the electronic games on the achievement of the ninth grade students and on their performance in mathematics, and no differences between the experimental group and the control group attribute to gender variable.

Nelson (2009) study aimed at finding out the effect of acquiring the basic mathematical facts fluently through using the computerized mathematical games. Results showed that using the computerized mathematical games contribute to acquire the mathematical concepts in an effective way.

Kappers (2009) conducted a study aimed to find out the effect of the educational video games on the students achievement in mathematics for the 7th grade. Results revealed the presence of clear difference in the achievement degrees in mathematics subject in favor of the experimental group. Also, the results showed the differences between the two genders, the females are less willing to use the educational video games, especially regarding time and feeling comfort with the game.

## **The study Method**

### ***Study Sample***

Study sample consisted of first grade children in Al-Hussein Ben Talal University School pertains to Directorate of Education in Ma'an Governorate. The school has been purposely selected because of the researcher's work conditions. The first grade consisted of three branches, then selecting the experimental and control group after controlling the teacher's factor. The experimental group studied by using the educational software while the control group studied by the traditional way. The sample individuals were selected randomly from the study population and (70) individuals to represent the study sample. Experimental group consisted of (35) students and the control group consisted of (35) students, the females formed (52.9%) while the males forward (47.1%). Table (1) clarifies the demographic characteristics of the study sample individuals regarding the group and gender.

**Table 1:** Demographic Variables of the Study Sample (N=70)

Variable	Category	Frequency	Percentage
The Group	Experimental	35	50%
	Control	35	50%
Gender	Male	33	47.1%
	Female	37	52.9%

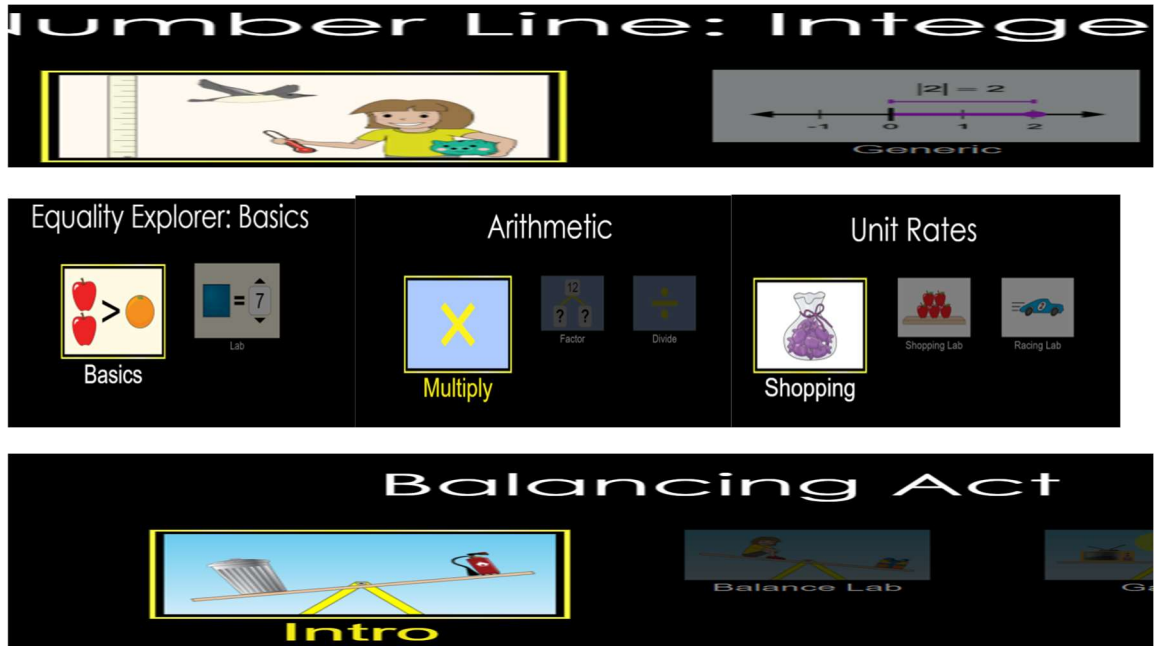
### ***Controlling the Variables influencing on the Study***

