



Adapting Learners' Styles for Effective Learning of Difficult Concepts in Biology

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ABSTRACT

In diverse, fast-pace, and hyper-stimulated environment, searching for preferred portal to effectively communicate information is essential. The evolutionary history is changing the way modern man prefers to interact with new and challenging information. This paper discuss how distraction and changes in learning behaviour from over-whelming information from media affect ability to pay attention in the classroom and offers possible solution through adaptation of learning preferences in Biology education. A conceptual and theoretical basis was highlighted for instructors to consider. The paper also suggested learning sequence that could be adopted to effectively educate the diverse preferences for effective teaching of Biology. The paper recommends that teachers and learners should be made to be aware of their learning preferences to be able to face challenging and distractive learning situation.

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INTRODUCTION

Biology is the foundation and a pre-requisite for advance studies in medical, paramedical and environmental courses; these attracted large number students in science bias to choose it. Bridging the wider professional gap in those courses lies in how students are performing in biological concepts. The future of medical, paramedical, and environmental professions in Nigeria are endangered considering the gravity of research report on the students' perception of difficulty in learning Biological concept. Massive failure is making Biology as one of the emerging dreaded subject Nigeria. For almost three decades studies on students' perception of difficult topics in biology keep on rising annually. For example (Tekkaya et al., 2001; Cimer, 2012; Zeidan, 2010), others are Oyedokun (2002), Danban (2012), Allahoki (2012), Baiyelo, (2014) and Umar, (2015), reported that some concepts in biology are difficult for most of the students to understand. The concepts include ecology, genetics, evolution, physiology among others. It has been observed that experience of difficulties in so many topics in biology negatively affects students' motivation and achievement (Ozcan, 2003). Some scholars believed that experiencing difficulty in Biology could be multi-factorial which includes- classroom learning environment, lack of interest in learning science, overloaded curriculum content and delineation of

science from society, among others. (Benjamin Emmanuel, 2017).

What scholars over the years fail to recognise is that speed and large information decrease attention span. Similarly the way learners in 21st century prefer to consume information changes because they are living in hyper stimulated environment full of distraction. This make many scholars to think that the best way to survive this is to support attention by increasing intensity of figures, sound and activity. However, perception of difficulty in learning still persisted. Educators emphasise on objective factors at the expense of subjective factors of attention. It has been observed that designing learning environments while ignoring students' interests and expectations causes several learning problems as well as decreasing their interest in biology (Yuzbaşıoğlu and Atav, 2004; Roth et al., 2006; Zeidan, 2010)

This paper argued that though there may be inherent difficulties in sciences, but the possible bane is attention difficulty. Development in modern technology like, television, internet and tablets decreases attention span. Everything outside classroom is faster while classroom interaction is slower, hence performance in classroom could be poor. It is believe that attention increases if the person is able to perform the task at hand smoothly, compared to a person who has difficulty performing the task. This suggests that distraction reduces time on task hence perception of difficulty in learning.



Therefore, students' engagement is the major problem in students learning.

It has been suggested that one of the ways to encourage learners active involvement in their education is to give them tools to help them become better learners regardless of the setting in which they are learning. One tool that can be used to facilitate learning is learning style (Marcy, 2001 in Umar, 2015). Learning preferences are how learners process, interact with and respond to the environment. In fact, learning preferences is a criterion for individual differences. O'Connor (1997) described learning styles as self-bride filters used by people to account for their relation with the world. Individual learning styles direct their methods of learning. They change the way people express their inner experiences, how they remember things, and even the words they choose.

For decades instructors used efficiency model of instruction in attempt to transmit large body of accrued information to cover the course content. This has been criticize as inadvertently causing the loss of able, interested students from the profession of science. It has been acknowledged that if we lose students precisely because they learn differently than those who currently dominate the profession and teach them, we lose a potential source of future creativity in our discipline (Tobias, 1990)

More than ever in the history of mankind distraction is waxing out of control to an average human. Information flow is making attention as one of the scarce resources as it is pulled in different direction. Today distraction has become a norm even in children that have richer sensory experience than adult. Every one of us opts for entertainment options which indicate preference for distraction instead of focus on task at hand. Literature is replete with popular phrase "attention spans decreasing" attention deficit disorder (ADH). According to Richtel (2012) constant use of digital technology is hampering the attention span and ability to persevere in face of challenging task. Hence educators must to adjust to better accommodate the way students learn. For decades instructors are forcing students to adjust to the uniform instruction or teaching styles of the instructors, this paper contend that though it could facilitate efficient delivery of content, however, it is slow in knowledge transfer, adaptation to learning preferences of students could be faster and enduring.

