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EDUCATIONAL MULTIMEDIA AND LEARNING STYLE PREFERENCES

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ABSTRACT: *Multimedia learning offers a significant opportunity to reach the greatest number of students and most effectively supports students with different learning styles. The basis for the use of multimedia is the assumption that when the user interacts within these media he/she learns more meaningfully. The fundamental principle behind multimedia learning is best described by Mayer (2005) "People learn better from words and pictures than from words alone". This study seeks to provide a framework for multimedia-enhanced education. The multimedia in this study were PowerPoint and Multiple Mouse Mischief. The framework for the study was built on what high-end multimedia presentation currently facilitates: presenting course materials in; text, graphics, photographs and animation (visual), audio and discussion (aural), with follow-up point-and-click or drag-and-drop exercises (Kinaesthetic). The study set out to examine how learning styles interact with the presentation media to influence the learning outcomes of the students. The findings revealed no significant main effect of learning style on the students' achievement scores. However, the kinaesthetic learners recorded the highest adjusted post-test mean achievement score. It was concluded that interactive multimedia presentation can facilitate diverse learning styles and although there are claims about the benefits of multimedia presentations but the reality is that the instructional technologies are only tools and should be applied with careful regard to the complex nature of human information processing.*

KEYWORDS: Multimedia, Learning Style, Powerpoint, Multiple Mouse

INTRODUCTION

The integration of technology into the curriculum has opened up the classroom to accommodate more flexible teaching methods that result not only in more engaged student learning processes, but also in the changing roles of the teacher and student. Most of the instruction in schools, tends to be auditory (lectures), abstract (intuitive), passive (little opportunity for student feedback) and sequential. According to Bransford, Brophy, and Williams, (2000). 'When computer technologies meet learning' such mismatch between the conventional style of teaching and the learning styles of the students can lead to poor student performance, and student frustration, as well as compromise student retention. It has been opined that educational technology research should be undertaken with an understanding of how people teach and learn, as this will enable distinct theoretical position concerning the integration of technology to the teaching and learning process.

Most educators use selected theories of intelligence or learning styles to influence their teaching. The theories are based on the idea that students have different strengths and learning preferences; thus teachers must adjust their instruction according to the students learning styles. (Brian, 2011). The process by which people perceive and process information is as unique as

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the individual. Interest in individual differences spawned the study of learning styles. The theory of learning styles contends that the amount an individual learns is directly related to the educational experience that is directed towards that learning style, rather than individual intelligence. The study of learning styles was active for much of the 1960s and 1970s, but recently, the interest has further gained ground; especially in education (Brian, 2011).

Learning Styles

There are many interpretations and definitions of learning styles. The definition cited in Byrne (2002) refers to "a personally preferred way of dealing with information and experiences for learning that crosses content areas". Learning styles can be seen as "a description of the attitudes and behaviours which determine an individual's preferred way of learning" (Honey & Mumford, 1992 in Clark, 2011)). Many learning style models exist in literature, such as the learning style model by Kolb (1984), Honey and Mumford (Clark, 2011), and Felder and Silverman (Byrne, 2002). While there are still many open issues with respect to learning styles, the learning style models agree that learners have different ways by which they prefer to learn. Furthermore, many educational theorists and researchers consider learning styles as an important factor in the learning process and agree that incorporating them in education has potential to facilitate students learning. Knowing students' learning styles can help enhance learning and teaching. First, teachers can benefit by getting information about how students learn best, and this provides a deeper understanding that could help explanation or preparation of learning material. Furthermore, making students aware of their learning styles and showing them their individual strengths and weaknesses can help students to understand why learning is sometimes difficult for them and could be the basis for developing on their weaknesses. In addition, students can be supported by matching the teaching styles with their learning styles. Providing students with learning material and activities that fit their preferred ways of learning can make learning easier for them. This matching hypothesis is supported by many educational theories, as stated and described by Coffield, Moseley, Hall, and Ecclestone (2004).

