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RESEARCH ARTICLE

THE IMPACT OF (PICTiL) PROGRAM DESIGNED ACCORDING TO A NEW PROPOSED MODEL (ICTiL) ON WORKING-MEMORY AMONG GIFTED STUDENTS

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ABSTRACT

A proposed (ICTiL) model that integrates thinking creatively into learning process was presented to bring the two processes as one process. One of the aims of the modelis to find a way of enhancing working-memory through following a new proposed way of learning and thinking. This enhancement is supposed to increase learning, generating and producing new ideas, and achievement. This research sought to find the impact of (ICTiL) model on working-memory. Depending on (ICTiL) model, a new proposed training program (PICTiL) was presented and delivered to the sample of this study which consisted of (92) male gifted students of secondary school stage who were distributed equally onto control and experimental groups (46 respondents each) and were assigned randomly. Mixed-method approach was used with an explanatory sequential design. Working Memory Tests was used as a pre-test/post-test as an instrument to find quantitative results, followed by a focus group to find qualitative results. The findings included high size effect in general of (ICTiL) model represented in (PICTiL) program on respondents` working-memory. All working memory elements showed statistical significance differences between pre-test and post-test means of scores except for visuospatial sketchpad and visual sketchpad functions. Findings also revealed positive attitudes towards the effectiveness of (PICTiL) training program regarding retaining and recalling information. Depending on results, invitation to adopt and improve (ICTiL) model is proposed.

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INTRODUCTION

It is clear that the sought learning occurs when students are involved in active learning rather than sitting passively and listening. Twenty-four hours later, students seem to retain only 5% of the information they receive in lecturing method. Retention rates increase up to 75 to 90% when active learning that includes peer teaching substitutes lecturing. Other methods of active learning, such as demonstration and discussion, also result in higher rates of retention ranging from 30% up to 50% respectively (Wirth and Perkins, 2012). For many reasons, pursuit of new kinds of learning emerges from a number of educational and non-educational organizations. First, educators suffer from students` attendance in classes, uncompleted tasks, and the focus on grades rather than the learning. Second, transmitting information through lecturing method is not interesting and may lead to the failure of recognizing the value of what is learned among students. Third, today`s employers seek employees who have the ability and the desire of lifelong learning and improving in order to match appropriations with performance. Fourth, including developing skills in communication, teamwork, and leadership is a necessity to keep moving in the right path in a challenging rapid change world (Wirth and Perkins, 2008). It can be added that the learning span among students is calculated by identifying a student`s age with an addition of two minutes, thus, if a student is asked to sit passively and listen, this may strongly result in losing concentration which will lead to stopping learning and misbehaving (Dodd, 2004). Created things of creative value should always be new, solo, and different from the familiar things. This does not mean that created things do not relate to past experiences, there are many signs showing that all creations include composing new ideas out of old ones, the old is the basis to create, thus the artist, as an example, produces new colors from old known colors, and a child who creates an imaginary world uses the views, events, and all of the old experiences found in the daily life (Al-Issawi, 1991). Gifted students are supposed to have educational experiences and planning activities that help them set long-term goals and strive for mastery, expertise, and creative achievement

