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Full Length Research Paper

The effect of using cognitive discipleship strategy in the understanding of basic stage students to scientific concepts in light of their locus of control concept

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This study aimed to investigate the effect of cognitive discipleship strategy in understanding scientific concepts among elementary students in light of their locus of control compared to the current way. The sample of the study consisted of (75) ninth grade student, were randomly divided into two groups: experimental group that studied using cognitive discipleship strategy, and control group that studied using the current way. The data was collected by classifying students to an indoor and outdoor locus of control based on locus of control scale. And the test of understanding the scientific concepts was applied. The data was analyzed using Two-way analysis of variance (ANCOVA). The results of the study showed the superiority of cognitive discipleship strategy on the current way in understanding the scientific concepts among the members of the study. The results also showed superiority of female students with internal locus of control on female students with external locus control in understanding scientific concepts. In light of this, the study recommended conducting similar studies of the current study and its impact on other educational variables which weren't addressed by this study.

Keywords: Cognitive discipleship, understanding scientific concepts, locust of control

INTRODUCTION

The Science education and the science curriculum and its teaching have witnessed a new era in the eighties and nineties of the twentieth century, and passed projects and movements of reform depends on the constructivist theory and intellectual orientations basis for the practice, which has helped to improve learning by changing teacher practices and activate the student role(Bentley 1995).

The constructivist is a theory of knowledge and learning, focusing on the role of the active learner in building itself to his information, through intellectual involvement and effective in this process, So that meaningful learning based on understanding rather than considering the learner an empty bowl and pour the knowledge in, according to what the teacher wants without make aware of or understand what he learned. (Aydin et al, 2009 ; Aydeniz & Hodge, 2010; Allen, 2008 and Wu & Tsai, 2005).

Strobel & Jonassen (2005) have described the constructivist learning active social mental process, reacts the individual with the surrounding environment where notes, predict, build its own explanations, and negotiating with others, while Kim selected (Kim, 2005) several differences between Constructivist education and other types of education.

So, that constructivist education active and ongoing building process, rather than the process of acquiring knowledge, and it supports the learner constructive processing of information for understanding, rather than the delivery of information to the learner, and that education is the learning and teaching concept, instead of teaching and learning concept, and this means, put learning

first and education second, and so have the learner center of the teaching-learning process.

Thus, structural imposed new roles on both the teacher and the learner in the light of outlook to the learning and teaching process; learner in constructivist learning environment has a responsibility to learn, and gain a better understanding through active participation in the learning process educational participation (Correiro et al, 2008).

As for the teacher in the constructivist learning environment, plays the role of mentor and facilitator and organizer of the learning environment, and gives importance to build a learner of ideas and concepts by himself (Akpinar & Unal , 2006) .

In the context of that, New New (Neo &Neo, 2009) defined constructivist learning environment, as a place where learners work together and support each other, and using tools and multiple sources of information, in their quest to achieve the goals of learning and problem solving.

In spite of the criticism of the constructivist theory, however the emanating from the thinking and orientation of teaching strategies has shown their role in the teaching-learning process.

A number of researchers have pointed out that the transition to the educational process of learning from its conventional form to the constructivist shape , lead to opportunities wide in front of the students self-learning, dialogue, discussion, generate meanings, and improve the performance of students in science learning in the light of the previous cognitive structure of the output they have to become more extensive and sophisticated, and reduces the alternative concepts they have, and improves their understanding of scientific concepts to become a better learning characterized by permanence and continuous development . (Correiro et al, 2008; Akgun & Aydin, 2009 and Wu & Tsai (2005) ; (Akuset al , 2003)

The constructivist theory based on the idea of education for understanding, that is where the focus on teaching and learning of scientific concepts, and that importance of concepts in the constructivist composition of principles of learning and generalizations, and build a pyramid of knowledge, and methods in research and thinking.

There are two criteria to understand the scientific concepts, namely: that the learner understand certain scientific idea, which mainly comes initially and integrates them into a conceptual construction (Lesniak & Liu, 2005). And that learner understand the degree to which scientific idea employed in the appropriate social context, as in the description and interpretation of phenomena, notes, design and operational procedures (sadler & zeidler ,2005) .

Therefore, Anderson and Ruth (Anderson & Ruth, 1989) was classified scientific understanding into two inseparable, namely: understanding constructivist: Regards of the learner to acquire knowledge of interrelated conceptual constructivism and his knowledge linked to the former. And the Career understanding Regards of learner acquisition and functional knowledge for the purposes of prediction and interpretation of phenomena.