A number of perspectives have been taken by researchers in an effort to identify, analyse and label a person's learning style. Categorising the plethora of learning style models into groups helps in the understanding of the main differences in the approach to identifying the individual learning styles. Byrne (2002) offers four categories, which arrange learning style models from those focusing on external conditions to those based on personality theory. These four groups are:

> **(i) Instructional and Environmental Preference**: This approach categorises learning style from a perspective that considers one's preferences in terms of Sensory Perception (auditory, aural, visual, and tactile.).
>
> **(ii) Social Interaction:** this reference learning styles "as a particular set of behaviours and attitudes related to the learning context". These include a learner's epistemic attitude as well as social and environmental attitudes.
>
> **(iii) Information Processing:** considers physiological traits as being the decider of individuality in learning styles.
>
> **(iv) Personality Levels**: advocate consideration of the psychological types of people and their resultant cognitive processing. Building on this, the inclusion of personality traits mean that temperament is a deciding factor. (Byrne, 2002)

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Identifying ones learning style is not an easy task as scholars and researchers have concentrated their works on a very broad range of factors and personal characteristics, which they believe affects a person's ability to learn. There is a vast catalogue of Learning Style Models in each of the main perspective categories. The Instructional and Environmental Preference is of particular interest in the context of this study. The Instructional Preferences approach directly facilitates the effort to identify the students' perception of multimedia as sensory stimuli. This model is based on learners' preference for particular external events to stimulate their senses to help them learn. It classifies learners by their preferred mode of interaction with others based on input stimulus and output performance. This model facilitates Multimodal-learning styles for those learners with more than one preference. The Dunn and Dunn VAK model is one of the most widely known and used theory of Learning style (Coffiel, Moseley, Hall & Ecclestone, 2004).

The VAK learning style uses the three main sensory receivers: Visual, Auditory, and Kinaesthetic to determine the dominant learning style. It is sometimes known as VAKT (Visual, Auditory, Kinaesthetic, & Tactile). It is based on modalities channels by which human expression can take place and is composed of a combination of perception and memory. VAK is derived from the accelerated learning world and seems to be about the most popular model due to its simplicity (Clark, 2011). VAK Learners use all three modalities to receive and learn new information and experiences. However, according to the VAK or modality theory, one or two of these receiving styles is normally dominant. This dominant style defines the best way for a person to learn new information by filtering what is to be learned. This style may not always be the same for some tasks. The learner may prefer one style of learning for one task, and a combination of others for a different task.

VAK categorizes Learning Styles into three:
Visual: Visual learning style is the learning style which focuses on watching to learn. The individuals who prefer visual learning style learn best through visual stimulation. The visual learners are able to read and understand and they study best when reading a text and using highlighters as visual stimulation that assist in remembrance. These students benefit when diagrams, videos or similar visuals are used to teach them.
Aural: Auditory learning style is the style of learning through listening. Students who prefer this learning style hear lectures, participate in discussion from which it is easy for them to understand the information better. For individuals who are auditory learners, written works are often difficult, information should therefore be sufficiently loud to be heard such that tone, pitch and sounds will aid comprehension.
Kinaesthetic: Kinaesthetic learning style refers to tactile learning, which is learning by doing something. The individual learns by touching, putting something together or take something apart using his hands. These learners are exploratory learners and need to move to understand the world around them. (Dunn & Dunn, 2002)

Since individuals respond differently to certain situations, the preferred learning style of a learner may not always be the same for different learning tasks. The learner may prefer one style of learning for one task, and a combination of others styles for a different task. It is the dominant style that defines the best way for a person to learn new information which occurs by filtering what is to be learned. In support of effective learning, Clark (2011) is of the opinion that the most effective teaching methods involve a combination of all three sensory components. According to the VAK theorists, we need to present information using all three

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styles. This allows all learners the opportunity to become involved, no matter what their preferred style may be.

The study set out to examine how learning styles interact with the presentation media to influence the learning outcomes of the students

Learning Stlyes and Multimedia

According to Mayer (2005), Learner Style influences the way people access multimedia. Multimedia learning offers a significant opportunity to reach the greatest number of students and most effectively support students with different learning styles.

