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Emerging Trends in Science Education in a Dynamic Academic Environment

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Abstract
Emerging Trends in Science Education in a Dynamic Academic Environment highlights the changes that have occurred in science education particularly in institutions of higher learning in southern Nigeria. Impelled by the fact that most Nigerian Universities and Colleges of Education still adhere to the practices and teaching methodologies of the teacher-centered classroom teaching approach. Four research Questions and Hypotheses were raised. A total of 96 respondents were selected at random from the Faculty of Science and Education from seven (7) different Institutions of learning (3 Universities and 4 Colleges of Education) in Delta State. An internal consistency with a coefficient of 0.88 was established using Cronbach alph. A mean was used to answer the research questions. T-test statistics was used to test each hypothesis at 0.05 level of significance. The study revealed that there was an apparent upgrade from the chalk and board system to the use of the Magnetic White Board system, the use of slide projector based tutoring (SPBT) increases students understanding in science education, and that there is no significant difference between the attainments of teaching objectives when web-based training is administered by male science education tutors or by female science education tutors. The researcher recommends that Nigerian Government should embark on deliberate technological ventures that will not only develop the nation but also affect the academic environment positively.
Keywords: Emerging Trends, Dynamic, Academic Environment,

Introduction

The dawn of the 21st century has brought about prominent changes in the way and manner in which society interact with itself. From the early stages of industrialization, the birth of the microchip to the ground breaking discoveries in wireless and fiber optic communication technology, humanity has always found a way to constantly improve upon its previous achievements. The academic environment, often labeled as "a society within a society", is also not left out. It refers to the socio-cultural behavior that occurs in any institution of leaning and its constantly bombarded with evolutional and socio-cultural changes as a result of the fact that it is directly being shaped and controlled by larger societal needs/wants and vice-versa as Ulrich and Yesemin (2009) posited that higher education and research contribute technological progress, economic growth, societal wellbeing and cultural enhancement, thus making it apparent that the academic environment and the larger society are twin sides of the same coin.

Over the past decade, new dynamics have emerged in each of the key domains of higher education, these include: (i) demand; (ii) diversification of provision; (iii) changing lifelong learning needs; and (iv) growing Communication and Information Technology (CIT) usage and enhanced networking and social engagement, (Kearney, 2009), with explicit implications in science education.

As an educational and scientific discipline, science education concerns itself with the sharing of scientific content and processes with other academic disciplines not traditionally related to the sciences. Science on one hand refers to the process of knowledge acquisition through observation, studying and practice, while education on the other refers to the resultant effect of the application of knowledge.

The definition of science in this regard is a de facto gatekeeping device for what can be included in a school science curriculum. "Science" from this perspective refers to descriptive knowledge of nature developed through experience with nature. The definition of science used here is consistent with Ogawa (1995, p. 588) who refers to science simply as "a rational perceiving of reality (Cobern & Loving, 2000).

Literature Review

In almost every academic institution, there is an increased emphasis on improved teaching methodologies / students centered learning systems, which has led to the discovery/adoption of different approach varying from the orthodox teaching/ learning processes previously used. In the Sub Saharan Africa, these methodologies evolved from the informal gathering of children under trees and moonlights to the formal yet local classroom and school programmes, as Obanya and Touré (2003), rightly noted that there has also been an influx of 'new methodologies' into the school system, promoted largely through new teaching-learning guidelines and localized in-service training programmes, "these" new methodologies go by different names, such as active methods, audiovisual methods, pedagogy by objectives (outcome-based learning), etc.

As an academic discipline, science education is not an exception to these influx of new methodologies or 'modern trends' due to the fact that it is concerned with providing basic scientific literacy to individuals in

order to cope with the fundamental issues of life. Its composition is therefore unique, as Kola (2013) opines that "science education comprises three subjects namely biology, chemistry and physics which are combined with education" forming an exceptional academic discipline with prevailing research activity, as "research activities; tend to mirror the prevailing trends in the development of basic education services in areas related to the subject of Theme (involving) Pedagogical Renewal and Teacher Development" (Obanya & Touré, 2003). These prevailing trends according to them are further portrayed in;

1. The pre-school experience
2. Teacher development
3. Teaching and learning
4. Education technology
5. Action research
6. Gender issues