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(Bereiter and Scardamalia, 1993; Simonton, 1997). Their goals should meet their aptitudes and giftedness (Sternberg & Davidson, 2005). In spite of the fact that gifted students are able to perform higher than normal students, some gifted children are less farther than their potential. In fact, it was found that a range of 15 to 40 percent of gifted students may experience failure or low performance when compared to their potentialities (Seeley, 1993). They actually need the guidance of teachers, counselors, and parents (Sternberg and Davidson, 2005). In order to learn new facts, interpretations, or skills, people must be able to remember them. Learning for understanding boosts remembering as it helps information get into memory in a way that is easier to recall. Doing more detailed meaningful thinking puts more information into memory (Cromley, 1999). Memory is considered as one of the most important mental processes in individual`s life, as another mental processes like perception, awareness, and thinking depend on it. Saleem (2003), proposed that any human being with no memory will have a very limited ability to think and will only stay linked to the process of the initial perception of senses, which may lead into the absence of learning and the inability to plan for future. Memory is studied according to many fields of interest, which resulted in a variety of definitions. Most of the definitions agree that the main role of memory is to store information to be retrieved when needed. Mulhim (2006: p. 260) defined memory as "the mental process in which the past experience is decoded, stored, and encoded". Abdulfattah (2004), indicated that types of memory varied depending on the variance of bases, the most famous model is of *Stage Theory*. Atkinson and Shiffrin (1968), proposed that information is processed and stored in three stages; (a) sensory memory, (b) short-term memory, and (c) long-term memory. Baddeley (2002), added that the concepts of long-term memory and short-term memory have been considered as two separated systems since 1960s. After years of working in the field of education as a teacher, the researcher confirms that ministry of education in Saudi Arabia has been supporting the educational process through providing great facilities, improved curricula that mix thinking skills to the content, teaching aids, well-qualified teachers, and an excellent treatment towards the students. In spite of that, the researcher noticed that the output of the majority of students in Saudi Arabia does not meet the targets.

Many studies showed that the contents of school books concentrate on the cognitive aspects more than thinking styles and skills (Al-Rashed, 2001; Al-Ghaiyadh, 2003; Abdul-Majeed, 2004; Al-Jabr, 2005; Al-Shayi and Al-Uqaiyel, 2006). It is noticed that the efforts of improving creative thinking has not reached a convincing accepted level yet, which reveals a necessity to design and develop educational enriching units (Al-Uqaiyel, Al-Shayi and Al-Jughaiman, 2014). In addition to that, the programs of taking care of gifted students are still in their theoretical form and unapplied properly (Al-Dalam, 2010).

This gave the researcher a motive to search for the reasons behind gifted students` weak productive outcome. Thus, the researcher starts to find out some information that are related to learning process and creative thinking process; as learning and thinking are related processes that are supposed to lead to generating new thoughts and ideas.

According to the official website of Mawhiba, which was launched by King Abdul-Aziz and his Companions; enrichment programs have been being provided since 2000 A.D., including creative thinking training programs (http://www.mawhiba.org). This may not agree with what stated in the report of King Abdul-Aziz City for Science and Technology (KACST) (2014); which aimed to track the transition to knowledge society in Saudi Arabia, where it was found depending on the statistics of the World Bank for the period between 2000 A.D. and 2012 A.D. that Saudi Arabia- in comparison to the other countries in the field of education- was ranked as the (58^{th}), while there was no ranking progress in the field of innovation; where it settled in rank (84). The indicator of knowledge economy shows the scores of the performance of Saudi Arabia in the fields of education and innovation, as they represent two pillars of four that constitute knowledge society;the total score of economy knowledge was (5.96/10), the score of education was (5.65/10), and the score of innovation was (4.14/10).The scores are shown in Table (1):

Table 1. The performance of Saudi Arabia on knowledge economy indicator

The total score of economy knowledge indicator	The score of education	The score of innovation
5.96/ 10	5.65/ 10	4.14/ 10

Source: (KACST, 2014).

The indicator of knowledge economy shows how Saudi Arabia is classified in the fields of education and innovation; Saudi Arabia is ranked to the world as (50) on economy knowledge, (58) on education, and (84) on innovation, as seen in Table (2):

Table 2. Classification of Saudi Arabia on knowledge economy indicator

The rank	Rank on economy knowledge indicator	Rank on education	Rank on innovation
To world	50	58	84
To Arab world	4	3	8

Source: (KACST, 2014).