Multimedia may be defined in multiple ways, depending on the perspective in view. What is most common among these definitions is that it involves the integration of more than one medium into some form of communication. Most commonly though, this term refers to the integration of media such as text, sound, graphics, animation, video, imaging, and spatial modelling into a computer system (Jonassen, 2000). Multimedia represents the presentation of instruction that involves more than one delivery media, presentation modes, and/or sensory modalit. The basis for the use of multimedia is the assumption that when the user interacts within these various methods they learn more meaningfully

Investigating the effects of multimedia presentation on learning and performance requires a solid foundation in learning theory. Bishop and Cates (2001) effectively synthesize information processing and communication theories as a foundation for the investigation of the use of sound in multimedia instruction. Another example of multimedia investigations that are grounded in cognitive theory includes the work of Mayer. The Cognitive Theory of Multimedia Learning (CTML) was popularized by the work of Mayer and other cognitive researchers who argue that multimedia supports the way that the human brain learns. The various authors assert that people learn more deeply from words and pictures than from words alone, which in a way explains the multimedia principle (Mayer 2005a).

Multimedia researchers generally define multimedia as the combination of text and pictures; and suggest that multimedia learning occurs when we build mental representations from these words and pictures (Mayer, 2005). The words can be spoken or written, and the pictures can be any form of graphical imagery that include illustrations, photos, animation, or video. Multimedia instructional design attempts to use cognitive research to combine words and pictures in ways that maximize learning effectiveness.

> This model is based on three primary assumptions (Mayer, 2001), they are:
> **Dual channel**: Humans possess separate information processing channels for verbal and visual material.
> **Limited capacity**: There is only a limited amount of processing capacity available in the verbal and visual channels.
> **Active processing:** Learning requires substantial cognitive processing in the verbal and visual channels.

Furthermore, this model is activated through five steps: "(a) selecting relevant words for processing in verbal working memory, (b) selecting relevant images for processing in visual working memory, (c) organization selected words into a verbal mental model, (d) organizing selected images into a visual mental model, and (e) integrating verbal and visual representations as well as prior knowledge" (Mayer, 2001).

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Cognitive Theory of Multimedia Learning was first used by Mayer and his colleagues in 1996, and became the standard name for Mayer's theory in the year 2000. The various models over the years had focused on different aspects of the current model, but the underlying assumptions remained unchanged. The cognitive process elements and mental representations were added and the model refined.

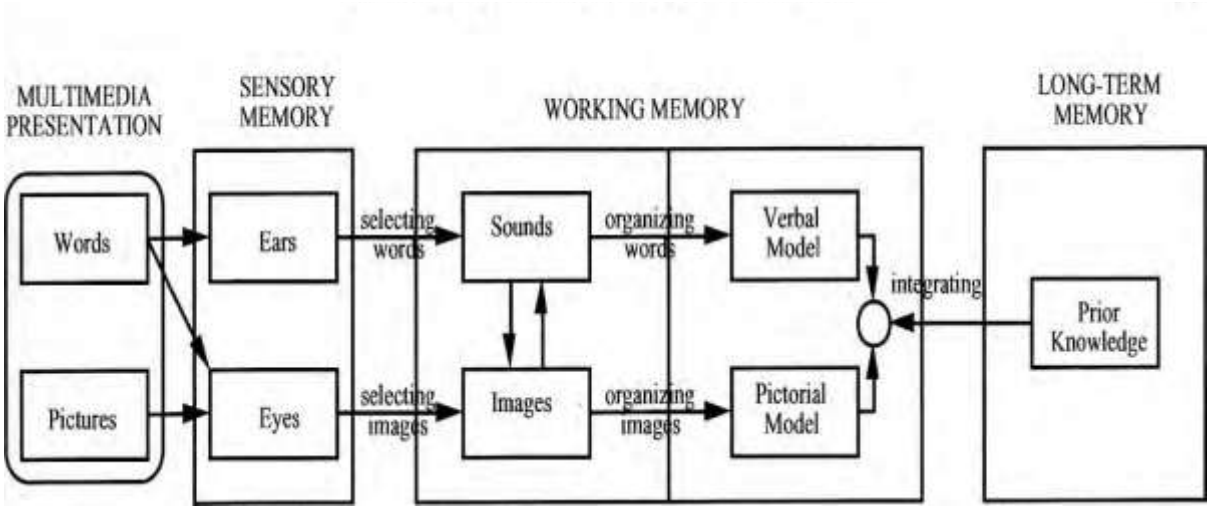

Figure 1 The Cognitive Theory of Multimedia Learning. (Mayer, 2009).

