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RESEARCH ARTICLE

COGNITIVE LOAD THEORY AND EFFECTIVENESS OF COMPUTER – ASSISTED ENGLISH LANGUAGE LEARNING

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ABSTRACT

This study aimed at investigating the effect of using a CAELL instructional program of English grammar, the Degrees of Comparison, under the Cognitive Load theory framework on the achievement of IX Standard school students. The sample of the study consisted of 240 students distributed randomly on three experimental groups and three control groups. The instruments of the study were an instructional software program for teaching the Degrees of Comparison and an automated assessment is incorporated in the module itself. An Analysis of covariance was used to find out the significance of the Variables Vs Goal-free effects on the students' achievement in the Degrees of Comparison. The findings of the study revealed that: 1. there were statistically significant differences on Cognitive factor Goal- free problem effect on the students' achievement on post- scores in grammar attributed to Computer Exposure (At Home, School& Both) of the experimental group. The difference is significant on the Experimental group students those who have Computer Exposure with respect to Goal –free problem effect.2. There were statistically significant differences on Cognitive factor Goal-free problem effect between the students' achievement on post- scores in grammar attributed to Gender of the experimental group. The difference is significant on the experimental group students based on gender with respect to Goal-free problem effect. In light of the findings of the study, it was recommended that English Language teachers could use CAELL instruction programs under the Cognitive Load Theory framework.

INTRODUCTION

Every learner is an individual with different needs and abilities of learning a language. Traditional methods of teaching a language placed the teacher in the role of a transmitter of knowledge while learners were seen as passive recipients of this knowledge. In the group instructional system, the speed is generally determined by taking into consideration the level of the average students. The below average students feel or the so called slow learners cannot cope with this speed and so they achieve far below their capacities. But the average students or the gifted do not feel any challenge and they also achieve far below their capacities. So what we need urgently is some kind of reorientation in our instructional system which will fulfill the demands of every individual. As a result, the concept of individualized instruction is increasingly gaining importance. Educational technology plays a leading role in individualized instruction. Computers and language learning are closely inter-related and the judicious integration of both can enable students to organize and process their knowledge at the touch of keyboard button. This innovative approach to language learning, which is a variation from the conventional classroom based-instruction, will definitely yield exciting and rewarding results in language teaching.

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Need for the Study

In the light of the information revolution and the scientific challenges of the 21 st century, there is a sweeping trend to use computers in all aspects of life and education is no exception. As the world is heading towards knowledge economy, lot of money is invested in CAELL instructional programs. Therefore it is worth investigating the Effectiveness of such CAELL programs under the Cognitive Load Theory framework. The aim of the study tends to explore how the students achieve themselves in learning the English Language with the aid of CAELL under the COGNITIVE LOAD THEORY framework. The research combining the two fields is not common so far, which makes this study important.

This study would like to address three questions:

1. Are there any cognitive factor Goal- free effect statistically significant differences ($\alpha < 0.05$) between the students' achievement on post-scores in grammar attributed to Computer Exposure (At Home, School& Both) of the experimental group.
2. Are there any cognitive factor Goal- free effect statistically significant differences ($\alpha < 0.05$) between the students' achievement on post- scores in grammar attributed to Gender(Male & Female) of the experimental group.

3. What are the implications of the Cognitive factor Goal – Free effect in a CAELL program.

Objectives of the Study

1. To find out the cognitive factor (Goal – Free effect) which contributes to the students of the experimental group based on the Variables - Computer Exposure and Gender.

Hypotheses of the Study

The post-test scores of experimental group were analyzed for finding significant difference between groups of the two demographic variables and different levels of cognitive factor variable. Since the cognitive factors were introduced to assess their effect on post-test scores. The interaction effect of the demographic variables Vs cognitive factors was also studied for the following hypothesis were framed and tested.

Ho: 1

1. The post-test scores of experimental group do not differ significantly based on Computer Exposure, between the levels of cognitive factor Goal free effect and the interaction effect of Computer exposure Vs Goal free effect.

Ho: 2.

