

The Effect of Courseware Utilization to the Student's Achievement for Field Independence-dependence Cognitive Styles Student

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ABSTRACT : The aim of this research is to study about the effect of using courseware in the learning process for student that posed field independence-dependence cognitive styles. This research involved two group of students which purposely chosen from the electrical engineering department in one of polytechnic in Malaysia. The research design for this study is quasi-experimental which involved pre test and post test as the instruments. Besides, this study also involved the usage of Group Embedded Figures Test (GEFT) and questionnaires. Group Embedded Figures Test (GEFT) was used to determine whether the student is in field-independence group or field-dependence group. This research is focusing on the difference of student achievement between the control group and treatment group. Besides, the difference between the field- independence students and field-dependence student are also to be compared. The test that has been use in this study is independent t test which the result of that test is, there is significant difference between control and treatment group in their test result. There is also significant difference between control and treatment group of field- dependence student but there is no significant difference between them for the field- independence students. As conclusion, courseware usage is effective among the field- dependence students but is less effective than the field-independence students while there are compared by their test achievement.

Keyword: *Courseware, Field Independence-Dependence, Cognitive Styles, Quasi-Experimental, Group Embedded Figures Test, Chalk & Talk*

1.0 INTRODUCTION

Teaching and Learning process nowadays have changed from previous and yet still on evolving process, mastery in oral and writing no longer sufficient in education activities. Advancement of technology has driven a strong demand for more sophisticated teaching instruments such as computer application, video, and various different equipment which able to combine visual, audio and text elements. Indeed, there is an increasing of population of educators that prefer utilizing instruments and teaching materials based on multimedia in Malaysia.

In technical and vocational field of studies, information technology and communications often used to enhance teaching and learning process. Applying ICT in teaching and learning process in field of Technical Education and Vocational mean using ICT ethically, well planned and suitable enough to improve efficiency and effectiveness in education activities. Multimedia Software is one among alternatives in diversifying education media and give exposing to students on richness of multimedia system (Ismail, 2002).

According to Faizah et.al (2005), Multimedia system will provide an attractive learning experience, more effective and encouraging and can adapt with individual needs. Besides of use multimedia as reference material for students, it actually can be combined as additional teaching tools (ABBM). According To McEwan and Cairncross (2004), multimedia has the potential to create a higher learning quality. Multimedia can be used to convey information that given and users effectively, they can learn through media channel and it is time efficient.

Effectively applying courseware as teaching tools will encourage students to master their field of studies. Majority of users prefer mastery approach for software developments. Learning mastery is an approach in teaching and learning activities to ensure students are able to master what have been taught and achieve their academic objectives (Mok Soon Sang, 2008). It is due to the mastery approach simplify and level out academic difficulties that fit to user's competence (83.33%), and yet it helps users to master topics they are studying easily (86.11%). In short, mastery approach will improve learning process effectiveness. This approach also helps users to master their topics of studies according to style and capability to a way better fit to them (Junaidah and Rasyidah, 2006).

Effectiveness of using multimedia for academic activities are actually depends on users, especially students. Each student has their own learning manner. Researches carried out before shown a variety ways of students in learning process, some of them learned by traditional visual and verbal activities, some of them comfortable in reflective and manipulative way, and there are students who prefer to learn in groups or individually. In Felder Silvermann Learning Manners, there are four learning manners which are Active or Reflective, Visual or Verbal, Rentet or Global, and Sensing or Intuitive (Baharom et al, 2008). Students also show a difference between their memory powers. Ismail (2002) pointed out individual memory power will only memorized:

- i. 20% of what they read
- ii. 30% of what they heard
- iii. 40% of what they looked
- iv. 50% of what they said
- v. 60% of what they done
- vi. 90% of what they read, heard, looked, said and done at same time.

Multimedia is able to fulfill the sixth feature as it able to present texts, graphics, videos, audios and animations at the same time (Faizah A. Karim et al, 2005)

Courseware also involves utilizing graphics elements in teaching and learning process. According to Narayasamy (2000), by effective graphics presentation and management, students will improve their thinking skills more explicit and concrete actively. Teaching and learning process will be more effective with utilization of graphics.

Attachment of animations into multimedia will also boost up students' comprehend and ease up their learning process. According to Clark & Mayer (2003), using combination of visual and pictures will improve cognitive ability, where Dahlqvist (2000) point out animation graphics is more appropriate as it is able to present two important features that are motion and trajectory.