Figure 1 presents a cognitive model of multimedia learning that is intended to represent the human information-processing system. The boxes represent memory stores, sensory memory, working memory, and long-term memory. Pictures and words come in from the outside world as a multimedia presentation (see left side of the figure) and enter sensory memory through the eyes and ears (indicated in the sensory memory box). Sensory memory allows for pictures and printed text to be held as exact visual images for a very brief period in a visual sensory memory (at the top) and for spoken words and other sound to be held as exact auditory images for a very brief period in an auditory sensory memory (at the bottom). The arrow from the pictures that leads to the eyes corresponds to a picture being registered in the eyes, the arrow from words to ears corresponds to spoken text being registered in the ears, and the arrow from words to eyes corresponds to the printed text being registered in the eyes. The central work of multimedia learning takes place in the working memory. Working memory is used for holding and manipulating knowledge in active consciousness.

For example, in reading a sentence, one may be able to actively concentrate on only some of the words at one time, or looking at Figure 2.1, the beholder may be able to hold the images of only some of the boxes and arrows in mind at a glance. This kind of processing — that is, processing that involves conscious awareness — takes place in the working memory. The left side of the working memory represents the raw material that comes into the working memory — visual images of pictures and sound images of words — so it is based on the two sensory modalities that is called visual and auditory. In contrast, the right side of working memory represents the knowledge constructed in working memory — pictorial and verbal models and the links between them — so it is based on the two representation modes that are called pictorial and verbal. The term pictorial model includes spatial representations. The arrow from sounds to images represents the mental conversion of a sound (such as the spoken word "cat") into a visual image (such as an image of a cat) — that is, when one hears the word "cat" one might also form a mental image of a cat. The arrow from images to sounds represents the mental

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conversion of a visual image (e.g., a mental picture of a cat) into a sound (e.g., the sound of the word "cat") — that is, one mentally hears the word cat when one sees a picture of one.

As Mayer observes, multimedia messages that are designed in the light of how the human mind works are more likely to lead to meaningful learning than those that are not. A cognitive theory of multimedia learning assumes that the human information processing system includes dual channels for visual/pictorial and auditory/verbal processing, that each channel has limited capacity for processing, and that active learning entails carrying out a coordinated set of cognitive processes during learning. (Mayer, 2005). Good multimedia instruction is driven by an understanding of how the brain processes information, this is why the most effective multimedia applications should take advantage of this knowledge. There is a growing body of research that is exploring what makes multimedia effective. The summary of multimedia learning principles is now presented:

Multimedia Content Characteristic

1. Words and pictures are better than words alone.
2. Multimedia learning is more effective when the learner's attention is focused and not split.
3. The presentation of multimedia content should exclude extraneous and redundant information.

Multimedia Delivery Characteristic

4. Multimedia learning is more effective when it is interactive and under the control of the learner.
5. Multimedia learning is most effective when the learner is engaged with the presentation.

Multimedia context characteristic

6. Multimedia learning is more effective when learner knowledge structures are activated prior to exposure to multimedia content.
7. Multimedia learning is most effective when learner can apply newly acquired knowledge and receive feedback.

Framework

This multimedia principle was used as a guide to the development of the presentation media that this study proposed. A critical perspective to maintain while designing multimedia lessons according to CTML is that the multimedia instructional methods are learner-centred—they are not technology-centred approaches. Mayer (2009) points out that multimedia can be as simple as a still image with words and that it is the instructional method, not the technology that matters. Multimedia instructional designers often fall victim to letting the technology drive the instructional design, rather than looking at the design from the perspective, and limitations, of the learner

This framework has the potential to underpin the development of instruments for research into examining the pedagogical effectiveness of multimedia presentations. This research therefore

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proposes that information should be presented in different ways in order to engage learners with different learning styles and strengths, knowing that students may have preferences for a particular mode or learn most effectively through different modes thus improving attitude towards the subject. This framework was built on what high-end multimedia presentation currently facilitates: presenting course materials in; text, graphics, photographs and animation (visual), audio and discussion (aural), with follow-up point-and-click or drag-and-drop exercises (Kinaesthetic).