1. The post-test scores of experimental group do not differ significantly between Gender , between the levels of cognitive factor- Goal-Free effect and the interaction effect of Gender Vs Goal free effect.

METHODOLOGY

Experimental method was adopted for this study.

Sample for the Study

The population of the study consisted of IX standard students of three schools of three different boards (State board, Matriculation and CBSE) in Erode district in Tamilnadu. The students were selected on the basis of purposive sampling. 240 students were selected for the study.

Tools Used in the Study

Software based on Cognitive Load Theory was developed by the investigator for teaching the English grammatical item "Degrees of Comparison" included in the IX Standard English curriculum in Tamilnadu.

Statistical Techniques Used

Two way Analysis of variance

Analysis and Discussion

The data have been analyzed be SPSS Package and interpretation of data is given below.

Goal – Free effect and Variable Gender with Two Categories

Analysis of co. variance was applied to test the above three hypothesis after the post-test scores were adjusted with the pre-test scores. The result of ANCOVA is given below. From the above table, it is seen that the 'F' value for the co-variant pre-test effect is 59.031 which is to be significant at 1% level. The 'F' value for between- gender (groups) is 10.626 which is found to be significant at 1% level. The 'F' value to test different levels of Goal free effect is 69.464 which is found to be significant at 1% level. The 'F' value to test the interaction effect of gender Vs Goal free effect is 4.156 which is also found to be significant at 5% level. There is a significant difference between-Gender (groups) in the post-test scores. The post-test scores varies significantly among low, moderate and high level of cognitive factor goal free effect and there is a significant difference in the combination of Gender and Goal free effect (interaction effect). Hence the hypothesis with respect to, Gender, and Goal free effect and gender Vs Goal free effect were rejected.

Goal- free effect and Variable Computer Exposure with Three Categories

Analysis of co. variance was applied to test the above three hypothesis after the post-test scores were adjusted with the pre-test scores. The result of ANCOVA is given below. From the above table, it is seen that the 'F' value for the co-variant pre-test effect is 56.573 which is to be significant at 1% level. The 'F' value for Computer Exposure (groups) is 8.455 which is found to be significant at 1% level. The 'F' value to test different levels of Goal free effect is 27.888 which is found to be significant at 1% level. The 'F' value to test the interaction effect of Computer Exposure Vs Goal free effect is 3.684 which is found to be significant at 1% level. There is significant difference on Computer Exposure (groups) in the post-test scores. The post-test scores varies significantly among low, moderate and high level of cognitive factor Goal free effect and there is significant difference in the combination of Computer Exposure and Goal free effect (interaction effect). Hence the hypothesis with respect to, Computer Exposure, Goal free effect and interaction effect between Computer Exposure Vs Goal free effect were rejected. (Table.1)

FINDINGS

There is a significant difference between-gender (groups) in the post-test scores. The post-test scores varies significantly among low, moderate and high level of cognitive factor goal free effect and there is a significant difference in the combination of gender and Goal free effect (interaction effect). Hence the hypothesis with respect to, gender, and Goal free effect and gender Vs Goal free effect were rejected. There is a significant difference on Computer Exposure (groups) in the post-test scores. The post-test scores varies significantly among low, moderate and high level of cognitive factor Goal free effect and there is significant difference in the combination of Computer Exposure and Goal free effect (interaction effect). Hence the hypothesis with respect to Computer Exposure, and interaction effect between Computer Exposure Vs Goal free effect and Goal free effect were rejected.

Conclusion

It is concluded that

Table 1.

		Pre-Test									Post-Test								
		Cognitive Factors-G.F.E									Cognitive Factors-G.F.E								
		Low (<2.35)			Medium (2.36-2.82)			High (>=2.83)			Low (<2.35)			Medium (2.36-2.82)			High (>=2.83)		
		Mean	S.D	No	Mean	S.D	No	Mean	S.D	No	Mean	S.D	No	Mean	S.D	No	Mean	S.D	No
Computer Exposure	At school	4.00	2.72	14	2.20	1.61	15	1.23	1.33	31	21.00	3.49	14	22.87	1.77	15	24.39	.72	31
	At home	5.00	1.41	2	3.00	.	1	1.50	.71	2	4.40	2.44	15	1.69	1.58	16	1.00	1.35	24
	Both	4.40	2.44	15	1.69	1.58	16	1.00	1.35	24	22.27	2.28	15	22.50	1.79	16	24.54	.72	24
TOTAL		4.26	2.48	31	1.97	1.58	32	1.14	1.32	57	21.74	2.87	31	22.63	1.76	32	24.46	.71	57

Table 2.