Ranks and scores, shown in Tables (1) and (2), reflect the reality of education and innovation as one level of creative thinking; which does not meet the goals that were set, as all progress and excel requirements are provided by the government of Saudi Arabia represented in all concerned institutions. Moreover, Saudi Arabia was ranked (42) on innovation indicator of world countries order, and came on the second rank in comparison to the Arab world countries; where the innovation sub-indicator showed that the innovation input score was (2.44), while the innovation output score was (3.44) with an output score of creativity of (2.24) (KACST, 2014). Once again, these scores are far below expectations. Memory is where information is stored and also found later when needed. These two actions are called coding and retrieval, which act together to affect learning. Research shows that learning for understanding helps remembering better as information gets into memory in a way that is easier to recall. In fact, doing more thinking, more detailed thinking, and more meaningful thinking puts more information into memory (Cromley, 1999). Assaf (2009) stated that students who do not

have the opportunity to practice thinking skills with an active engagement when delivering material will fail to make good connections between the thousands of information they are supposed to store in their long term memory. Depending on all the preceding information, the researcher decided to present a new cognitive-thinking model relying on some concepts of learning styles theory and some concepts of Islamic perspective of thinking to integrate creative thinking in learning seeking to overcome the majority of negative points carried by other programs in general, and the point that is related to acquiring and producing knowledge in particular. Consequently, the researcher designed a new program to take the model into practice in order to test it experimentally and find out whether it is effective or not. (ICTiL) model aims at integrating learning process and creative thinking. The researcher believes that thinking creatively in fresh pieces of information at the time of acquiring them may lead to new ideas or products, as those pieces of information are still founded in perception field and can be taken to other phases. It is premised on a particular concept of learning style theory and an Islamic perspective of thinking. Using senses asynchronously and following some Islamic concepts driven from some verses of the Holy Qura`an and some instructions of Sunnah has resulted in presenting the (ICTiL) model, which is illustrated in Figure (1).

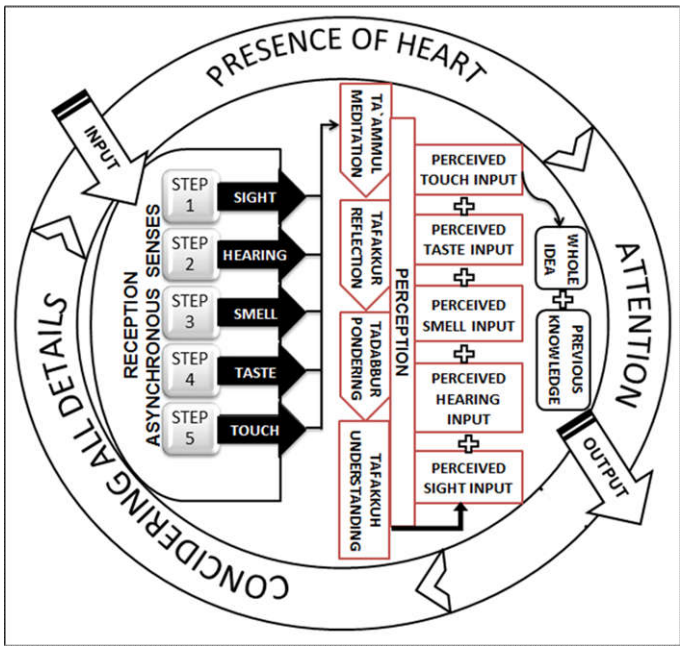

Figure 1. The model of integrating creative thinking in learning (ICTiL)

Depending on what is presented in figure (1), it can be seen that information, behavior, and/or skill are received by senses asynchronously; to use one sense at a time. When a sense, sight for example, receives something, it should be sent to thinking steps that lead to perception; which are Ta`ammul (Meditation), Tafakkur (Reflection), Tadabbur (Pondering), and Tafakkuh (Understanding) respectively. The same steps are followed for the reception of the remaining senses using them one after another. When all possible senses are used and all related perceptions are acquired, they are connected together to form a whole complete idea. This idea can be linked to previous knowledge and transferred to long-term memory. Using senses asynchronously and the above mentioned steps of thinking should happen within three conditions; (a) presence of heart, (b) paying attention, and (c) considering all details.