For the field of Technique and Vocational, technological enhanced teaching and learning activities will improve students' intellect for those abstraction and intricacies of subjects. Multimedia should high depend by students as it will strengthen their remembrance in studies.

In Malaysia teaching and structure, although there was infrastructures or teaching tools being supplied to improve students' academic performance, however, the effect is not yet clear to be determine. It may highly because of few factors like individual difference and

decentralized teaching method. As it, this survey is to figure out effectiveness of courseware on students' academic performance with consideration of their individual cognitive features. Exercising of educational software or courseware for teaching and learning activities being seems as an alternative to strengthen national academic performance. However, allocation and expenditures to design courseware will squander if it cannot replace conventional teaching method. Ting Kung Shiung and Woo Yoke Ling (2005) suggested chalk and talk have to be replaced with modern technology. A survey from Noriah et al (2002) indexed conventional teaching method will limit students' learning outcome and educators will find embarrassment in providing students' better quality of learning experience.

Besides, utilization of multimedia in academic industry should take in consideration for few factors like students' learning styles and their cognitive ability especially for those students in field of dependence-independence. Students in this field hold variety of learning pattern, if the teaching manner not suit to them, they will find difficulties to achieve a good academic results. For technical subjects in Polytechnic, students posed field-dependence will face difficulties more than students with field-independence. From a research by S. Tai et al (2001), students with field- independence will score better academic results than students with field-dependence in engineering subjects. This dissimilar of cognitive ability have to count in teaching and learning process to consider whether to use multimedia academic software or not.

2.0 METHOD

2.1 Research Objective

The objective for this research is to pinpoint the difference in academic result from two groups of students who received different teaching methods, which are Conventional Teaching method and Courseware method for a same Electrical Engineering subject. Besides, this research will also indentify possibilities of significant difference in students' academic result among Treatment and Control group according to their circle of Field-Independence and Field-Dependence. Lastly, this research will value courseware method according to students' perspective for subject Electrical Engineering from 5 criteria that are: User's Facilities; Interface Suitability; Interaction Suitability; Assistance in Learning and; Motivation.

2.2 Procedure

This survey used quasi design experiment where number of students being divided to two sample groups: Control group where they taught by conventional teaching method; and another Treatment Group where they received courseware learning method. Each student was given a GEFT test to differentiate and group them according to their cognitive ability. Survey targets were chosen from semester 1 students in Diploma in Electrical Engineering and Electronic, Polytechnic Kementerian Pengajian Tinggi, Merlimau, Melacca, Malaysia. A total of 33 students from class DET1A enrolled into Treatment Group while 33 students from DET1B joined Control Group.

2.3 Test Instrument

Before experiment starts, a pre-test was given to both groups to measure academic result from 3 units from subject Electric Technology 1. After they gone thru their own teaching-learning method, a post-test were then given to both groups of students to identify their academic result. Finally, a set of questionnaire was distributed to students in Treatment Group to identify suitability of the courseware.

3.0 RESULTS

Table 1 below indicated GEFT results that un-puzzled 37 students being categorized to *Field-Dependence* and 29 students being categorized into *Field-Independence*.

Table 1: Separation of respondents according to their Cognitive Ability

GEFT Result	Control Group	Treatment Group	Cognitive Ability
0-9	18	19	Field-Dependence
10-18	15	14	Field-Independence
Total	33	33	

To identify whether there were any difference among Treatment Group and Control Group, a *t-free* Test was conducted to confirm research hypothesis in early stage was accepted or not. According to table 2, shown a significant value of 0.001 that was below significant level $p < 0.005$. As a result, hypothesis null being rejected and there is a significant difference in academic result between Treatment Group and Control Group.

Table 2: t-free Test among Treatment Group and Control Group

Group	N	Min	Standard Deviation	t	df	Sig.
Control	33	15.3636	3.5516	-0.3488	64	0.001
Treatment	33	18.3934	4.6967	-0.3488	59.579	0.001

Table 3 shown a difference in Min among Treatment Group and Control Group according to their Pre-Test and Post-test results. It is clearly stated that Treatment Group hold a higher Min score that was 8.1813 than Control Group that was only 5.3636.