The multimedia learning tools used in this study (PowerPoint & Multiple Mouse Mischief) accommodates the three types of learning styles and these three types are effective in the classical ways of learning. The fundamental principle behind multimedia learning is best described by Mayer (2005), one of the leading researchers in this area: "People learn better from words and pictures than from words alone". In this context, the PowerPoint presentation used words, which include written and spoken text, and pictures include static graphic images and animation. Research tells us that the use of both words and pictures allows the brain to process more information in working memory (Sweller, 2005). By using multiple channels of working memory, multimedia content can increase the likelihood that information will be effectively integrated into long term memory and not lost.

Mayer (2003) also states that Multimedia presentations are more effective when the learner has the ability to interact with the presentation and when the content and format actively engage the learner. Active engagement helps the student construct knowledge and organize information into meaningful schema (Mayer 2003). The Microsoft mouse mischief add-on allows for multiple mouse presentation which enables the learners to interact with the PowerPoint presentation and thus lead to active engagement of the learners. The multiple mouse presentation also provides feedback through its student's response system. Feedback is an important part of the learning process, and multimedia is no exception. It is important to provide learners with clear feedback about their progress on an ongoing basis (Gee, 2005). Multimedia applications like the Microsoft multiple mouse add-ons that provide opportunities for student self-assessment offer a particularly valuable opportunity for feedback.

Purpose of the Study

This study set out to examine how learning styles interact with the presentation media to influence the learning outcomes of the students. The study generated and tested the following null hypotheses:

1) There is no significant main effect of treatment (PowerPoint (PPT), Multiple Mouse (MM), and Conventional Method (CM) on students' achievement

2) There is no significant main effect of learning style on students' achievement

3) There is no significant interaction effect of treatment (presentation media) and learning style on students' achievement

METHODOLOGY

The population for this study consisted of the Junior Secondary School students in Ogun state, Nigeria. Purposive sampling was used in the selection of schools based on some criteria which

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include prior familiarity with the Computers, as this would help reduce the time required for training and the effect of novelty of the technology on the students. It was also to ensure possible continuity of the use of the technology after the end of the treatment. Intact classes in this schools were used. A total number of 110 students participated in the study.

The instructional packages were designed by the researcher, the design of the PowerPoint slides was guided by the Mayer's (2009) multimedia principle. The learning materials used were a combination of World Wide Web resources and computer-generated multimedia designed and developed by the author. These were administered on the experimental group assigned to power point presentation.

The multiple mouse presentation package was also designed by the researcher using, a PowerPoint add-in called Mouse Mischief, which is used to create and play interactive, multiple-mouse presentations. The same PowerPoint slides created for the PowerPoint group was used, with the interactive dimension enabled by Mouse Mischief application, which allows the students to point and click or pick and drag on the PowerPoint presentations. Questions requiring yes or no answers, multiple choice questions, and drawing activities were included in the slides and administered on the experimental group assigned to Microsoft Multiple Mouse.

The Learning Styles Self-Assessment Test (LSSAT) was an adaptation of the VAK (Visual, Aural, Kinaesthetic), which is an informal learning styles inventory designed to help students identify how they prefer to learn. The inventory contained 30 questions whose answers provided students with an indication of what their personal learning preference could be. The students were asked to respond to thirty items to detect their learning style, ten items each, representing one of the three categories of Visual, Aural and Kinaesthetic. However, the items were shuffled to control for respondents' fixation on any of the categories. The statements made in the instruments required respondents to indicate how each applied to them. specifically *1* means Not Like Me, *2* means A Little Like Me, *3* means Like Me, *4* means A Lot Like Me . Scores were totalled to determine learning style preference.

A pre-test was given to determine if any statistically significant differences existed among the groups at the beginning of the study. At the end of the treatment, the two instruments (SAVA & VAAT) were administered as posttest, the same set of test used for the pretest where used, in order to reduce the test re-test effects, the items were reshuffled to minimize students' use of previously acquired response sets.

