

Cognitive and Metacognitive Strategies Teaching: Effects on ICT Application

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ABSTRACT

The purpose of the present study was to compare the effectiveness of cognitive and metacognitive strategies teaching on the amount of using ICT among Payam Noor university of Ardabil province. The research hypotheses were as follow: cognitive strategies instruction has an influence on the value of using information communication and technology, ICT; and metacognitive strategies teaching exerts an effect on the value of using ICT. Sixty participants who were randomly selected and divided into three conditions of cognitive, metacognitive and control group, involved the entire students (both men and women) of Payam Noor university of Ardabil province, Iran. The design of the study was quasai experimental multigroup pretest and posttest. The instrument applied was a researcher made test which was composed of seven ICDL skills. First all three groups were given a pretest then were trained some cognitive and metacognitive strategies ending up with a posttest. ANOVA and ANCOVA statistical tools were used to analyze the data. Results indicated a meaningful relationship between cognitive strategy teaching and the students' application of information technology and communication. There was no meaningful relationship between metacognitive strategy teaching and the application of information technology and communication. No remarkable difference was seen between the results of pretest and posttest of control group.

KEY WORDS: teaching, effectiveness, cognitive and metacognitive strategies, ICT.

INTRODUCTION

From the time when man used gesture and smoking for communication and conveying information to the invention of alphabet, many primitive technologies were used to record and maintain information. Some innovations however have not only had historical and fundamental effects on information development but have revolutionized many foundations of our society as well. The emergence of these technologies caused many changes in all societies (Gilory, 2001) and also was one of the most renowned reasons for application of ICT in a better environment and preparing students for workplace conditions in which ICT and especially computer and internet were increasingly used.

However, the obligation to find out about information systems and information technology in order to achieve the objectives of organizations is an undeniable fact. On the basis of the nature and objectives of varied organizations, they are obliged to utilize these instruments in an appropriate way to accomplish the specified goals. On the other hand, the nonstop electronic alternations and changes have made it vital for organizations to adopt these instruments to their survival unless will be forced to surrender the environmental affairs (Outarkhani, 2001). Therefore, regarding the surge of technology in the present age learning new skills which are required by the newly emerged occupations entails a scientific and technological foundation and also a set of high cognitive and social skills like problem solving, flexibility, alertness and cooperation and group work. Students of universities are then as the prospective work power will be necessarily in need of a large range of knowledge and required skills for new technologies and globalization of knowledge. In addition, it is compulsory to be updated and flexible in order to become compatible with constant changes (Haddad, Vadi, Draxler and Alexander, 2005). Then, we are required of an effective learning approach to better instruct the ICT skills. In spite of the fact that an effective learning approach to an enhanced ICT instruction is an obligation, nowadays the most influencing approach is the information processing approach from which many other approaches have been originated. Put it this way, learning is claimed to be established as a result of receiving environmental stimuli and their passing

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through the short term memory, being meaningful and finally positioning in the long term memory (Seif, 2006). In a survey, Ghorbani (2006) studied the effect of teaching cognitive and meta cognitive strategies on the students ICT, the following results were reported: 1. Teaching cognitive strategies cause the learners to function effectively 2. Teaching meta cognitive strategies cause the learners to function effectively in ICT skills. In a research, Fahimzade (2006) found that teaching metacognitive strategies will not be conducive to effective learning among university students in the short run. In a study, Hagzien *et al* (2001) revealed that only a meager percentage of the teachers possessed the ICT skills (Kruch 2003). Rossen Shine and Mister in 1999 also found that the teaching of cognitive strategies would have a positive effect on the students' ability to use ICT skills and makes them to appropriately surf in the specified internet sites and achieved the following results:

1. Teaching cognitive strategies increases the learners' potentiality to learn ICT skills, specifically internet skills,
2. Teaching cognitive strategies enable the students to do their assignments rapidly and appropriately (Insk, 2001). In another research by Renta, Allen and Stewart in (2001) the results achieved by Rossen Shine and Mister were approved. The researchers conducted the study on a group of a computer firm stuffs named Jacksen and achieved the following results:
1. The teaching of cognitive strategies is not effective on the stuffs ability to work with computer in the office, while effective in their personal jobs.
2. The effect of metacognitive strategies instruction was really influencing and caused to gain in time, that is, the strategies were time consuming for the stuffs.
3. About 85 percent of the students were managed to learn and perform the metacognitive strategies appropriately.
4. The group who were trained on both cognitive and metacognitive strategies was indicated to be successful in 90 percent of the cases (louka and Mc Lohan, 2004).