In recent years students' engagement in classroom is one of the major critical problems in

education. To address problem of student engagement researchers and educators focused more on objective factors in facilitating student's attention due to their affinity in justifying testable ends of research evidence. Recognition of objective factors in students' engagement is to the detriment of subjective ones, which consequently affect student individual needs. Objective factors of attention mainly focused on the nature of the object attended to, this paves the way for the dominance of school instruction which heavily based uniformity against diversity, this call for balance. The major thrust of this paper is that instructors should not focus only on efficiency, there is need to distinguish between what should be uniform for all students and what should be diverse and to strive towards putting into practice what could facilitate student's engagement in their learning.

CONCEPTUAL FRAMEWORK

Students are expected to use their attention optimally in order to succeed in schools, control behaviour, and relate well with others. Learners show different strength and weaknesses in this area. Therefore, helping students to understand the effective control of attention and ways to strengthen aspect of attention can increase their success in school and life at large. The conception of this paper is towards adapting students learning preference in order to adapt effectively in difficult learning situation for effective learning. Teacher centered instructional selection create environment in which only a subset of learners can succeed. Understanding different learning preferences that students bring to a science classroom will not only help some students learn more science, but also help more students learn any science? Effective teaching recognizes diversity of learning preference among students in our classroom. It was envisaged that learning styles could be actively adapted to certain extent, to different learning environment. Hence frame works for characteristic differences in the way learners prefer to learn, the VARK multiple intelligence and dimension of learning styles in science no one school of thought is superior or inferior (Allen&Tanner 2003)

THEORETICAL FOUNDATION OF DIVERSE INSTRUCTION

Constructivist theory is drive from the cognitive gestalt principle that people interpret reality differently. Acceptance of constructivism in



science education has led scholars to show interest in individual differences, while current education demography in Nigeria reflected significant raise in student population which need to be accommodated for effective learning. Frame works for characterizing differences in and dimensions of learning styles in science, no one school of thought is superior or inferior. There are various models of categorizing learners but sensory modality enjoys wider application in practice. Although it is believed that learners can use all the sensory modalities in learning, however, one mode often dominant and preferred. Despite the contention of Carl Jung that there are two ways in learning that is sensing and intuiting, what al agreed is that learner prefer the world that give them energy that the world which drain them. These suggest that learners prefer to use modes they trust most, because learners use the modalities at different degrees of effectiveness and with different level of comfort. Hence modeling learner's preference could ease and facilitate innovation in science through enhancing focus. Learning situations that learners find difficult are those in which learners has conflict between learning modes. In these situations, the dominant preference will take over. Similarly, what learners perceived as easy and feel good about it are usually as a result of being in synchronization with all the learning preferences. This made Eigbe (2013) to conclude that lack of adequate focus/ attention during learning is the major cause of gap in students' academic performance from the same learning exposure.

Perception of Biology as difficult Subject

Three decades ago in Nigeria studies on learning difficulty in Science and Biology in particular suggest the rise of a new variable in science classroom. Fast and easy access to large volume of information coupled with expanding population in Biology classroom could be the palpable phenomenon that many researchers believe create difficulty in Biology. Effective teaching of Biology goes beyond content it requires attention on the process of moving students from their initial state of knowledge and understanding to the desired level. According to Umar (2015) an increased interest in learners' individual differences which emphasized on inclusiveness, cooperative learning and diversity to date has not yielded significant change in perception of difficulty. The possible bane as conceived by this paper is that Biology has larger content and with

abstract concepts which require high attention resources. Therefore, the major challenge is that which approach of teaching can accommodate all learners irrespective of their differences in learning preferences. Newer, innovative, and active learning approaches such as Concept mapping, Cluster map, Cooperative learning, Games and Play, Field Trip, Team Teaching, Simulation and Think-List-Pair-Share has been advocated. However, performance, attitude and interest in Sciences and Biology in particular is on the perennial decline. In recent years adapting student learning styles for effective learning is gaining acceptance in the scholastic and instructional practices, however its feasibility in Nigerian classrooms is questioned or challenged. Therefore, the need for innovative approaches such as adaption of learners' preferences/styles cannot be over emphasize.