The research sought answering the following questions:

1. What is the impact of the program of integrating creative thinking in learning (PICTiL) on gifted students` working-memory?

This question includes the following five sub-questions:

a. What is the impact of PICTiL program on gifted students` phonological loop?
b. What is the impact of PICTiL program on gifted students` compatible functions of the central executive and the phonological loop?
c. What is the impact of PICTiL program on gifted students` visuospatial sketchpad?
d. What is the impact of PICTiL program on gifted students` compatibility between the central executive functions and the functions of the visuospatial sketchpad?
e. What is the impact of PICTiL program on gifted students` visual sketchpad function?

2. How does your remembrance change after following the instructions of the PICTiL program?

MATERIALS AND METHODS

For the purpose of this study, mixed-method approach is used, the explanatory sequential design is adopted;where quantitative data collection and analysis is followed by qualitative data collection and analysis before interpretation is delivered. The population of this study is comprised of all male secondary school gifted students who passed Mawhiba`s scales of giftedness successfully in Al-Quraiyat city, Saudi Arabia for the academic year 2014-2015 A.D. Due to the nature of mixed-method approach researches, two samples were assigned; one for quantitative approach and the other one for qualitative approach. Simple random sampling technique was used to assign the sample of this study.

Table 3. The distribution of the study population members

School	Grade	Gender	No.
secondary	1st	male	41
secondary	2nd	male	39
secondary	3rd	male	37
Total			117

Table 4. The distribution of the study sample

Secondary school grade	Control group	Experimental group	Sum
1st	15	17	32
2nd	18	17	35
3rd	13	12	25
Total	46	46	92

The researcher referred to sample size determination table of Krejcie and Morgan (1970) to decide the appropriate sample size of this study. A number of (92) elements were assigned from a population that consists of (117) as shown in Tables (3) and (4). Sample elements were divided and distributed equally on control and experimental groups (46 each). The qualitative sample elements were chosen and assigned randomly from the elements of the experimental group. A focus group of eight elements was used to explore opinions, attitudes, and feelings. In the light of the study objectives, the researcher used Torrance Test of Creative Thinking, figural form (Form B), standardized into Arabic environment by Alnafi (2008).

RESULTS

To answer the first question "What is the impact of the program of integrating creative thinking in learning (PICTiL) on gifted students` working memory?", means of scores of the two groups were extracted to check if there is a difference as in Table (5).

Table 5. Means of scores of control and experimental groups on pre-test and post-test of working memory tests

Group		Pre-test W.M tests	Post-test W.M tests
Control group	Mean	26.22	28.04
	N	46	46
	Std. Deviation	8.030	6.128
Experimental group	Mean	26.22	33.46
	N	46	46
	Std. Deviation	8.030	4.983
Total	Mean	26.22	30.75
	N	92	92
	Std. Deviation	7.986	6.185

The results indicate that there is no difference between the means of the control group and the experimental group on pre-test of working-memory tests; the means of the scores of the control group was (26.22) with a standard deviation of (8.030), and the mean of the scores of the experimental group was (26.22) with a standard deviation of (8.030). To find out whether the difference between the means of the two groups is significant at the level ($\alpha \leq 0.05$), independent samples t-test was used. Results are shown in Tables (6).

Table 6. Independent samples t test results on (WMT)

Levene's Test for Equality of Variances		F.923 Sig..339	Equal variances assumed	Equal variances not assumed
t-test for Equality of Means		t	-4.648	-4.648
		df	90	86.407
		Sig. (2-tailed)	.000	.000
		Mean Difference	-5.413	-5.413
		Std. Error Difference	1.165	1.165
	95% Confidence Interval of the Difference	Lower	-7.727	-7.728
		Upper	-3.099	-3.098