Depending on the constructivist theory and it's ideas, the specialists in scientific education and methods of teaching strategies and models of educational learning may help the teacher to carry out its roles effectively, and provide opportunities for student and self-active learning (pabellon , 2005) One of these strategies that relied on constructivist cognitive discipleship strategy that current research is trying to examine its impact on the understanding of scientific concepts with the primary students in the light of the their locust of control.

Cognitive discipleship strategy can be considered as a curve based on which of teaching design or use it as a strategy for learning so that students learn through it through the assistance and guidance by the teacher or expert (Brill; Kim; and Galloway, 2001).

Cognitive discipleship strategy includes several methods (Linda et al , 2009) puts in four names: the modeling and educational scaffolding , training and guidance.

And learning and teaching through cognitive discipleship requires a clear underlying operations of the learners so they can note check understanding and then they can exercise, (Collins et al, 1989). While Enkenberg shows (Enkenberg, 2001) methods as methods support the achievement of the objectives of cognitive discipleship.

- Modeling: explaining the thinking process.
- Interpretation: explaining the reason for choosing the steps and processes used.
- Coaching: follow-up of students at work . Help and support when needed.
- Scaffolding: student support so that they can handle the job as well as this method involves the gradual withdrawal of the teacher when students can themselves task of leadership.
- Reflection: When the student analyzes and evaluates his performance.

(Enkenberg, 2001) .

As for the style of modeling and explaining were return the principle of modeling to the expert display of operations and strategies required to perform the task, and learner should be notes the practical application of this performance , and learner should be notes the practical application of this performance , (Collins,1991) had confirmed on the importance of modeling because most of the tasks to solve the problem in the operational framework of cognitive discipleship are submission mentally . He said that two types of modeling: the processes that are observable in the world and modeling of the performance of experts including modeling of cognitive processes implicit (collins , 1991).

Collins (1991) confirms on the importance of integration between supply and explanation during teaching because learners need to get to the explanations during their observation of performance modeler where Collins suggested the real modeling of the performance of competitive including false starts and endings useless which helps learners to the rapid adoption of the implied relationship where they are educated as a smart beginners (Schwartz & Bransford, zech , 1988)

After modeling the desired operations it turns teachers into coaches and this requires students in control at work and provide immediate feedback and sometimes hint provide assistance when needed (Atkinson, 1999).

As students become more confident in their abilities and accomplish more as a result of cognitive skills they have, so intervention teacher it became less necessary. Modeling include performance and motivation to work and express an opinion as well as display the internal cognitive processes of the expert (Schoenfeld , 1985) .

As for the style of scaffolding is so named because it focuses on temporary support of the learner through provision of a range of activities and programs and then left to complete the rest of the learned based on their capabilities. Vygotsky the leading of social constructivism expresses the educational scaffolding by saying: gap consists between the student's knowledge and knowledge of the teacher and the closest experience is called among student closest growth area is bridging this gap through programs that scaffolding used by the teacher on a temporary basis to help the student linking the tow knowledge (Collins , 1991).

When the student can work on the task on its own, the support should ease or the teacher gives the students a more challenging assignments and teacher clarification students how to complete the task or solve the problem through a process of expression with words (Johnson, 1992).

Coaching: it is one of the most important approaches of cognitive discipleship where students are observed in the course of their attempts to complete tasks and provide them with allusions and assistance when needed.

Bransford & Vye, (1989) has pointed to several characteristics distinguish effective trainers, ones that coaches need to monitor the performance of learners to prevent them from moving away too much from the norm but leave them space of freedom for real sense of exploration and problem solving, and the coaches helping learners to thinking of their performance and compare with the performance of others. Also trainers used problem solving exercises to assess the cognitive status of the learners and use training to solve the problem to creating a moment of appropriate education.

Reflection: a technique based on making students reviewing their efforts to complete the mission and analysis their performance on the assumption that it enables students to compare their operations to solve the problem with those owned by the expert whether it is a teacher or an expert or colleague or model . Reflection such as interpretation, but it refers to previous missions backgrounds (Scradamali & Bereiter , 1989).

Reflection has four levels:

- Imitation: when expert displays the appropriate action.
- Replays: show when the coach portrays your business and bring him back criticizing and comparing it to the performance of the expert.
- Abstract replays: show when tracing key movements of the body of expert its example: the movement of the hands, elbows, knees and compare these movements with your movements.
- Physical location: Tracking parts of the body and determine its movement in the void site and thus make the abstract thing physically (Brown & Collins, 1989).