The data collected were analysed using descriptive and inferential statistics. Means and standard deviation scores were the descriptive statistics used to show estimates of the post-test achievement and attitude scores according to the levels of presentation media and learning style. The formulated hypotheses were tested using the Analysis of Covariance (ANCOVA), with the pre-test scores as covariates. The accompanying Multiple Classification Analysis (MCA) was used to explain the magnitudes of the post-test mean achievement and attitude scores across the different levels of presentation media and learning style

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RESULTS

Descriptive Results of Students' Achievement

Table 1: Students' Achievement Scores According to Presentation Media

Presentation Media		N	Mean	S.D.	Minimum	Maximum	Range
Power Point (PPT)	Pre-test	28	14.18	4.16	7	23	16
	Post-test		16.64	3.54	10	23	13
Multiple Mouse	Pre-test	45	14.67	3.58	5	23	18
(MM)	Post-test		17.67	3.59	8	23	15
Conventional	Pre-test	37	13.30	3.30	8	19	11
(CM)	Post-test		15.16	2.50	11	21	10
Total	Pre-test	**110**	**14.08**	**3.66**	**5**	**23**	**18**
	Post-test		**16.56**	**3.40**	**8**	**23**	**15**

The result in Table 1 revealed the participants' pre-test and post-test mean achievement scores before and after exposure to the presentation media used as instructional strategies. At the end of the treatment period, the group of participants taught using the multiple mouse presentation strategy recorded the highest post-test mean achievement score of 17.67 (S.D. = 3.59); this was followed by the participants taught using the power point presentation strategy whose post-test mean achievement score was 16.64 (S.D. = 3.54), while the participants taught using the conventional method recorded the least post-test mean achievement score of 15.16 (S.D. = 2.50).

The result in table 1 also revealed mean gains across the three treatment groups when the pre-test and post-test scores are compared, with the highest mean achievement gain from the multiple mouse presentation group.

Table 2: Students' Achievement Scores According to Learning Style Group

Learning Style Group		N	Mean	S.D.	Minimum	Maximum	Range
Visual	Pre-test	38	14.58	3.81	10	23	13
	Post-test		16.53	3.42	10	23	13
Aural	Pre-test	49	13.98	3.53	5	20	15
	Post-test		16.61	3.79	8	23	15
Kinesthetic	Pre-test	23	13.48	3.73	8	19	11
	Post-test		16.52	2.52	13	22	9
Total	Pre-test	**110**	**14.08**	**3.66**	**5**	**23**	**18**
	Post-test		**16.56**	**3.40**	**8**	**23**	**15**

The result in table 2 revealed the participants' pre-test and post-test mean achievement scores according to learning style before and after exposure to the three presentation media used as instructional strategies. At the end of the treatment period, the aural learners who participated recorded the highest post-test mean achievement score of 16.61 (S.D. = 3.79); followed by the visual learners who participated, the post-test mean achievement score was 16.53 (S.D. = 3.42), while the kinaesthetic learners who participated recorded the least post-test mean achievement score of 16.52 (S.D. = 2.52). The result in table 2 also revealed mean gains across the three

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levels of learning style when the pre-test and post-test scores are compared, with the highest mean achievement gain recorded by the kinaesthetic learners.

Table 3: Summary of Analysis of Covariance of Students' Achievement Scores According to Presentation Media and Learning Style

Source of Variation	Sum of Squares	df	Mean Square	F	Sig. of F
Main Effects	**800.819**	**1**	**800.819**	**93.045**	**.000**
Covariates (pre-test)	142.744	1	142.744	16.585	.000
Treatment (PPT, MM, CM)	64.683	2	32.342	3.758	.027*
Learning Style (LS)	5.281	2	2.641	.307	.737
2 Way Interactions					
Treatment * L. Style	59.490	4	14.873	2.728	.151

* indicate significant F at .05 level R Squared = .378 (Adjusted R Squared = .255)

Hypothesis 1: There is no significant main effect of treatment (PowerPoint (PPT), Multiple Mouse (MM), and Conventional Method (CM) on students' achievement

The result in Table 3 shows the main effect of presentation media on the students' achievement scores. The result revealed significant outcome ($F_{(2, 91)} = 3.758$, $P < 0.05$), that is, the post-test mean achievement scores of the students exposed to the different presentation media are significantly different. As a result, the null hypothesis one that states that there is no significant main effect of treatment (PowerPoint (PPT), Multiple Mouse (MM), and Conventional Method (CM) on students' achievement is rejected.