Table 3: Min Score among Treatment Group and Control Group

Group		Pre-Test	Post-Test	Increment
Control	Min	10	15.3636	5.3636
	N	33	33	33
	Standard Deviation	2.8723	3.5516	0.6793
Treatment	Min	10.2121	18.3934	8.1813
	N	33	33	33
	Standard Deviation	3.3889	4.6967	1.3078

Table 4 indicated a difference in Cognitive Ability that was *Field-Dependence* and *Field-Independence* between Treatment Group and Control Group. For students who posed Field-Dependence, significant value for *t-free* Test among both groups was 0.001. This value shown a significant difference among both groups who hold a Field Dependence Ability, whereas the value was below significant level 0.05, hypothesis null was then rejected.

Table 4: t-free Test among Treatment Group and Control Group for Field- Dependence

Group	N	Min	Standard Deviation	t	df	Sig.
Control	18	13.8889	2.9082	-3.693	35	0.001
Treatment	19	17.9474	3.704	-3.717	33.865	0.001

Table 5 shown a significant value of 0.08 that was more than significant level of $p > 0.08$ mirrored out there was no significant changed among Treatment Group and Control Group that posed Field-Dependence. As it, hypothesis null accepted. Treatment Group holds a higher score of 20.2857 than Control Group 17.1333.

Table 5: t-free Test among Treatment Group and Control Group for Field- Independence

Group	N	Min	Standard Deviation	t	df	Sig.
Control	15	17.1333	3.5227	-1.817	27	0.08
Treatment	14	20.2857	5.6491	-1.788	21.517	0.088

Table 6 shown a comparison in Min score between Treatment Group and Control Group on their pre-test and post-test. Control Group showed an improvement on *Field-Dependence* that was 3.500 min score, however, Control Group on *Field-Independence* turn up a higher min score of 7.600. On the other hand, Treatment Group presented an 8.000 min score on *Field-Dependence* and 9.7143 min score on *Field-Independence*. This result revealed that individual who posed Cognitive Ability of Field-Independent has higher academic result than individual who posed Field- Dependence no matter from Treatment Group and Control Group.

Table 6: Min Score for Pre-test and Post-Test by Treatment Group and Control Group

Group	Cognitive Ability		Pre-test	Post-Test	Increment
Control	Field-Dependence	Min	10.3889	13.8889	3.5
		N	18	18	18
		Standard Deviation	3.0705	2.9082	-0.1623
	Field-Independence	Min	9.5333	17.1333	7.6
		N	15	15	15
		Standard Deviation	2.6422	3.5227	0.8805
Treatment	Field-Dependence	Min	9.9474	17.9474	8
		N	19	19	19
		Standard Deviation	3.274	3.704	0.43
	Field-Independence	Min	10.5714	20.2857	9.7143
		N	14	14	14
		Standard Deviation	3.6313	5.64908	2.0178

One of the criteria to test is convenience of the courseware designed. Table 7 indicated a high total min of 4.115 as it was given a high appraisal.

Table 7: Min Score for Convenience of Courseware

Item	Item	Min Score	Standard
1	This software is easy to use.	4.0606	High
2	I'm not facing any problems when using this software.	4.0303	High
3	I can exit this software at any time.	4.0909	High
4	Every instruction given by this software is easy to understand.	4.2727	High
5	I can explore the software without interferes.	4.1212	High
Total		20.5757	
Min		4.115	High

Table 8 showed a highest min for item 7 that is 'Wordings in this software are easy to read' where lowest min in table 8 is 'Background music in this software is suitable for target users'.

Table 8: Min Score for FrontPage Suitability

Item	Item	Min Score	Standard
6	This software has suitable background colour.	4.2424	High
7	Wordings in this software are easy to read.	4.4242	High
8	Animations in this software are attractive.	4.2424	High
9	Background music in this software is suitable for target users.	3.8182	High
10	Icons used are easy to understand.	4.0303	High
Total		20.7575	
Min		4.1515	High

Table 9 indicated a high min of 4.8485 that is ‘After use this software, I can answer questions from achievement test correctly’, whereas lowest min score in this table is 3.9697 as ‘Lesson delivery in this software is orderly arranged’.

Table 9: Min Score for Interaction Suitability

Item	Item	Min Score	Standard
11	Lesson delivery in this software is orderly arranged.	3.9697	High
12	This software often gives me proper guideline to use it.	4	High
13	Information present in this software is easy to follow.	4.1515	High
14	Table of contents organized according to curriculum model	4.0303	High
15	After use this software, I can answer questions from achievement test correctly.	4.8485	High
Total		21	
Min		4.2	High

Table 10 surveyed utilization of courseware in learning process. Highest min scored is 4.2727 from ‘Contents are correct and not misleading’. It implied majority of students agreed this courseware will improve their academic performance.

