Influence of Learning Styles on Male and Female Science Education Distance Learning Students of NOUN and their Attitudes towards E-Learning

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Abstract

The main purpose of this research was to investigate the impact of learning styles and attitudes towards e-leaning environment with reference to Masters in Science Education students of the National Open University of Nigeria. All the Masters in Science Education students of the National Open University of Nigeria formed the population for this study. Seventy (70) students were randomly selected from the population through balloting (n=70). Survey designed was used for the study through questionnaires. Learning style questionnaire developed by Honey and Mumford (1992) was used to determine the learning style of Science Education students of NOUN undergoing Masters in Science Education (M.Ed. Sc. Ed). Attitudinal questionnaire was later administered to the subjects. The results indicate that attitudes of science students towards e-leaning have a strong positive correlation with their learning styles. The findings of this study have practical implications for educators and designers of e-leaning programmes of higher institutions. Based on the findings from this research, it was recommended that science teachers should provide both synchronous and asynchronous activities during science teaching. This will enhance meaningful learning through e-leaning. It is also recommended that science teachers should identify the learning styles of their students and pattern their teaching towards it.

Keywords: Synchronous, asynchronous, scientific attitudes, learning style

Introduction

The 21ˢ' century education all over the world today is moving towards the use of internet and intranet and this represents great and exciting opportunities for both educators and learners. According to Anon (2006), the internet is the largest and most powerful computer network in the world. This is because it encompasses several million computers with internet addresses that are used by millions of people around the world. As increasingly more colleges, universities, elementary and secondary schools, companies and private citizens connect to the internet, more possibilities are open for distance educators to overcome time and distance to reach students.

e-Leaming basically comprises all forms of electronic applications and processes to learning. The application and processes of e-leaning include web-based learning, computer- based learning, virtual classroom and digital collaboration. It is expected that e-leaning will soon play a greater role at the higher education level, as well as middle and primary school levels (Zanaida, 2004).

Igbal (2013) classified e-leaning into three viz:

- Face- to -face learning with support provided through internet
- Learning at self-pace through internet and
- Multiform learning through the use of videos, e-book etc.

E-leaning can also be classified into two major types. These are synchronous and asynchronous e-leaning. Synchronous e-leaning refers to real-time, instructor-led e-leaning where all learners receive information and instruction simultaneously and communicate directly with other learners. Examples include teleconferencing (audio, video or both), internet, chat forums, and instant messaging. In asynchronous e-leaning, the transmission and receipt of information do not occur simultaneously. Here, the learners are responsible for facing their own self instruction and learning. In asynchronous e-leaning, the instructors and the learner communicate using e-mail or feedback technologies. A variety of methods can be used for asynchronous delivery. These could be through e-mail, online course materials, CD- Rom, online bulletin boards and weblogs.

In the National Open University of Nigeria, asynchronous e-leaming delivery system is used. This is because the mode of instruction involves the use of weblogs, online course materials, CD -Rom, e-mail and the use of radio programme.

It is an undisputable fact that there are individual differences in human beings and these differences have become more important in the area of education [1] Canavan, 2004). Learning styles simply put refers to the various ways by which an individual learns. James and Gardner (1995) defined learning style as the complex means and conditions under which learners most efficiently and most effectively perceive, process, store and recall what they are attempting to learn. Felder (1996) puts it as characteristics strength and preferences in the ways learners take in and process information.

Researchers believe that learning style is a good predictor of an individual's preferred learning behaviour (Coffield, Moseley, Hall and Ecclestone, 2004; Zanaida 2004; and Anon 2006). Lindsay (1999) found that a match between earning style and teaching style reveals increases in student's achievement and satisfaction. According to Igbal (2013), there exists differences in individual learning styles and these individual styles pose a challenge for those who want to impart knowledge. The review of literature on studies in earning styles have shown that several instruments were developed to measure learning styles of young and adults (Dunn et al., 1981). Coffield et al. (2004) identified 71 models of learning styles out of which 13 models were categorised to have significant importance with respect to their widespread usage and influence on other models. Kolb (1984) used learning style inventory (LSI) to define four stages of learning cycle. These are: Reflective observation, concrete experience, abstract conceptualisation and active experiment. Riding (1991)'s cognitive style analysis measures an individual's preference for processing information holistically or analytically and to think verbally or visually. Felder and Silverman (1988) used Fielder-Silverman's learning style model to define four dimensions of learning styles. These are: sensory-intuitive; active-reflective; visual-verbal and sequential global.