Table 4: Multiple Classification Analysis of Students' Achievement Scores According to Presentation Media and Learning Style

Variable + Category Presentation Media	N	Unadjusted Deviation	Eta	Adjusted for Independent + Covariates	Beta
1. Power Point (PPT)	28	- 0.96		1.40	
2. Multiple Mouse (MM)	45	- 0.02		1.80	
3. Conventional (CM)	37	- 2.23	**.08**	0.01	**.28**
Learning Style					
1. Visual	38	- 1.37		0.74	
2. Aural	49	- 0.65	**.01**	1.07	**.08**
3. Kinesthetic	23	-1.15		1.36	
Multiple R Squared					**.378**
Multiple R					**.615**

Hypothesis 2: There is no significant main effect of learning style on students' achievement.

The result of the main effect of learning style in table 3 revealed no significant main effect of learning style on the students' achievement scores ($F_{(2, 91)} = .307$, $P > 0.05$). The result implied that the post-test mean achievement scores of students having visual, aural and kinaesthetic

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learning styles exposed to the different presentation media were not significantly different. Therefore, the null hypothesis cannot be rejected.

However, the result of the multiple classification analysis (MCA) on learning style in table 4 showed that with a grand mean of 16.559, the kinaesthetic learners recorded the highest adjusted post-test mean achievement score of 17.919 (i.e. 16.559 + 1.36). The aural learners recorded the next higher adjusted post-test mean achievement score of 17.629 (i.e. 16.559 + 1.07) while the visual learners recorded the least adjusted post-test mean achievement score of 17.339 (i.e. 16.559 + 0.74). This outcome thus revealed that the treatment had more impact on the kinaesthetic learning style than the visual or aural learning style. There was however no statistically significant difference in the post-test mean achievement scores of the students according to learning style.

Hypothesis 3: There is no significant interaction effect of treatment (presentation media) and learning style on students' achievement.

The result of the 2-way interaction effect of treatment and learning style in table 3 revealed no significant interaction effect of treatment and learning style on the students' achievement scores ($F_{(4, 91)} = 1.728$, $P > 0.05$). The obtained results implied that students' post-test mean achievement scores under different treatment (presentation media) did not vary significantly among students with different learning styles i.e visual, aural or kinaesthetic. Hence, the null hypothesis that states that there is no significant interaction effect of treatment (presentation media) and learning style on students' achievement cannot be rejected.

DISCUSSION

This results show that the multimedia presentations of PowerPoint and Multiple Mouse had more superior potency in enhancing learning than the conventional method. This finding corroborates the assertion of the multimedia principle which states that including multimedia as part of instruction can significantly enhance student learning (Mayer, 2005). Zywno and Waalen (2002) quasi-experimental study in a course offered in a hypermedia-assisted mode, found a statistically significant increase in academic achievement in the hypermedia mode, as compared with the conventionally instructed control group.

The findings revealed no significant main effect of learning style on the students' achievement scores. The result implied that the post-test mean achievement scores of students having visual, aural and kinaesthetic learning styles exposed to the different presentation media were not significantly different. However, the result of the multiple classification analysis (MCA) on learning style showed that the kinaesthetic learners recorded the highest adjusted post-test mean achievement score. Followed by the aural learners while the visual learners recorded the least adjusted post-test mean achievement score.

The result of the 2-way interaction effect of treatment and learning style also revealed no significant interaction effect of treatment and learning style on performance. This outcome implied that students' post-test mean achievement scores under different treatment (presentation media) did not vary significantly among students with different learning styles (visual, aural or kinesthetic). These findings seem to support what is documented in literature, namely that due to multi-modal attributes involved, hypermedia is more effective in reaching all types of students and reducing differences in the academic performance among different

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learning styles (Mayer, 2009). Adedapo (2013) reported similar results of no significant effect of learning style on students' cognitive achievements in microteaching and no significant interactive effect of microteaching modes and learning style on students' cognitive achievement in microteaching.