Research hypothesis

1. Cognitive strategies teaching is influencing on the value of using information communication and technology, ICT.
2. Metacognitive strategies teaching is influencing on the value of using ICT.

METHODOLOGY

The study makes use of a quasai-experimental design and compares the effect of teaching of cognitive and metacognitive strategies on the Ardabil province Payame Noor University students' ICT application. In this research, except for the dependent and independent variables, other variables such as sex, place and time are controlled.

Research population of the study is all the students of Ardabil province Payame Noor University who are taking their courses at the time research. The number of participants was 60 who were selected randomly and assigned in to three conditions as follow:

Cognitive group, Metacognitive group and control group. In this study the pretest and posttest multigroup design has been used.

The design of the study is as follow:

E1	T1	T2	X1
E2	T1	X2	T2
C	T1	-	T2

Teaching cognitive strategies: x1

Teaching metacognitive strategies: x2

Each individual group is illustrated with capital E above, so the group who is instructed to learn cognitive strategies are indicated with E1 and the group who is instructed metacognitive strategies is indicated with E2 and the control group is indicated with C.

The study utilizes a researcher made test that is proved to have an appropriate validity but the reliability of the test was examined by the Kuder-Richardson 21 which showed reliability index of 0.88.

Procedure

First and foremost a pretest was given for the students who were randomly assigned as cognitive, metacognitive and control group to examine their knowledge of ICDL skills and each group, 20 students, were specifically instructed the specified strategies.

The instruction therefore involved cognitive strategies teaching and their practical functions in ICDL skills to one group while the other group was instructed on the metacognitive strategies and their practical functions in ICDL skills. Each strategy teaching session composed of 3 sessions which lasted for 45 minutes each. The instruction is performed by cooperation of a soft ware engineer who was trained about cognitive and metacognitive strategies and their practical relevance to the ICDL skills in advance individually.

In order to give a posttest after two weeks on their ICDL skills, after the termination of the instruction of course, a file which was related to the cognitive strategies was delivered to the cognitive group and a file which was related to the metacognitive strategies was delivered to the metacognitive group.

E1 instruction program

The first session

In this session participants are acquainted about the concepts, kinds of memory, their structure and the reasons of forgetting in brief. Then repetition and simple and meaning bearing issues of specific review strategies were instructed and they were reminded that in learning and using of the ICDL skills they can recite an issue for themselves and separate them into parts and also by practicing in interval between the separated parts or units they can study theoretically and perform them practically. If necessary, participants could write the crucial issues repeatedly.

They were also instructed about underlying important issues, high lighting, note taking and copying important issues. All of the so called skills are practically instructed by the help of a soft ware engineer.

The second session

In this session the strategy of meaning extension was instructed to the students in a way that they could be finally able to, with recourse to this strategy, construct a meaningful relationship among their previous and current information and skills.

Mental imagery and interfering strategies are then instructed in which the meaningful relationship between the learnt issues are formed by establishing a mental relationship between them and they are all practically implemented and exercised. The acronym strategy was also discussed which is used to learn ICDL skills. All the skills were practically exercised.

The third session

Organization strategy and all its subsets involving: cellular, pyramid and overlapping procedures was instructed in this session.

The present strategy not only links the previous and current information but also present an organizational framework for them which were then instructed and explicated in detail.

The instruction program of E2

The first session

In this session the participants were told about some concepts, kinds of memory its structure and the reasons for forgetting in brief. The planning strategy was also instructed. It includes determination of the goal of learning and application of ICDL skills, envisaging the time of learning rehearsing, specification of suitable speed, difficulty level of learning and utilization of them in these skills, selecting an appropriate learning and use of ICDL skills strategy. All the so called skills were practically implemented.

The second session

In this session the control and monitoring strategies instructed which makes the learners to assess and evaluate their learning check the way they make advancement and development. Some of the procedures are utilized follows:

Monitoring the howness of attending while reading a text, asking questions from themselves when studying and controlling the time and so forth in the comprehension and conducting the flow of study and learning are samples of monitoring strategies which instructed discussed practically.

The third session

In this session the ordering strategy, which includes permanent metacognitive adaptations and reconstructions taken by the learners in case of related feedbacks to the errors, is instructed.