	Sum of Squares	df	Mean Square	F	Sig
Covariate—Pre—Test	119.713	1	119.713	56.573	**
Between computer Exposure	35.782	2	17.891	8.455	**
Between Levels of G.F.E	118.025	2	59.013	27.888	**
2—Way Interactions Computer Exposure x G.F.E	31.185	4	7.796	3.684	**
Residual	232.767	110	2.116		
Total	537.472	119			

Table 3.

		Pre-Test									Post-Test								
		Cognitive Factors- Goal- Free Effect									Cognitive Factors-Goal-Free Effect								
		Low (<2.35)			Medium (2.36-2.82)			High (>=2.83)			Low (<2.35)			Medium (2.36-2.82)			High (>=2.83)		
		Mean	S.D	No	Mean	S.D	No	Mean	S.D	No	Mean	S.D	No	Mean	S.D	No	Mean	S.D	No
Gender	Male	4.06	2.86	17	1.79	1.53	14	1.24	1.27	29	20.76	3.25	17	22.21	2.08	14	24.45	.78	29
	Female	4.50	1.99	14	2.11	1.64	18	1.04	1.37	28	22.93	1.82	14	22.94	1.43	18	24.46	.64	28
TOTAL		4.26	2.48	31	1.97	1.58	32	1.14	1.32	57	21.74	2.87	31	22.63	1.76	32	24.46	.71	57

Table 4.

	Sum of Squares	df	Mean Square	F
Covariate—Pre—Test	113.726	1	113.726	59.031
Between Gender	20.471	1	20.471	10.626
Between Levels of G.F.E	267.653	2	113.827	69.464
2—Way Interactions Gender x G.F.E	16.012	2	8.006	4.156
Residual	217.700	113	1.927	
Total	537.467	119	4.517	

1. There were statistically significant differences ($\alpha < 0.05$) on Cognitive factor Goal- free problem effect on the students' achievement on post- scores in grammar attributed to Computer Exposure (At Home, School& Both) of the experimental group.
2. There were statistically significant differences ($\alpha < 0.05$) on Cognitive factor Goal-Free problem Effect between the students' achievement on post-scores in grammar attributed to Gender(Male & Female) of the experimental group.

Students those who have Computer Exposure are having positively significant association with respect to Goal –free problem effect. Students based on gender are having positively significant association with respect to Goal-free problem effect

The following conclusions favor the above mentioned findings:

The study by Sweller and Levine (1982) revealed that students showed better learning from goal-free problems than means-ends analysis problems because the former condition did not give an excessive burden on limited working memory. Sweller, Mawer, and Ward (1983) ran several experiments using kinematics and geometry problems with secondary students. The kinematics problems were similar to the one used as an example above. The geometry problems used theorems such as vertically opposite angles are equal and the external angles of a triangle equal the sum of the opposite internal angles. Conventional geometry problem required students to find a value for a particular angle in a diagram, whereas goal free problems asked students to find the values of as they could. The general procedure was to provide a conventional group with relevant instruction in kinematics or geometry, followed by an acquisition phase involving practice at solving conventional problems. An identical procedure was followed by goal-free groups except that the practice session used goal-free rather than conventional problems. Common tests using conventional problems were then used to assess learning. Results were consistent. Sweller, van Merrienboer, and Paas indicated that goal-free groups were superior in terms of schema construction. Similar results were obtained by Owen and Sweller (1985) in the domain of trigonometry. Sweller(1988), using computational models and secondary tasks, provided evidence of a substantial reduction in cognitive load when using a goal-free as opposed to a conventional, means-ends, strategy.

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