Variables that might influence efficiency of the independent variable were controlled regarding age, since the researcher has reviewed the children's records to assert their ages equivalent which ranged between (6-7) years, and from the other side, the groups equivalence regarding social and economic level, since the researcher has selected the sample individuals from Ma'an Governorate, this population is characterized by proximity in the cultural, economic and social levels, in addition to controlling content's variables and number of activities in order for the children in the experimental and the control group to study the same content. The application has started in the first scholastic term year 2019-2020.

### ***Instruments of the Study***

1. Educational software: to achieve the primary of the study, the researcher used the educational software from (PhET) site, since they introduce enjoyable, free, and interactive simulation for sciences and mathematics at different stages of study. This site depends on designing the software on simulation processes in Java or Flash or HTML languages, can be operated through the internet or download them on the personal computer device. One of the most important features of this electronic site is that all the simulation processes are open free all teachers and students. There has been an agreement to select seven mathematical concepts represent in (Balancing Act, Arithmetic, Integers, Unite Rate, Number Line, Area Model Decimals, and Equality). Here, s a screenshot of yhe interactive simulation:

**Shape1. Interactive Simulations**



2. Testing the mathematical concepts: objective of the test is to measure the children acquisition of the mathematical concepts mentioned in Collins curricula through the female teachers and educational supervisors' recommendations.

The nature of the test was relevant photographed cards to the mathematical concepts and to the children at this stage. In light of that, vocabularies were wanted for the test consisted of (21) photographed card in a simple and enjoyable method to be understood by the first grade students. The researcher determined one degree for the right answer by the child on each concept and zero for the wrong answer the final degree of the test will be (21) degree, the students were subjected to the educational software in the computer's lab for the children to use it individually, every two days on skill, and the child sees the software describes the mathematical concept in its complete form.

***Pilot Study***

The test has been applied to a pioneering sample reached (20) male and female child from the first grade out of the sample individuals who previously studied these concepts. The time of the test was calculated for the first child who ended the test answer which is (35) minutes, and the time spent by the last child to finish the test answer which is (45) minutes, then mean time was calculated, time of the test  $35+45/2=40$  minutes.



### ***Validity of the Two Instruments***

The test and the interactive software were introduced to a group of specialist arbiters in kindergartens and in education technology, in curricula and teaching methods, their number was (15) arbiters, to present their opinions about extent of validity of the test and the interactive software in facilitating the mathematical concepts mentioned in Collins method, and to measure the mathematical concepts and their relevance for each question to measure the concept appropriate linguistic wording based on the arbiters' opinions, the researcher made the required modifications.

### ***Reliability of the Two Instruments***

Reliability of the mathematical concepts test was calculated on the same pioneering sample which consisted of (20) male and female child from the first grade, using Cronpach's Alpha coefficient, results showed that the reliability coefficient (0.89) which is a high value then calculating reliability coefficient of the educational software, results showed that the reliability coefficient was (083) which is a high value indicating that the scale and the software have high degree of reliability.

### **Discussion of the Results**

Results relating to the first hypothesis of the study: ***There are no differences with statistical significance at significance level ( $\alpha \leq 0.05$ ) in the means of the total degree and degree of the sub-dimensions (Balancing Act, Arithmetic, Integers, Unite Rate, Number Line, Area Model Decimals, and Equality) for the post-test of the mathematical concepts between the experimental group individuals who learned by using the educational software compared to their peers who learned by using the normal way***”.

To test this hypothesis the researcher has extracted the means and the modified means and the standard deviations for the post achievement at the total degree for each of the dimensions and at the total degree of the mathematical concepts test of Collins developmental mathematical method. Table (2) shows results of this analysis.