Prior to the advent of these new methodologies, Ouedraogo, (2000) asserts that classroom activities are characterized by 'rigidity', and conclusions of a study from Côte d'Ivoire (Coulibaly, 2000) explain 'rigidity', as occasioned by:

1. Insufficient and poor training, leading to poor mastery of appropriate teaching techniques;
2. Poor supervision;
3. Large and unmanageable classes;

These are predominant features in most Nigerian Universities and Colleges of Education, "despite global uniformity in many areas of society; structures or policies for higher education, research and innovation" (Kearney, 2009). Obanya and Touré, (2003) however, posited that reforms and innovations are terms that have been over flogged in the discourse on education in Africa since the early 1960s, yet the National Consortium of Education Foundation (NCEFS), holds ground that "within the next five years there will be profound shifts in technology and content capabilities which will profoundly affect teaching and learning". Stating further that these shifts or 'emerging trends' will occur in the following areas;

1. Conversion to e-textbooks – stating that over 90% of collegiate textbooks are already available in e-textbook format
2. Rise of K-12 Learning Platforms – currently lagged in Higher Education
3. Proliferation of Mobil Devices –embrace devices for education, learning almost anywhere
4. Advances in academic analytics – intelligent software used in analysis eg. Graph Pad Prism, SPSS
5. Growth of intelligent classrooms –multimedia experiences

In more analytic terms, these trends in science education reveal the technological position of the 21st Century and according to González-Valiente, (2015), technological revolution emerged in the late 20th Century (and) has brought about a re-dimensioning process of the theoretical and practical ways of thinking in the disciplines fields; and in the case of Educational Sciences (Science Education), the information technologies (ITs) have open new possibilities to teaching (Yusuf, 2005; Gómez, 2012), which has implied a re-formulation of teaching-learning process's practical methods (Reddy, 2006).

Statement of the problem

A good number of Nigerian Universities and Colleges of Education still adhere to the practices and teaching methodologies of the teacher-centered classroom teaching approach, using the chalk and black board where "the teacher being the controller of the learning environment; power and responsibility are held by the teacher and they play the role of instructor (in the form of lectures) and decision maker (in regards to curriculum content and specific outcomes), (regarding) students as having 'knowledge holes' that need to be filled with information. In short, the traditional teacher views that it is the teacher that causes learning to occur" (Novak, 1998). This trend is also evident in science education as Wieman (2008) and Diamond (2009), stated that in a traditional science class, the teacher stands at the front of the class lecturing to a largely passive group of students. Those students then go off and do back-of-the-chapter homework problems from the textbook and take exams that are similar to those exercises. Nigerian Universities and Colleges also portray similar characteristics in their teaching and learning practices, not recognizing that there are other possible ways of achieving their teaching objective especially in science education.

Objectives of the study

This study therefore seeks to analyze the emerging trends in science education in a dynamic academic environment. Other objectives include the following;

1. To determine whether the use of Magnetic White Board emerged as an effect of a dynamic academic environment.
2. To determine if the use of slide projector based tutoring (SPBT) increases students understanding in science education.

3. To find out whether the use of audio-visual teaching material in science education emerged as a result of a dynamic academic environment.
4. To investigate if a difference exist in the attainment of teaching objectives when web-based training is administered by male or female science education tutors.

Research Question

1. Does the use of Magnetic White Board emerge as an effect of a dynamic academic environment?
2. Does the use of slide projector based tutoring (SPBT) increases students understanding in science education?
3. Does the use of audio-visual teaching material in science education emerged as a result of a dynamic academic environment?
4. Does a difference exist in the attainment of teaching objectives when web-based training is administered by male or female science education tutors?

Research Hypothesis

Ho_1 – There is no significant relationship between uses of Magnetic White Board and a dynamic academic environment.
Ho_2 – There is no significant relationship between uses of slide projector based tutoring (SPBT) and increases students understanding in science education.
Ho_3 – There is no significant relationship between uses of audio-visual teaching material in science education and a dynamic academic environment.
Ho_4 – There is no significant difference between the attainments of teaching objectives when web-based training is administered by male science education tutors and when web-based training is administered by female science education tutors.