The results revealed a number of studies, that the use of cognitive discipleship strategy had an impact on the learning and teaching process where Awasana & Seymour (2004) held a study in which researchers used cognitive discipleship strategy in the ranks of teacher training in the University of Missouri in Columbia to test critical thinking skills related to complex educational problems where results indicated that individuals involved in the cognitive discipleship environment has improved their ability to concepts evidence when judging the dialectic issues and they were better able to use research results when making decisions related to the school complex problems , also Joatr and Solomon (2005) held a study aimed to use modeling and discipleship cognitive processes of scientific investigation in order to help students to improve understand the conceptual and production scientific questions with a high level and within the spirit of discipleship. The study sample consisted of (37) students worked through groups with existence of the teacher and Computer teacher to answer questions and provide feedback, the results showed an improvement in students' ability to Questions formation and that this improvement is an indication that the conceptual learning has taken place and achieved its objectives .

Joatr and Solomon (2005) also held a study aimed to use modeling and discipleship cognitive processes of scientific investigation in order to help students to improve understand the conceptual and production scientific questions with a high level and within the spirit of discipleship. The study sample consisted of 37 students worked through groups with existence of the teacher and Computer teacher to answer questions and provide feedback, the results showed an improvement in students' ability to Questions formation and that this improvement is an indication that the conceptual learning has taken place and achieved its objectives.

Kolecant & others (2006) also held a study aimed at developing the conceptual understanding and enhance communication skills through writing by using cognitive discipleship-oriented model where this form appears for

students experts thought processes, allowing them to experiment with expert strategies while working on a real assignments , 42 students were participated in the study and determined to be able to write scientific papers and how to search for the sources and use them. Where showed. results that scaffolding in cognitive discipleship strategy was useful in helping to identify targets as well as enable students to provide answers research to their questions from their work papers and achieve conceptual understanding.

In a study conducted by (Charney et al , 2007) looking for how high school students in response to the environment of the real learning by participating in summer institutes at Rutgers University, where he has been training students with experts in the field of genetics according to cognitive discipleship model and the results showed the evolution of ways of thinking among students in the issues that have been discussed, increase their ability to generate hypotheses, governance in the alternative hypotheses, implementation of models, communicate ideas, expand the concepts and ask questions ،these results indicate that students in the real practice of science can make a difference in their understanding and beliefs.

Braxava & Botha (2011) also held a study aimed at teaching math by using the virtual world (3D) on the basis of cognitive discipleship formed the study sample of the fifth and sixth grade students were taught unit fractures and showed quantitative and qualitative analyzes of the data collected to a significant improvement replies in the students and good absorption of sports concepts.

Cheng (2014) held qualitative study aimed to implement and evaluation a training program based on cognitive discipleship to investigate its impact on the improvement of professional skills for teachers of kindergarten where the implementation of the program for six months and was qualitative data represented by observations classroom, interviews and observations of teachers and results showed that the program may help to engage in constructivist education through the provision of external support such as education plans and models, guidance , cooperation in solving problems. Also, the relationship between supervisors and learners is the task of strengthening the capacities of the trainees to solve problems.

Seen from the display of previous studies on the impact of apprenticeship knowledge on the different variables that it showed positive results for the use of the style of cognitive discipleship, which researchers pay to try this method to teaching science, especially that the current search taking new aspects of an understanding of physics concepts and locus of control which did not address in Previous research in the range of science researchers. So this research comes to answer the follows main question: What is the impact of use cognitive discipleship strategy in the understanding of scientific concepts, among elementary students in the light of the concept of locus of control they have?

In the light of the previous main question, the study tried to answer the following sub-questions:

The study Questions

1- Are students' understanding of scientific concepts varies according to the teaching strategy (cognitive discipleship, the current way) among basic stage students?

2- Do students' understanding of scientific concepts varies depending on the locus of control (indoor, outdoor) among basic stage students?

3- Is there an effect of the interaction between teaching strategy (cognitive discipleship, the current way) and the locus of control (indoor, outdoor) in the understanding of scientific concepts among basic stage students?

Hypotheses of the Study

In light of the previous questions, the study tried to test the Zero hypotheses following:

First: there is no difference statistically significant (05.0= α) between the average understanding of scientific concepts among basic stage student who are studying cognitive discipleship strategy and the average understanding of their counterparts who are studying in the usual way.

Second: There is no difference statistically significant (05.0= α) between the average of understanding scientific concepts among students in basic stage depending on locus of control (indoor, outdoor) they have.