Adapting Learning Preferences

Literally learning style or preferences are affective and cognitive trait acquired and adapted in learning situation. However, according to James (1995) is the complex manner in which anda condition under which learners most efficiently and most effectively perceive, process, store and recall what they are attempting to learn. Or learning preferences are predispositions of an individual to perceive and process information in a particular way or combination of ways (Sarasin 1998). In another view Dunn and Dunn (2003), in Umar (2015) defined learning style is the way each learner begins to concentrate on, process, internalize, and remember new and difficult academic information or skills.

Umar (2015) opined that behaviour provides an insight in to how learners behave during knowledge acquisition. This prompted many scholars in developing models as part of effort to categorise learners for effective instruction. Fleming's (2006) model of Visual, Audio, Kinesthetic (VAK) learning suggested that learners use three modalities to receive and acquire new information and experiences. However, one or two of these receiving modalities is normally dominant. Therefore, this paper adopted Visual, Audio and Kinesthetic (VAK) learning model. One central theme of VAK learning model was that individuals can learn and individuals have their own unique ways of mastering new and challenging information.

Adapting students to the overflow of information in schools requires modeling their needs to address their individual differences for easy practice in the classroom. Elvira Popescu, Costin Badica and Lucian



Moraret (2010), opined that integrating learning styles in adaptive educational system is relatively recent trend in technology enhance learning. The rationale is that adapting course to the learning preferences of the students has a positive effect on the learning process, leading to an increased efficiency, effectiveness and/or learner satisfaction. Therefore, the philosophy behind accommodating the individual differences of the learners for example visual, auditory and kinesthetic learning style is that it enhances student engagement which is beneficial for the student, leading to an increased learning performance and/or learner satisfaction. Students' attention increases if a person is able to perform a task or learn fluently and distraction reduces time on task or learning. It is believed that attention increases efficiency because it improves sensory discrimination, like a bright search light. To support this Golema (2013) opined that the ability to focus is a secret element to success that often gets ignored. He stressed that 'the more you can concentrate the better you will do on anything, because whatever talent you have, if you can't apply it if you are distracted. Interference and attention deficit models have been proposed to explain negative performance effects of anxiety. These models assume that anxiety involves task-irrelevant thinking which reduces task-related attention, thus interferes with performance that is task requiring attention resources. It is observed that students who worry about possible failure cannot focus their attention in learning (Cherry, 2014). The paper proposed teaching students according to their learning preferences, that is the way they enjoy learning, because there is ample evidence to support the view that enjoyment of learning facilitates students focus/engagement.

MODELS OF LEARNING STYLES

There are different models of learning styles as proposed by scholars to be considered in characterization of learners. Some of the popular ones include Myer-Briggs Type Indicator, (1986); Kolb/McCarthy Learning Cycle, (1984); Felder-Silverman Learning Style Model, (1988); Grasha-Riechmann Learning Style, (1996); and Neil-Fleming and Baume Model (2006); sensory input: Visual, Audio and Kinesthetic. (VAK). This paper adopted Visual, Auditory and Kinesthetic model due to its simplicity in practice. VAK learning style does not consider intelligence or inherent skill, but focused on individual accumulation or understanding of information or new knowledge. Umar (2015) reported that:

Researchers like Dunn and Dunn (1978) found that only 20-30% of school age children appear to be auditory learners, that 40% are visual and that the remaining 30-40% was kinesthetic, visual/kinesthetic or other combination in a class. Fleming (2001) reports that about 41% of the population who have taken the instrument online have single style preferences, 27% two preferences, 9% three and 21% prefer all four styles. Similarly, Barbe and Milone (1981) stated that for grade school children the most frequent modality strengths are visual (30%) or mixed (30%), followed by auditory (25%), and then by kinesthetic (15%). Uba (2012) in Nigeria found that 91.5% multimodal while 8.5 unimodal. Also, in Nigeria, Alade¹ and Ogbo (2014) reported that Majority of the students in public school preferred the visual learning style to auditory and kinesthetic. Similarly Umar, (2016) reported that about 47.08 % of Colleges of education students are Visual, 31.25 Audio, while 21.67 are Kinesthetic.