Table 10: Min Score for Bestead of Contents

Item	Item	Min Score	Standard
16	I can understand lessons for every topic easily.	4.0606	High
17	Animation in the software helps me remember lessons easily.	4	High
18	Contents are correct and not misleading.	4.2727	High
19	I am more attracted by lessons prepared in the software compared to the animations.	3.7879	High
Total		16.1212	
Min		4.0303	High

Highest min score in this table 11 is ‘This software giving me a stimulant to continue learning’, which contributed a score of 4.2727. Respondents are agreed with the courseware will stimulate them to continue their learning.

Table 11: Min Score for Motivation

Item	Item	Min Score	Standard
20	I am enjoying using this software.	4.0909	High
21	This software giving me a stimulant to continue learning.	4.2727	High
22	Academic activities in this software attracted me.	4.2424	High
23	Animations in this software are not tedious to continue my studies with it.	4	High
24	If opportunity given, I want to use this software.	4.1515	High
Total		20.7575	
Min		4.1515	High

4.0 DISCUSSION

Utilization of Courseware for teaching and learning activities is potentially effective in improving students’ academic performance. Besides, it will also ease up teaching and learning process compare to conventional method. According to Noriah et al (2002), conventional teaching method like chalk and talk and lecturing only allow limited information deliver to students, some more amount of information received by students highly depend on knowledge they acquired before. On the other hand, according to Baharom et al (2008), combination of audios, videos and animations together with sufficient instructors’ interaction may give students a chance to manipulate and dominate learning materials thru technologies.

It is easily understood as research results detected an improvement of Treatment Group who received courseware learning method while an unchanged min score for Control Group that taught by conventional method.

Witkin and Goodenough (1981) defined Field-Independent as person who can distinguish circumstances according to their perceptions in consequence whereas Field-Dependent may not so good in this endowment and they may only receive concepts or field of studies they versed. From the point of Cognitive Ability, no significant difference on t-test result for both conventional and courseware groups of students who posed Field-Independence showed as they have the potential in self-reliant and quick in the uptake without assist of courseware. From a research by Jonassen and Grabowski (1993), they claimed that individual nature for Field-Independent was they are self-directional and they are able to acquire information themselves to meet their concepts, present their concepts thru analysis, design their own hypothesis and not highly influence by present formats. Thus these students are more independent than student who posed Field-Dependence that have in the end handover a significant difference t-test result among Treatment Group and Control Group. These Field-Dependence students may be washed out if they continue their conventional learning process as delivering method will be vague in the way they receiving. Thus, Field-Dependence student are the students who need courseware learning method.

No doubt that suitability of courseware for teaching and learning process will enhance student academic performance, by the way, user-friendly of the courseware should be take in at the same time. As a result from 5 criteria researched, participants have feedback that this courseware's Users' Facilities were easy enough to exercise without third party's assistance. All respondents have also agreed that Interfaces were attractive and becomingly. Analysis for third features has turn out a major applaud from respondents for Interaction Suitability. Function for Assistance in Learning has been maximized as most of respondents' feedback was the courseware has helped them in remembrance of studies. Lastly, participants showed a high Motivation to continue use the courseware as it helps them to comprehend and remembrance their studies.

5.0 CONCLUSION

From analysis and discussion above, all objectives set in the early stages have been achieved with questions were fully answered. First objective revealed a significant difference in academic performance between Treatment Group and Control Group. Control Group scored a lower min compared to Treatment Group. As a result, utilization of courseware will effectively improve students' academic performance than conventional teaching method. Second objective have answered a significant difference in students' academic performance between Treatment Group and Control Group among Field-Dependence and Field-Independence. For students in Field-Independence, there was no difference between Treatment Group and Control Group as they share a same characteristic of automatism to endure either conventional or courseware method. By the way, students that posed Field-Dependence have to count on courseware method as catalyst for their learning manners. Third objective discovered a strong supports from students on effectiveness of multimedia towards academic performance. All respondents agreed with suitability of courseware on teaching and learning process and feedbacks revealed that this courseware especially effective for students who undertake subject Electronic Engineering 1.

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