Results revealed that the significance value of Levene`s test for equality of variance was (0.339) which is higher than (0.05). This indicates that the variance between the two groups is equal, and hence the values of "Equal variances assumed" are considered. The results show that the calculated "t" value is (-4.648) which is greater than the table "t" value at degree of freedom of (90) and a level of (0.05) which is (±1.990). The significance value is (0.000) which is obviously less than (0.05). To find out the effect size, Cohen`s (d) was used. The means and the standard deviations of the experimental group on Working Memory Tests pre-test and post-test were used to calculate the effect size, the resulted output was a value of (-1.08) which indicates that the effect size is large as it is higher than (± 0.8). As for the five sub-questions of the second question, they are tested using paired samples t-test to find the differences between the scores means and to judge whether the differences are statistically significant. The results show the following:

The first sub-question was "What is the impact of PICTiL program on gifted students` phonological loop?" The result is shown in Table (7):

Table 7. Paired samples t-test results of phonological loop test

			Pre-test W-M sentence span / Post-test W_M sentence span
Paired Differences	Mean		-2.413
	Std. Deviation		1.845
	Std. Error Mean		.272
	95% Confidence Interval of the Difference	Lower	-2.961
		Upper	-1.865
t			-8.871
df			45
Sig. (2-tailed)			.000

According to the values shown in Table (7), the difference between the means of scores on sentence span pre-test and post-test is (-2.413) in favor of scores of means of post-test, the significance value is almost (0.000). This indicates that the difference between the two means of scores is statistically significant. The second sub-question was "What is the impact of PICTiL program on gifted students` compatible functions of the central executive and the phonological loop?" The result is shown in Table (8):

Table 8. Paired samples t-test results of compatible functions of the central executive and phonological loop test

			Pre-test / Post-test working-memory letters and numbers span test
Paired Differences	Mean		-3.696
	Std. Deviation		1.976
	Std. Error Mean		.291
	95% Confidence Interval of the Difference	Lower	-4.283
		Upper	-3.109
t			-12.684
df			45
Sig. (2-tailed)			.000

According to the values shown in table (8), the difference between the means of scores on letters and numbers span pre-test and post-test is (-3.696) in favor of scores of means of post-test, the significance value is almost (0.000). This indicates that the difference between the two means of scores is statistically significant. The third sub-question was "What is the impact of PICTiL program on gifted students` visuospatial sketchpad?" The result is shown in Table (9):

Table 9. Paired samples t-test results of visuospatial sketchpad test

			Pre-test / Post-test W-MCorsi blocks (direct)
Paired Differences	Mean		-.261
	Std. Deviation		1.182
	Std. Error Mean		.174
	95% Confidence Interval of the Difference	Lower	-.612
		Upper	.090
t			-1.497
df			45
Sig. (2-tailed)			.141

According to the values shown in Table (9), the difference between the means of scores on Corsi blocks direct trials pre-test and post-test is (-0.261) in favor of scores of means of post-test, the significance value is (0.141). This indicates that the difference between the two means of scores is not statistically significant as the value of significance is higher than (0.05). The fourth sub-question was "What is the impact of PICTiL program on gifted students` compatibility between the central executive functions and the functions of the visuospatial sketchpad?" The result is shown in table (10):

Table 10. Paired samples t-test results of compatibility between the central executive functions and the functions of the visuospatial sketchpad test

			Pre-Test /Post-test working-memory Corsi blocks reverse
Paired Differences	Mean		-.435
	Std. Deviation		.981
	Std. Error Mean		.145
	95% Confidence Interval of the Difference	Lower	-.726
		Upper	-.143
t			-3.006
df			45
Sig. (2-tailed)			.004

Depending on the values shown in Table (10), the difference between the means of scores on Corsi blocks reverse trials pre-test and post-test is (-0.435) in favor of scores of means of post-test, the significance value is (0.004). This indicates that the difference between the two means of scores is statistically significant as the value of significance is less than (0.05). The fifth sub-question was "What is the impact of PICTiL program on gifted students` visual sketchpad function?" The result is shown in Table (11):

The values illustrated in Table (11) show that the difference between the means of scores on Corsi blocks total score pre-test and post-test is (-0.435) in favor of scores of means of post-test, the significance value is (0.194). This indicates that the difference between the two means of scores is statistically insignificant as the value of significance is higher than (0.05).