**Table 2:** Means and the modified means and standard deviations for the mathematical concepts test of the mathematical curriculum of Collins

Dimensions	The Group	Mean	Standard Deviation	Standard Error
Balancing Act	Experimental	2.94	0.338	0.159
	Control	1.60	0.381	0.164
Arithmetic	Experimental	3.06	0.725	0.146
	Control	1.46	0.919	0.146
Integers	Experimental	2.74	0.780	0.175
	Control	1.69	1.057	0.175
Unite Rates	Experimental	3.06	1.070	0.256
	Control	1.23	0.843	0.256
Number Line	Experimental	2.43	0.739	0.148
	Control	1.51	0.887	0.148
Area Model Decimals	Experimental	3.29	0.893	0.171
	Control	1.60	1.012	0.171
Equality	Experimental	2.91	0.742	0.181
	Control	1.54	0.912	0.181
Total	Experimental	20.43	2.593	0.502
	Control	10.63	3.097	0.502

Based on the above table, there are apparent differences in the means on the post performance of the sub-dimensions degrees and the total degree of the mathematical concepts tests of Collins developmental mathematical curricula between the experimental and control group individuals and in favor of the experimental group individuals.

And to reveal if these differences were with statistical significance at significance level ( $\alpha \leq 0.05$ ), the researcher used (MANCOVA) test to study these differences considering their degrees on the same scale which has been applied before starting the program as a variable. Table (3) shows results of this analysis

**Table 3:** Results of (MANCOVA) Analysis to test the mathematical concepts of Collins Developmental Mathematical Curriculum between the experimental and control group individuals

Post Variable	Source of the Variable	Sum of the Squares	Freedom Degrees	Means of the Squares	(F) Statistical Value	Sig Value	Effect of R2 Value
Balancing Act	Pre-variable	0.001	1	0.001	0.001	0.972	
	The group	16.020	1	16.020	22.965	0.000	0.274
	The error	42.803	61	0.624			
	Total	449.0	70				
Arithmetic	Pre-variable	0.026	1	0.026	0.042	0.838	
	The group	38.379	1	32.379	51.789	0.000	0.460
	The error	38.071	61	0.624			
	Total	448.0	70				
Integers	Pre-variable	0.018	1	0.15	0.020	0.888	
	The group	0.329	1	8.329	9.321	0.003	0.133
	The error	59.508	61	0.894			
	Total	429.0	70				

Unite Rate	Pre-variable	0.390	1	0.390	0.203	0.654	
	The group	50.749	1	50.749	26.390	0.000	0.302
	The error	117.294	61	1.923			
	Total	429.0	70				
Number Line	Pre-variable	5.470	1	3.470	5.392	0.054	
	The group	6.143	1	6.143	3.545	0.003	0.135
	The error	39.256	4	0.649			
	Total		733200				
Area Model Decimal	Pre-variable	0.138	1	0.138	0.160	0.690	
	The group	47.783	1	47.783	55.491	0.000	0.476
	The error	52.526	61	0.861			
	Total	537.0	70				
Equality	Pre-variable	0.058	1	0.058	0.063	0.803	
	The group	88.458	1	28.453	29.681	0.000	0.327
	Total	442.0	70				
Total degree of the test	Pre-variable	16.710	1	16.716	2.262	0.138	
	The group	435.243	1	1185.243	160.441	0.000	0.725
	The error	450.633	61	7.387			
	Total	19115.0	70				

Table (3) shows the presence of differences with statistical significance at level of significance ( $\alpha \leq 0.05$ ) between the modified mean of performance of the experimental group individuals and the control group individuals at the degree of each dimension and at the total degree of the post mathematical concepts test and in favor of the experimental group individuals the highest in the means, since size effect of the educational software on acquiring the mathematical concepts on Collins curricula among the children of the first basic grade in Jordan ranged between medium to high.