Third: There is no statistically significant (05.0= α) between teaching interaction strategy (cognitive discipleship, the usual) and locus of control (indoor, outdoor) in the understanding scientific concepts among basic stage student.

RESULTS AND INTERPRETATION

First, the results relating to the first, second and third study assumptions

For the purpose of reaching a clear results to accept or reject the first, second and third zero hypothesis related to understanding scientific concepts, it has been necessary descriptive data collection as follows: Descriptive statistics were extracted calculation of averages and standard deviations for signs of female members of the study on a test understanding of the scientific concepts of pre and post. Table 1 shows the summary of these statistics for signs of female members of the study on a test tribal understand scientific concepts and posttest.

Table 1: Means and standard deviations for the scores of female students to the pre and post tests of understanding scientific concepts according to the variables of the teaching strategy and locus of control

Strategy	locus of control	Pretest			Posttest		
		SMA	standard deviation	Number	SMA	standard deviation	Number
The experimental group	External	8,10	3,169	11	10,37	2,231	11
	Internal	11,86	4,399	26	14,28	3,158	26
	Total	10,71	4,399	37	13,13	3,410	37
The control group	External	8,85	3,806	7	8,28	3,121	7
	Internal	9,82	4,01	31	9,27	2,591	31
	Total	9,65	3,94	38	9,09	2,811	38
Total	External	8,34	3,368	18	9,57	2,730	18
	Internal	10,76	3,31	57	11,57	3,860	57
	Total	10,17	4,18	75	11,11	3,699	75

Table 2: Results from Two-way analysis of variance ((2x2 for scores of the members of the study on the post test of understanding of concepts, according to the variables of the teaching strategy and locus of control and the interaction between them

Contrast source	Sum of squares	Degrees of freedom	The average sum of squares	Value of "P "	Significance
Tribal	204.972	1	204.972	38.240	.000
Teaching strategy	143.001	1	143.001	26.365	.000
locus of control	24.994	1	24.994	4.561	0.034
locus of control × Teaching Strategy	9.355	1	9.533	1.734	.193
Error	377.08	70	5.4001		
total summation	1010.677	74			

Means and standard deviations for signs of the members of the study on a test Tribal understand scientific concepts and post according to the variables of the teaching strategy and locus of control.

It is noted from Table 1 that the averages signs of female students' members of the study with internal control and external control in the experimental and control groups to test the tribal understand scientific concepts differ outwardly. On the other hand, it is noted from Table 1 that there is a marked difference between the averages of students' members of the study marks on the test dimensional understanding of scientific concepts in accordance with the strategy of the variables and locus of control.

So, to test the significance averages were used accompanying contrast bilateral analysis (ANCOVA, 2x2) as to be regarded as signs of female students on the tribal understand scientific concepts variably joint as shown in Table 2.

The results of accompanying contrast bilateral analysis (2*2), for signs of female students to test the dimensional understanding of concepts, according to the variables of the teaching strategy and locus of control and the interaction between them.

It is noted from Table 2 that there is statistically significant differences (α=0.05) to the value of "P" (26.365) on the impact of the teaching strategy (discipleship cognitive, normal) in contrast student score in test understanding dimensional scientific concepts, showing modified averages Table 3 that this difference was for the benefit of female students of contained in the study group who had undergone a strategy cognitive discipleship, was (12.420) sing while the average rate was for the students of the study group who have undergone the usual way was (9.132) sing.

Table 3: Averages modified to perform the study sample to test understanding of scientific concepts

locus of control	The experimental group			The control group			Total		
	SMA	standard deviation	Average rate	SMA	standard deviation	Average rate	SMA	standard deviation	Average rate
External	10,37	2,231	11,278	8,28	3,121	8,841	9,57	2,730	10,102
Internal	14,28	3,158	13,557	9,27	2,591	9,410	11,57	3,860	11,490
Total	13,13	3,310	12,420	9,09	2,811	9,132	11,11	3,699	10,770

It is noted from Table 2 statistically significant differences ((α=0.05) to the value of "P" (4.651) on the impact the concept of locus of control (indoor, outdoor), in contrast female student score in test understanding dimensional scientific concepts, showing modified means in table (3) that this difference in favor of female students with the internal control site, where the rate was average for them (11.490) sing , while the average rate in external locus of control for students (10.102).