Table 11. Paired samples t-test results of visual sketchpad functions test

			Pre-test/Post-test W-M face recognition
Paired Differences	Mean		-.435
	Std. Deviation		2.238
	Std. Error Mean		.330
	95% Confidence Interval of the Difference	Lower	-1.099
		Upper	.230
t			-1.318
df			45
Sig. (2-tailed)			.194

To answer the second question" How does your remembrance change after following the instructions of the PICTiL program?"

Qualitative data analysis of the focus group revealed the following responses:

"I tried using the model when going shopping and see if it is possible to get rid of written lists, it works!"
"It seems that presence of heart makes things more memorable".
"When I use the program instructions, remembering information becomes easier".

DISCUSSION

In Table (5), means of scores of control and experimental groups on Working Memory Tests (WMT) pre-test showed that both groups have almost the same means; the control group has a mean of scores of (26.22), and the experimental group has also a mean value of (26.22). There was no difference between the two means. The standard deviations of both groups show the same value which was (8.030). These values of means and standard deviations may reflect that both group elements` working memories have approximately the same level of functionality. The approximation between the two groups' means may indicate that the distribution of the respondents on both groups was good and the sample was homogeneous. The results in Table (5) also show that the difference between the means of scores of control and experimental groups on post-test of (WMT) was (5.06) in favor of the experimental group; the control group mean was (28.04), while the experimental group mean was (33.46). This value of difference between the two means seemed to be large enough to be noticed. The two standard deviations of both groups were (6.128) for the control group and (4.983) for the experimental group. This indicates that the noticed progress of the experimental group can be assigned to the influence of the treatment program. The difference between the means of control group on pre-test and post-test indicates that there was a progress on working memory. The values of the means of control group according to table 5.6 show a mean difference of (1.82); as the mean on pre-test was (26.22), while on post-test

it was (28.04). On the other hand, the difference between the two means of scores of experimental group on pre-test and post-test of (WMT) was (7.24) which indicates that there was a respectable amount of progress on working memory. These values again may denote to the impact of the (PICTiL) program. To find out if the above results are statistically significant, the independent samples t-test was used. Results in table (6) show that the calculated "t" value is (-4.648) which is greater than the table "t" value at degree of freedom of (90) and a level of (0.05) which is (±1.990). The significance value is almost (0.000) which is of course less than (0.05). It was also obvious that the lower and the upper values of confidence interval do not include the (0) value; this confirms the indication that there is a difference between the two means due to the impact of (PICTiL) program.

It was obvious that the effect size of (PICTiL) program was large as Cohen`s (d) result was (- 1.08) which is greater than (±0.8). This result indicates that the way (ICTiL) model is designed, and hence the (PICTiL) program components, were of a great help in raising working memory abilities of respondents. Again, this may tell that respondents had found that (PICTiL) program was practicable, easy to use, and effective. Committing things to memory, avoiding forgetting committed things, and being certain that one committed targeted information are the keys to improve one`s memory. Being able to recall part of the experience and unable to recall another are results of thinking process; the part that have been thought of may be recalled easily. Even when thinking about more than one part of the experience, the part that is given most attention and thought will be more obvious and recallable than the other parts that are given less attention and thought. The use of memory and passage of time may be factors that make memory forgets thing, but the most important factor that leads to forgetfulness is the quality of the cues used to get to the memory; which are bits of information that works as triggers for retrieving a memory. A powerful cue will get one access to memory in contrast to a poor cue. According to some researches, it was found that people tend to feel and think that their learning is more complete than it is in reality (Willingham, 2008).