The importance of a child's attitude toward learning cannot be under estimated. Various definitions have been proffered for scientific attitudes. Gagne (1977) defines attitude as an internal state that influences or

moderates the personal actions of an individual. Pine et al. (2006) suggested that attitudes lie behind actions and tendencies and that they are acquired through the process of socialisation. Scientific attitudes, on the other hand, is an opinion or position taken with respect to a psychological object in the field of science (Peker and Mirasyedioglu, 2008). Bilem and Zakheriaders (1975) define scientific attitudes by six categories. These are rationality, curiosity, open- mindedness, aversion to superstitions, objectivity (i.e. intellectual honesty) and suspended judgements. Kozlow and Nay (1976) proposed eight attributes of scientific attitudes. They are: critical mindedness, suspended judgement, respect for evidence, honesty, open mindedness and questioning. Only 6 are mentioned here!! AUTHOR TO ADDRESS THIS PLS.

Learning style research has indicated that students succeed academically in learning environments that match their learning styles (Jones, Richard and Mokhtari, 2003; Peker, 2005). In a study carried out by Peker (2003), the difference in attitudes towards mathematics among pre-service elementary school teachers according to learning styles was investigated. It was found that the students' attitudes towards mathematic showed differences according to their learning styles.

Research Questions

1. Is there difference in the learning styles of male and female science education students' attitudes towards e-leaming?
2. Is there any relationship between each of the various learning styles and attitudes of science students towards e-leaming?

Methodology

The Subjects
The population for this study was made up of all the Masters in Science Education students of the National Open University of Nigeria out of which seventy (70) were randomly selected (N = 70) through balloting. The subjects were made up of both male and female students. The subjects were chosen from the National Open University of Nigeria because they have been exposed to e-leaning by virtue of the fact that they use internet right from the time they registered up till the time they sat for their examination hence they used e-leaning throughout their programme. The Research design used was a survey research design using questionnaires.

Instrumentation

Honey and Mumford (1982) presented a learning style model based on Kolb's (1976) work. The learning styles are defined by four features: activists, reflectors, theorists and pragmatists. The learning style comprises eighty (80) questions. The reliability of the questionnaire was found to be 0.68 using Cronbach alpha (Cronbach, 1951).

Learning style questionnaire (LSQ) developed by Honey and Mumford (1992) was used to determine the learning styles of the respondents.

Below are the characteristics of each stage:

- **Activists** enjoy new task and ideas and they play an active role in the learning process. They learn best when they are involved in new problems and opportunities. They like to work in groups and they dislike rigid schedules and tight instructions.
- **Reflectors** prefer working through different analysts and reports. They think and learn by observation. They do not prefer to be leaders and always do their homework.
- **Theorists** are usually challenged in complex environments where they can use their knowledge and skills. They are more rational and analytical in all they do. They learn less where they have to participate in situations involving feelings and emotions
- **Pragmatists** always prefer experiential learning and they prefer hands-on experience rather than theoretical learning. They prefer practical activities and they learn more when they are into activities or if clear guidelines on how to do things are given.

The rationale for choosing Honey and Mumford learning style is because it is an information processing model based on hands-on-experience learning. In e-leaning context, it is critical to consider learning styles of students. According to Canavan (2004), if the instructor is aware of differences in learning styles of their students, and the different techniques to accommodate students with different learning styles, he will be able to teach more effectively in online environment. Teachers who are conscious of differences in learning styles are in a better position to adjust their teaching techniques and strategies. According to Zapalska and Brozik (2006), teachers can create

a learning environment in which materials and resources are utilised to address the learning requirements of their students, thus maximising their potentials.

Attitude towards e-leaning was now measured using the scientific attitudinal inventory developed by Okebukola (2007). This instrument consisted of 20 multiple choice items made up of four options and used to measure scientific attitudes of students. The following attitudinal behaviour was captured: creativity, open- mindedness, suspended judgment, perseverance and honesty. Both the learning style questionnaire and the attitudinal inventory on e-leaning (AOL) were filled in the classroom environment and all the participants were briefed about the purpose of the survey and the items on the inventory. All the responses were entered into statistical packages for social sciences for further analysis. Analysis of variance ANOVA was used to compare the four groups i.e. activist, pragmatist, theorist and reflector.

Data Analysis and Discussion
Research Question 1 - Is there any difference in the learning styles of male and female Science Education students' attitudes towards e-learning?