The descriptive statistics which is related to the seven pre test ICDL skills are indicated in the table 1 below:

Table 1. Results of seven ICDL skills pre-test

Skills Statistics	Basics	Windows	Word	Excel	Access	Power point	Internet	Total
N	60	60	60	60	60	60	60	60
Mean	10.10	5.60	6.87	4.67	5.87	5.63	5.67	44.40
Std. Deviation	2.427	2.519	4.180	3.123	6.786	4.529	4.103	18.334

According to the table 1 from among the skills the basics possesses the highest mean while the skill of excel have the least of all. It is also clear that the access skill have the highest Standard Deviation while the basics have the least of all.

Table 2. Results of seven ICDL skills post-test

Skills Statistics	Basics	Windows	Word	Excel	Access	Power point	Internet	Total
N	60	60	60	60	60	60	60	60
Mean	11.05	6.37	8.47	4.97	8.07	8.38	8.93	56.23
Std. Deviation	2.645	2.343	3.481	2.442	4.194	3.858	3.714	16.050

According to the information in table 2 the basics has the highest mean and the excel skills has the least. The access skill has the highest Standard Deviation while the skill of windows has the last.

DATA ANALYSIS

To answer the research hypotheses of the present study ANOVA statistical tool was utilized. First the descriptive indexes of cognitive, metacognitive and control group are given below:

The first research hypothesis:

Cognitive strategies teaching is influencing on the amount of using information communication and technology, ICT.

The second research hypothesis:

Metacognitive strategies teaching is influencing on the value of using ICT

Table 3. Mean and Standard Deviation of three groups

Groups	N	M	SD
cognitive	20	20.05	28.878
metacognitive	20	18.85	19.940
control	20	0.60	1.095
total	60	11.83	21.542

According to the information provided in table 3, it is clearly observed that the cognitive group outperformed the two other groups, that is, metacognitive and control group, mean: 20.205 and standard deviation: 28.787.

In order to examine the research hypotheses of the study all three groups were given a pre test. Once the cognitive and metacognitive groups are taught about the strategies suitable to each group they were then given a post test. To analyze data, the scores of pre test and post test were subtracted and differentiation scores, post test – pre test = differentiation score, then were put in one way ANOVA. The rationale behind this was that we had three groups. Table 4 indicates the figures driven by the one way ANOVA on the differentiation scores.

Table 4. One way analysis of variance

	Sum of squares	df	Mean Square	F	Sig.
Between Groups	4056.033	2	2028.017	4.960	.010
Within Group	23322.300	57	409.163		
Total	27378.333	59			

Table 4 indicates that the proportion of F is meaningfully significant, 0.01, (since significant level of F is less than 0.05, zero was eliminated). To distinguish the difference among groups, Scheffe Post Hoc test had been used. Table 5 charts the results:

Table5, figure driven from Scheffe test

Between groups comparison	means difference	Std. Error	Sig.
Meta cognitive and control	14.25	6.40	0.09
Cognitive and control	19.45	6.40	0.01
Cognitive and meta cognitive	5.20	6.40	0.72

Table 5 indicated that only cognitive and control groups differed significantly $P < 0.01$, while the remaining two groups didn't significantly differ in terms of mean and standard error.

The first hypothesis:

Since the significant level of cognitive control group is less than 0.05, we can reject the null hypothesis and conclude that the mean of cognitive group is more than the control group.

The second hypothesis:

Since the significance of differentiation of means of cognitive and control group is more than 0.05 we cannot reject the null hypothesis. We conclude that the mean of metacognitive group is not more than control group.

DISCUSSION AND CONCLUSION

On the basis of the results we achieved it is concluded that the first research hypothesis is significantly different; this means that by teaching cognitive strategies to the students, the students will be in better chance of utilization of the skills needed for ICDL. The result we achieved in this research is in line with that of the research done by Fazeli, 2006 Shine and Myster, 1999 in which the results of teaching cognitive strategies were a positive one. they have also claimed that the approach causes development and advancement in personnel who were working with internet.

In concordance with the results of the previous studies in this field we are authorized to state that teaching cognitive strategies was satisfactorily effective on Ardabil province Payam Noor university students who were utilizing ICT. The results we achieved in terms of second hypothesis i.e. whether teaching metacognitive strategies are conducive to any kind of development or not is not same with a research findings gained by Fazeli, 2006. The participants' capriciousness toward the metacognitive teaching session may be a probable reason why these strategies were not of that usefulness to the metacognitive group.

Last but not least it is highly proposed that higher education centers specifically distance education centers should feel the necessity to cater for different sorts of information and communication technology ICT for students attending in these institutions.

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