Depending on preceded information, the researcher thinks that the components included in (ICTiL) model enhance functions of working memory effectively. Being conscious (presence of heart) makes the learner to be fully aware of what is going on around, what is going in inside to the brain, and what is to be done in advance till the storage happens in long-term memory. Moreover, recognizing all details enables the brain to continuously search for deeper details disjoining big pieces of information into smaller parts. Devoting more attention to the acquisition of information increases focus on all aspects and makes concentration reach its peak in the area of interest. These three elements works as a preamble to the four thinking steps in which a great amount of thoughts are devoted before bringing all information together to be transferred at a later step into the long-term memory. The results of the present study agree with the findings of the study of Duan, Shi, and Zho (2010), where it was demonstrated that experience and knowledge may influence the development of information processing speed. They add that it appears that specialized education for gifted children can actually accelerate development, suggesting that selection of educational system is of particular significance, especially for gifted children. Gifted children can study more quickly than average children because they have a higher speed of information processing. The efficacy of their study results in greater transmission of knowledge, and this in turn accelerates gifted children's information processing speed. Teachers and parents are supposed to realize that education is an important issue in regard to the development of students emphasizing on the importance of experience to gifted student's learning. The results of the study also confirm the need for a special education system designed for gifted students, which can represent a great investment in their future. The study of Hindal (2014), indicated that the very able students are of high working memory, which supports the finding of the present study related to working memory. Moreover, the study of Baruch-Paz, Leikin, and Leikin (2013), found that working-memory is related to both general giftedness and excellence in mathematics factors. The results also revealed that general giftedness factor is related to high short- term memory, while excellence in mathematics factor is related to high visual-spatial memory. Gifted students who excel in mathematics (G-E group) performed better in all tasks of processing speed when compared to the other three participating groups.

The results of the first sub-question as illustrated in Table (7), showed a difference of (-2.413) between the means on sentence span pre-test and post-test of the experimental group in favor of the scores on post-test. The difference was statistically significant as the value (0) is not included between the upper confidence interval value (-1.865) and the lower value (-2.961). These results indicated that the progress of the respondents increased due to the impact of PICTiL program. According to Baddeley (1983), the phonological loop is comprised of a phonological store; which keeps memory traces in an acoustically lasting for a few seconds, and a rehearsal process of articulation that is analogous to sub-vocal speech; which role is to retrieve and re-articulate what is held in this phonological store refreshing the memory trace. While the articulation operates in real time, the phonological store capacity is limited to number of items that can be articulated in the available time before the trace of memory gets lost. The results of the second sub-question as in table (8)showed that the difference between the means of scores on letters and numbers span pre-test and post-test was (-3.696) in favor of post-test scores, the significance value was found statistically significant. The results indicated that the progress of the respondents on compatible functions of the central executive and the phonological loop increased as a result of the impact of (PICTiL) program.

Repovs and Baddeley (2006), stated that executive processes are involved when information within the stores needs to be manipulated. Representation and maintenance are independent of the central executive, unless complex binding and integration of information are required. In complex cognitive abilities, the central executive works to control attention and helps in the division of attention between concurrent tasks and as one component of attentional switching. In related functions, central executive is supported by the phonological