Methodology

A descriptive survey consisting of 96 Lecturers from the Faculty of Science and Education respectively from seven (7) Institutions of learning (3 Universities and 4 Colleges of Education) in Delta State was adopted, based on convenient sampling. A twenty (20) item Questionnaires was used to collect data, and a four point scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) was employed to capture their responses. The instrument was validated by two professionals in Measurements and Evaluation from Delta State University, Abraka, and an internal consistency of 0.88 was established using the Cronbach alph method, while an arithmetic mean was used to test the research question, variables values below 2.5 were adopted as negative (Disagree) while all variable values above 2.5 were also adopted as positive (Agree). The research hypothesis was tested using a t test statistics at a significance level of 0.05.

Results of Analysis

The results were obtained from the research question and hypotheses tested and shown below;
RQ1: Does the use of Magnetic White Board emerge as an effect of a dynamic academic environment?
Table 1: Respondent's Mean rating

S/N	Item	N	SA	A	D	SD	Mean	Decision
1.	Magnetic White Board is an innovative teaching method used nowadays	96	68	18	9	1	3.594	Agree
2.	It reduces the health risk associated with using chalk and black boards	96	61	32	3	0	3.604	Agree
3.	It is convenient for note taking and diagrammatic examples due to its nonpermanent nature	96	59	25	8	4	3.448	Agree
4.	It enhances Classroom Instruction and Learning	96	56	36	3	1	3.531	Agree
5.	Portrays professionalism in lecture delivery	96	51	30	11	4	3.333	Agree
	Group Mean						**3.502**	

In Table 1, the result of all the variables had a mean score that is above the average 2.50 mean, indicating that all items were accepted by the respondents as areas in which they believe Magnetic White Board evolved as an effect of a dynamic academic environment. This was further confirmed by the group mean of 3.502 ± 0.113, which is also higher than the average mean of 2.50.
RQ2: Does the use of slide projector based tutoring (SPBT) increases students understanding in science education?

Table 2: Respondent's Mean ratings

S/N	Item	N	SA	A	D	SD	Mean	Decision
6.	Slide projector simplifies teaching nowadays	96	52	34	7	3	3.406	Agree
7.	Slide projector is a quick way to get students attention	96	61	33	2	0	3.615	Agree
8.	Slide projector is an effective tool to highlight areas of importance in class discussions	96	38	42	14	2	3.208	Agree
9.	The use of Slide projector increases students understanding of the subject matter	96	44	37	9	6	3.24	Agree
10.	Slide projector aids in demonstrations and illustration that are difficult to explain verbally	96	55	24	12	5	3.344	Agree
	Group Mean						**3.363**	

Revealed in Table 2, is the mean score of the items/variables listed therein obtaining a score that is above the average 2.50 mean, indicating that the use of slide projector based tutoring (SPBT) increases students understanding in science education. In addition, the group mean of 3.363 ± 0.162, confirms the above since its mean score was also higher than the average mean of 2.50.

RQ3: Does the use of audio-visual teaching material in science education emerged as a result of a dynamic academic environment?

Table 3: Respondent's Mean ratings

S/N	Item	N	SA	A	D	SD	Mean	Decision
11.	Audio-visual teaching material automatically makes the teacher a secondary source of information	96	29	51	11	5	3.083	Agree
12.	Audio-visual teaching material consolidates teaching and learning nowadays	96	59	19	15	3	3.396	Agree
13.	Audio-visual teaching material has a lasting imprint in the minds of the learners	96	48	34	12	2	3.333	Agree
14.	Audio-visual teaching material simplifies the teaching process	96	51	25	14	6	3.26	Agree
15.	Audio-visual teaching material In science education reinforces what has been learnt	96	47	39	8	2	3.365	Agree
	Cluster Mean						**3.287**	

The Table 3 above shows mean result of variable items 11 – 15, above the average mean of 2.50, thus signifying that the use of audio-visual teaching material in science education emerged as a result of a dynamic academic environment also due to their combined group mean of 3.287 ± 0.125, higher than the average 2.50 mean score.

RQ4: Does a difference exist in the attainment of teaching objectives when web-based training is administered by either male or female science education tutors?