However, that does not mean that learning styles are unimportant. As Coffield et al (2004) noted, just varying delivery style may not be enough, the unit of analysis must be the individual rather than the group. That is, when you analyze a group, the findings often suggest that learning styles are relative unimportant, however, when you analyze an individual, then the learning style often distinguishes itself as a key component of being able to learn or not. (Coffield et al, 2004).

The results of the study confirmed that students' learning style preference does not reflect in their academic performance, and that learning styles and presentation media do not interact in a way that could affect learning outcomes. This may indicate that everyone in the sampled groups had equal opportunity to learn in a preferred way. Those who learn well in a lecture/direct instruction still had the benefit of the lecture/direct instruction and those who did n't, rather than being disadvantaged had a different perspective provided by the multimedia presentation, therefore there was equal opportunity for the use of the three learning styles during the treatment.

CONCLUSION

How a learner approaches multimedia is hypothesized to depend on their learning style and their level of engagement with the material, the latter being dependent on their level of motivation which can be altered by their experience with the features of the multimedia environment. Also, material presented in a variety of methods keeps the learners interested and reinforces learning.

Most researchers agree that we do have various learning styles and preferences, however, the research tends to agree that it is relative unimportant when designing learning programs. Hattie (2011) notes that no single measurement of style ensures that a learner's need will be met. It is perhaps more important to build an adaptable learning environment that presents the material in a variety of methods than try to determine each learners' style. The more styles you address, the easier the instruction will be received by the learners. Rather, it is far more important to match the presentation with the nature of the subject, such as providing correct learning methods, strategies, and context; rather than matching individual preferences (Coffield, et. al., 2004).

According to Merrill (2000) the best philosophy for using learning styles as instructional strategies should first be determined on the basis of the type of content to be taught or the objectives of the instruction (the content-by-strategy interactions) and secondarily, learner styles and preferences are then used to adjust or fine-tune these fundamental learning strategies. Finally, content-by-strategy interactions take precedence over learning-style-by-strategy interactions regardless of the instructional style or philosophy of the instructional situation. Furthermore in Talia, (2012) question whether quantitative studies are the best method by which to evaluate whether teaching to a student's learning style affects the student's learning. The authors point out that learning-style teaching may benefit a child, but such studies don't allow for other factors, such as a more-educated teacher, better classroom environment or the

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child's own aptness for learning. These variables may be causing the positive results in a child's learning that are being attributed to learning-style teaching.

Thus one can assert from the these findings that the 'multi' modality of the presentation media used as strategies in this study has equally influenced the students learning outcomes across board, irrespective of the presentation mode the students had improved learning outcomes. Therefore it seems reasonable to claim that if we use the three presentation media in the teaching and learning, there would be much more improvement on the students learning outcome than exposing them to just one style of presentation. Also one can then conclude that the no significant interaction effect of treatment and learning style on the students' learning outcome may be due to the fact that there are other moderators that can influence learning outcomes of students other than learning style, as such, further investigation may therefore be needed to isolate these variables.

In conclusion, interactive multimedia such as Multiple Mouse presentation can facilitate diverse learning styles. Such sensory-rich participatory presentation goes beyond the more abstract style typical of lectures or textbooks, helping students who learn by seeing, hearing or doing. This study was built on an extensive body of multimedia material and it seeks to provide a framework for multimedia-enhanced education in the curriculum. There are claims about the benefits of multimedia presentations such as PowerPoint over traditional instruction but the reality is that the instructional technologies are only tools and should be applied with careful regard to the complex nature of human information processing.

RECOMMENDATIONS

The results of this study have indicated that the two treatments groups (PPT) and (MMM) have significantly higher level of learning achievement than the control group (CP). This implies that these two presentations media have been effective and can be recommended for use in teaching, especially for younger classes.

Teachers in planning their lessons should prepare to present information in ways that accommodate the different learning styles in the class and include activities that would meet the preference need of the different learning style.

Further investigation into other moderators that can influence learning outcomes of students using multimedia, other than learning style may be needed.

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