Learners can learn with the sensory modalities however, Timothy (2016) argues that one mode is often dominant and most preferred. Audio learners prefer auditory input, visual learners prefer visual input and kinesthetic prefer tactile, moving and objects manipulation. Similarly, evidence from neuropsychology suggests that learning style could be a form of adaptation, because over a time new synaptic density may be developed to adapt to environmental changes, so by implication learning styles are flexible and can be adapted to a certain extent to different learning environments. Therefore, this paper opined that characterizing learners on visual, audio kinesthetic learning modality could be an adaptive way for effective students' engagement in science classroom, which could lead to better academic performance in Biology. Effective teaching is one that considered students with diverse learning needs and ensure all students are academically successful, this can be achieved through adapting student characteristics to instruction and assessment. Visual, audio and kinesthetic learning style considers learners entry points by allowing all students to access the same classroom curriculum by providing entry points,

learning tasks, and outcomes that are tailored to students' needs (Hall & Meyer, 2003). Tomlinson (1999), Suggest that for effective adaptation of learning preferences, the curriculum can be modified via; content, process, or product. In

this paper differentiation is effective if teachers consider learners profile. An adapted differentiated instruction model for thispaper is presented in figure 1.

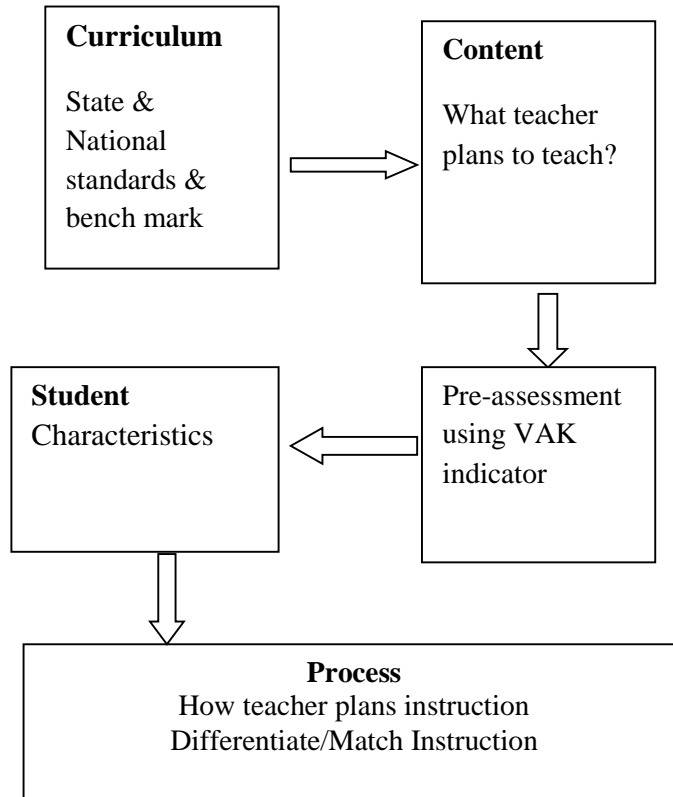


Fig .1: Differentiated Instruction Model

Source: Umar (2015) Adapted from Ireh and Ibeneme, (2010)

Visual, Auditory and Kinesthetic Learning Sequence

The paper provides a concise sequence for the three learning preferences as follows:

1. Visual Learning Style: **Step 1** Observation of printed materials: **Step 2** Raise printed questions: **Step 3** Read printed answers: **Step 4** Observe learning material: **Step 5** Display key points: **Step 6** Clarify misconceptions: **Step 7** Evaluation:
2. Auditory Learning Style: **Step 1** Listen to presentation: **Step 2** Question and answers: **Step 3** Discuss Key points: **Step 4** Repeat key points: **Step 5** Evaluation:
3. Kinesthetic Learning Style: **Step 1** Observe task and materials: **Step 2** Explain concepts: **Step 3** Engage Student: **Step 4** Observed models and tools: **Step 5** Record

observation: **Step 6** Evaluation: (Umar, 2015)

CONCLUSION

Since learning behavior can provide a basis of students' characterization VAK learning style model can be adapted for effective teaching and learning of science in an era where distraction is becoming a norm. Biology is packed with largest content and largest students' enrolment among the three natural sciences hence many students perceive it as difficult. This paper concludes that if students learning presences are adapted a flow in learning is created therefore, learning difficulty, boredom and interaction conflict moderated. Consequently, learning is facilitated.



RECOMMENDATIONS

In fast-paced and information overloaded generation instructors are required to use innovative ways to hold learner's attention, this can be done by adapting instruction to learners' sensory modalities. In addition, the following need to be considered:

1. Science teachers Association of Nigeria organized workshops and conference that focus on behavioural adaptation in learning.
2. Curriculum conference on content, product and process of information delivery is required.
3. Instructors, scholars and administrators need to convene to outline courses that require differentiation from those that do not.
4. Students need, interest, and presences need to be administered at point of entry and subsequently on yearly basis.
5. Instructional aides, science tools, apparatus text books and classroom arrangement should agree with students' differences.

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