Table 1: Mean and Standard Deviation of the Learning Style, Attitude and Gender of Students

Gender		N	Mean	Std. Deviation	Std. Error Mean
Activists	Female	14	22.6429	2.79029	.74574
	Male	15	21.6667	3.81101	.98400
Pragmatists	Female	15	14.3333	2.28869	.59094
	Male	15	14.5333	2.06559	.53333
Theorists	Female	15	8.9333	1.27988	.33046
	Male	16	9.1250	.88506	.22127
Reflectors	Female	16	5.0625	1.06262	.26566
	Male	15	5.0667	.88372	.22817
Attitude	Female	17	7.2941	2.41777	.58639
	Male	16	5.7500	3.58701	.89675

Table 1 shows the mean and standard deviation of the students learning style and attitude towards e-leaning. From the table above, the male students show a more positive attitude (mean = 7.29) as compared to the female students (mean = 5.75). In respect to their learning styles, the males were more in all areas as compared to their female counterpart. This answers the research question one in the affirmative.

A two-way ANOVA was conducted using the students' attitude as the dependent variable and the students learning style and gender as independent variables as indicated in Table 2. The result shows that the students style was significant [$F_{(1 1,14)}$ =3.861, $p < 0.05$]. But both gender and the interaction effect of gender on students' style were not significant, $p>0.05$.

Table 2: Tests of between -Subjects Effects
Dependent Variable: Attitude WHY IS THIS HERE PLS?

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	Hypothesis	869.440	1	869.440	201.714	.002	.988
	Error	10.620	2.464	4.310[b]			
Style	Hypothesis	135.207	11	12.292	3.861	.009	.740
	Error	47.621	14.958	3.184[c]			
Gender	Hypothesis	1.934	1	1.934	.964	.343	.066
	Error	27.335	13.622	2.007[d]			
Style * Gender	Hypothesis	2.250	3	.750	.069	.975	.017
	Error	130.083	12	10.840[e]			

WHERE IS LETTER "a
b.   1.380 MS(Gender) - .571 MS(Style * Gender) + .191 MS(Error)
c.   .759 MS(Style * Gender) + .241 MS(Error)
d.   .875 MS(Style * Gender) + .125 MS(Error)
e.   MS(Error)

A linear regression analysis was conducted in order to further test the contribution of each variable on the students' attitude. The model summary shows that R = 0.434 with R Square = 0.188 showing that the independent

variables must have contributed 18.8% to the dependent variable. The test of between WHAT & WHAT PLS? (Table 3) also shows that neither of the individual components of the learning style nor the students' gender was significant at $p > 0.05$.

Table 3: Beta Coefficients[8]

Model	Unstandardised Coefficients		Standardised Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	8.381	5.722		1.465	.157
Activist	-.024	.323	-.025	-.075	.941
Pragmatists	-.660	.563	-.427	-1.173	.253
Theorists	1.463	.934	.486	1.566	.132
Reflectors	-.370	.955	-.105	-.387	.702
Gender	-1.924	1.319	-.294	-1.458	.159

Dependent Variable: Attitude WHAT IS THIS DOING HERE PLS?

Research Question 2 - Is there any relationship between each of the various learning styles and attitudes of science students towards e-leaning?

Table 4: Correlation between Learning Styles and Attitudes towards E- Learning

	Activists	Pragmatists	Theorists	Reflectors
Sum of squares and cross products covariance	5.533 .094	-62.450 -1.058	-12.375 -.196	-16.429Ta -.265
N	60	60	60	60
Pearson correlation	.906	.892	.812	.546
Significance level	.000	.000	.000	.000

Table 4 shows that attitudes of science students towards e-leaning have a strong positive correlation with their learning styles. The order of relationship is activist (.906) followed by pragmatist (.892) then theorist (.812) and lastly reflectors (.546). The result in Table 4 answered the research question in the affirmative.

Discussion of Findings and Recommendations

These results support the findings of Pecker (2005), Peker, Mirasyedioglu and Yahn (2003) and Kinsley (2002) who separately posited that attitudes of students towards e-leaning have a strong positive correlation with their learning styles in science subjects. This implies that if science teachers' identify the learning styles of their students they will be able to pattern their instructions towards the learning styles and this will enhance academic performance of students.

Furthermore, Shaw and Marlow (1999) used learning style questionnaire to study the relationship between attitude towards information and communication technology (ICT) and learning styles. The study also included gender and student cohort as variables of interest. The results of the study indicated no significant difference in learning styles based on gender or student cohort. However, a significant but negative (but weak) difference was noted between the included gender and student "theorist" and the "interactivity" and context attitude dimensions.

Based on the findings and conclusions of this study, the researchers are of the view that electronic learning is a medium of choice for the students who enjoy learning new task and like to work in groups. According to Mackeracher (2009), adult learners have distinct mental abilities and learning styles.

It is hereby recommended that science teachers should aim at meeting the requirements of individual and social learners by providing both synchronous and asynchronous activities. On the whole, science teachers must be aware of learning styles and how they affect academic performance. The findings from this study can prompt further research, using a lower level of subjects.

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