loop which provides one form of convenient storage of execution programs. The researcher believes that the improvement noticed in span test of letters and numbers was due to the nature of ICTiL model which involves much quantity of attention, concentration, and information manipulation as thinking complex abilities that occur within the process of information treatment contribute in making representation and maintenance dependent on the central executive which is supported by the phonological loop. The results of the third sub-question as illustrated in Table (9) showed a difference between the means of scores on Corsi blocks direct trials pre-test and post-test of (-0.261) in favor of scores means of post-test, the significance value is (0.141) which reflects statistically insignificant value as it is higher than (0.05). The visuospatial sketch pad is devoted to the storage and maintenance of visual and spatial information. Some studies show that movements of the voluntary eye and the arm movements produce interference that disrupts spatial working memory. Processing visual information is brought to happen easily at the maintained locations in spatial working memory. Thus, when forcing attention to be directed away from locations held in working memory, the ability of an individual to remember those locations is impaired (Repovs and Baddeley, 2006). Depending on the information above, the researcher thinks that the absence of progress among respondents who took PICTiL program may be attributed to the design of the ICTiL model where a great deal of emphasis on taking immediate information to a higher phase of ideas generation is involved. The interference seems to happen not only because of eye and body movements, but also because of the intention held previously in mind to concentrate on the output rather than the input. The findings of the fourth sub-question illustrated in Table (10) showed that the difference between the means of scores on Corsi blocks reverse trials pre-test and post-test is (-0.435) in favor of scores means of post-test reflecting a statistically significant value. The central executive is the source that controls attention to be focused dividing it between concurrent tasks and as one component of attentional switching, while the visuospatial sketchpad functions as a guide for visual and spatial attention (Repovs and Baddeley, 2006). Comparing the findings of the third sub-question to the findings of the fourth sub-question, the researcher inferred that the progress noticed on one task of visuospatial sketchpad and the lack of it may be ascribed to the presence or absence of the central executive; when central executive is involved, progress occurs.

The results of the fifth sub-question illustrated in Table (11) showed that the difference between the means of scores on Corsi blocks total score pre-test and post-test is (-0.435) in favor of scores means of post-test, the significance value is (0.194). This indicates that the difference between the two means of scores is statistically insignificant as the value of significance is higher than (0.05). The visuospatial sketchpad is responsible for visual and spatial representations that are being stored and rehearsed in the working memory. The central executive function regulates attention in the working memory system (Keynes, 2010) by controlling the flow of information into visuospatial sketchpad, getting rid of what seems to be unimportant, making information processed higher through reasoning, decision-making, planning and comprehension (Smith, 2014). The progress noticed on total score of the visuospatial sketchpad on Corsi blocks may reflects the importance of the existence of some components involved in ICTiL model design. Presence of heart, attention, and considering all details- as the researcher believes- may be the prevalent components that contributed mostly in that progress. Another thing that can be mentioned is the reception of information; if the given information in Corsi blocks task was given five times considering all five senses asynchronously, the researcher assures that the result would be greater on both trials of Corsi blocks. As for the second question, it appeared that recalling information stored in long-term memory became easier after using (ICTiL) model and (PICTiL) program instructions according to the feedback received from respondents. Neath (2000), stated that memory is of three stages: encoding; where information is initially acquired and processed, storage; where manipulation and maintenance of the encoded information take place, and retrieval; where the stored information is accessed and used. He added that it is the dynamic interaction between the encoding and retrieval phases that determines memory performance. Lamberts and Goldstone (2005), stated that strong cues are better than weak cues at eliciting the correct item. They added that strong cues are words that elicit particular target words most of the time, whereas weak cues are words that only rarely elicits particular targets. In spite of having no intrinsic mnemonic properties, the effectiveness of a cue depends on the interaction between the encoding and retrieval conditions; that means remembering depends on the interaction between the conditions at encoding and the conditions at retrieval. Bauer (2015), confirmed that retrieval of information from long-term stores depends on the same circuits that were involved in experience registration initially, including visual and many other cortices. Moreover, Cromley (1999: p.212), stated that "information gets into the human mind better when it comes in through many senses instead of just one. For example, a word that is heard, seen, spelled, and acted out in charades is easier to remember than a word that is just heard. Because the word enters your memory through many paths, there are more ways to find the word later when you are trying to remember it".

The researcher believes that (ICTiL) model and therefore (PICTiL) program provides a mental state in which a desirable interaction between encoding and retrieval occurs. According to (ICTiL) model, knowledge acquisition takes place within certain conditions that in turns contains information maintenance and storage as well. It can be inferred that the quantity of attention paid to specific details that every sense provides about any information being received has a great deal of contribution to best remembrance. Repetition of receiving more details from various senses about the same targeted information can be another factor in making strong cues.

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