These results confirm importance of the educational software in the children acquiring the mathematical concepts. This can be attributed to using the educational software which might help in forming the correct mental images about the mathematical concepts, and to get rid of the normal methods, and maybe increased the children's motivation and interest about the information introduced to them of helping in acquiring mathematical concepts among the kindergarten children (Badawi, 2012).

In other words, using the educational software might help in increasing their understanding and focus on the educational situations leading to positive influence in acquiring the mathematical concepts (Al-Khateeb, 2018). Since educational software in their nature work to evoke the children's attention and contribute to increase their enjoyment and excitement because of the elements of the picture, sound, movement and color, increasing the child's motivation to learn, because they address both audio and visual scenes (Ghose&Kundu, 2016) and Kappers, 2009). It is noticed from these results and results of this

present study effectiveness of using the modern learning strategies, including the educational software in improving the children acquiring the information and the skills.

***Results Relating to Testing the Second Primary Hypothesis “There are no differences with statistical significance at significance level ( $\alpha \leq 0.05$ ) between means of the degrees of the first basic grade students on the total degree and on degree of the sub dimensions (Balancing Act, Arithmetic, Integers, Unite Rate, Number Line, Area Model Decimals, and Equality) for testing the post-concepts of the mathematical concepts attribute to gender variable”.***

To test this hypothesis, the researcher has extracted the means and standard deviations of the post-achievement at the total degree for each dimension and the total degree for testing the mathematical concepts of Collins developmental mathematical curriculum. Table (4) shows results of this analysis

**Table 4:** Means and standard deviations for the post-achievement of testing the mathematical concepts of Collins’ mathematical curriculum

Variable	Category	Frequency	Percentage
Balancing Act	Males	2.24	1.062
	Females	2.30	1.199
Arithmetic	Males	2.42	1.20
	Females	2.11	1.10
Integers	Males	2.52	1.064
	Females	1.95	1.104
Unite Rate	Males	2.27	1.180
	Females	0.03	1.007
Number Line	Males	2.06	0.827
	Females	1.89	1.022
Area Model Decimals	Males	2.33	1.361
	Females	2.54	1.282
Equality	Males	2.18	1.158
	Females	2.27	1.126
Total	Males	16.03	5.126
	Females	15.05	6.188

Table (4) shows apparent differences in the means for the sub-dimensions and the total degree of the mathematical concept test between the males and the females.

And to conform if these differences were with statistical significance at significance level ( $\alpha \leq 0.05$ ), (MANCOVA) test was used as seen in table (5).

**Table 5.** Results of MANCOVA

The Variable	Welx Lambda Value	F Value	Significance
Gender	0.847	1.135	0.355

It is clear from table (5) that there is no effect of gender variable on causing the differences on degree of the sub-dimensions and the total degree on degree of the post-test the mathematical concept of Collins' developmental mathematical curricula attribute to gender, since Welex Lambda value was (0.847) with statistical significance of (0.355) which is higher than sig level ( $\alpha \leq 0.05$ ). This result attributes to the similar educational environment and the used activities in the study, in addition to the equal capabilities and prepositions of the two gender's kindergarten's children age 5-6 years.

In other words, the introduced educational software is consistent with the developmental characteristics for both genders, also there are no barriers facing the application of software of the sessions in applying the software for both genders and the nature of the sessions in applying the software was general and does not form any specificity to the gender. This has led to the absence of differences with statistical significance. This results agree with results of Al-Khateeb (2017) study and with (Swearing, 2011) study. But results of this present study disagree with results of Kappers (2009) study which showed differences between the two genders.

## Recommendations

In light of the previous results, the researcher has a number of recommendations, the most important are:

- 1- Necessity for using the educational programs in teaching the children because of their effectiveness in facilitating the delivery of information to the children.
- 2- Ministry of Education should hold training courses to the female teachers of the basic education stage to turn the educational subject into the educational software and use them in the classroom.
- 3- Conducting more experimental studies regarding effect of the educational software on teaching the students in the first basic grade in other subjects and using other variables.

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