As can be seen from Table 2 the lack of statistically significant differences ((α=0.05) to the value of "P" (1.743) on the impact of the interaction between the teaching strategy and locus of control in understanding the dimensional concepts. This result demonstrates superiority of cognitive discipleship strategy compared to the usual way in the understanding of scientific concepts in addition to superiority of female students with internal locus of control on female students with external locus of control.

INTERPRETATION OF RESULTS

The results showed a statistically significant ((α=0.05) difference between the average students' understanding of scientific concepts attributed to the teaching strategy for the benefit of students who studied the strategy of cognitive discipleship compared to their counterparts of students who studied the habitual way .which indicates a outweigh the impact of teaching cognitive discipleship strategy on impact of the way normal in understanding the members of the study of scientific concepts can be explained this result in favor of the experimental group that style of cognitive discipleship new style focuses on student understanding and to make sure possession of scientific concepts and training on the use and application, unlike the usual way in which depends on the maintenance of information and replication without understand. It also focused on the cognitive style of discipleship install the article in the minds of students through meditation and interpretation and training in addition to the adoption of this style constructivist theory in terms of activating the role of the student and motivate learning he has.

Cognitive discipleship strategy also provided an educational and socially environment supported with discussion, dialogue, contact and exchange of ideas between members of the same group and between groups, which led to a better understanding of scientific concepts.

And away from the surface learning or deaf conservation educational material, to absorb and understand, and use them in their daily lives, it becomes learning has a meaning based on understanding, It can also be the reason that the style of cognitive discipleship stimulate students' motivation to learn as they learn a new style and using this new technique focuses on the role of the student seeks to make it an expert in the article are learning.

This result was consistent with a number of previous studies such as (Symou & Awasana) and Saymou study, where the results indicated that individuals involved in the cognitive discipleship environment has improved their understanding of the concepts of their ability to present evidence when judging of dialectic issues and were better able to use research results are best when making decisions related to the complex problems of school.

The results of this study also agreed with Solomon Joatr study, (Gautier & Solomon, 2005) results showed an improvement in students' ability to questions formation and that improvement is an indication that conceptual understanding has occurred and achieved its objectives .

As well as the results agreed with the results of Kolecant and others (Kolecant al et , 2006) study, where the results showed that the scaffolding in cognitive discipleship strategy was useful in helping to identify targets as well as enable students to achieve conceptual understanding .

And the current search results showed that outweigh female students with internal control to female students with external control in the understanding of scientific concepts.

This can be explained by the result and returned to a number of reasons, including the following:

That female students with internal locus of control noted they are more daring in the search for information and use them in a good way, and perseverance in the performance of tasks, and initiatives to challenge attitudes and difficult problems, and thus indulge in solving process, and to give new ideas and solutions which is a catalyst for the perseverance and determination among the students, to get to the desired understanding of scientific concepts.

The female students with internal locus of control has more sense of responsibility required by the educational

situation, and what happens to them of the results of success or failure, but respond to the initiatives and efforts of the students away from the luck factors, or chance, or the difficulty of the task, so female students with internal locus of control distinguished with high academic achievement.

By contrast, these properties diminish initially when female students with external locus of control who attribute the reasons for success or failure to the level that would arrive to him in every situation (tutorial) achievement site , is not subject to their abilities, or their potential, or their efforts they spend; but due to the factors they cannot control them, or tuned such luck factors, serendipity , difficulty of the task, and therefore, does not always bear the responsibility for their learning, or take remedial action to what they face problems, but also aware of themselves as individuals recipients only, and therefore do not achieve high scores.

The female students with internal locus of control have less anxious than female students with external locus of control. Researchers have noted that individuals with external locus of control, clearly and striking manifestation of the confusion seems to them to consider more than individuals with internal locus of control.

Anxiety is one of the relatively low factors that raise the students' motivation to learn, and promotes personal responsibility of each student to learn about, and push it to do more to achieve good levels of unwanted and retain understanding of the longest possible period of time. Hence, these results came to refer to the superiority of female students with internal locus of control on female students with external locus of control in the understanding of scientific concepts.

The results also showed that there is statistically significant (05.0= α) , the usual way), and the locus of control (indoor, outdoor) in the understanding of scientific concepts among students for interaction between teaching strategy (cognitive discipleship, the usual way), and the locus of control (indoor, outdoor) in the understanding of scientific concepts among students.

These could result interpreted on the basis that the impact of the teaching strategy was equal to female students with internal locus of control and female students with external locus of control both; that the performance of female students with internal locus of control was the best (top) of the performance of their native female students with external locus of control in strategies (cognitive discipleship, normal) alike.

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