Table 4: Respondent's Mean ratings

	Item	Mean Male N = 67	Std. Deviation	Mean Female N = 29	Std. Deviation
1	Web based training provides the students with a limitless knowledge base whether it is being taught by a male of female instructor	3.343	0.914	3.143	0.891
2	Web based training helps the students acquire knowledge outside the classroom whether administered by a male of female lecturer	3.493	0.894	3.31	0.806
3	Web based training provides a foreknowledge of course content to students whether it is being taught by a male of female instructor	3.239	1.016	3.138	0.875
4	Web based training covers almost all academic subject matter these days whether administered by a male of female tutor	3.418	0.873	3.483	0.634
5	Web based training provides in depth explanations not provided by teachers in traditional classrooms either male or female	3.06	0.736	3.276	0.841
	Group Mean and STD	**3.311**	**0.169**	**3.270**	**0.142**

The mean score of all variables in Table 4 above revealed the mean values above the average mean mark of 2.50, thus indicating that both male and female attest to the impact of web based training in science

education but regards the research question, the group means reveal a slight difference in the attainment of attainment of teaching objectives when web-based training is administered by either male or female science education tutors. This is as a result of the fact that the male tutors group mean was 3.311 ± 0.169, while the female had a mean score of 3.158 ± 0.105 respectively.

Research Hypothesis

Hypotheses One:

Ho_1 – There is no significant relationship between uses of Magnetic White Board and a dynamic academic environment.

Table 5: T-test for the significant relationship between uses of Magnetic White Board and a dynamic academic environment

	N	Mean	SD	DF	t-Calculated	t Critical Value (.05)	Remark
Magnetic White Board a dynamic academic environment	96	3.528 3.464	0.078 0.185	94	1.8032	1.660	Rejected

P= ≤ 0.05 level of significance

The result of the t-test for the mean of the two variables shown above indicates a significant relationship between uses of Magnetic White Board and a dynamic academic environment. This is due to the fact that the calculated t-value of 1.8032 is higher in value than the t-critical value of 1.660 at a 0.05 level of significance. Thus the null hypothesis is rejected implying that there is a significant relationship between uses of Magnetic White Board and a dynamic academic environment.

Hypotheses Two:

Ho_2 – There is no significant relationship between uses of slide projector based tutoring (SPBT) and increases students understanding in science education.

Table 6: T-test for the significant relationship between uses of slide projector based tutoring (SPBT) and increases students understanding in science education.

	N	Mean	SD	DF	t-Calculated	t Critical Value (.05)	Remark
uses of slide projector based tutoring	96	3.410	0.204	94	3.767	1.660	Rejected
increases students understanding in science education		3.292	0.074				

P= ≤ 0.05 level of significance

The result of the t-test for the relationship between the mean of the two variables as shown above indicates a significant relationship exists between uses of slide projector based tutoring (SPBT) and increase students understanding in science education. This is as a result of the fact that the calculated t-value of 3.767 is higher in value than the t-critical value of 1.660 at a 0.05 level of significance, implying that the null hypothesis is being rejected and the alternate hypothesis accepted, stating that there is a significant relationship between uses of slide projector based tutoring (SPBT) and increases students understanding in science education.

Hypotheses Three:

Ho_3 – There is no significant relationship between the use of audio-visual teaching material in science education and a dynamic academic environment.

Table 7: T-test for the significant relationship between the use of audio-visual teaching material in science education and a dynamic academic environment.

	N	Mean	SD	DF	t-Calculated	t Critical Value (.05)	Remark
audio-visual teaching material in science education	96	3.287	0.125	94	5.493	1.660	Rejected
a dynamic academic environment		3.464	0.185				

P= ≤ 0.05 level of significance

The Table 7 as shown indicates that there is significant relationship between the use of audio-visual teaching material in science education and a dynamic academic environment. The Null Hypothesis is being rejected due to its calculated t-value of 5.493 being higher than the t-critical value of 1.660 at a 0.05 level of significance, thus implying that a relationship exists between the use of audio-visual teaching material in science education and a dynamic academic environment.

Hypotheses Four:

Ho_3 – There is no significant difference between the attainments of teaching objectives when web-based training administered by male science education tutors and by female science education tutors.

Table 8: T-test for the significant difference between the attainments of teaching objectives when web-based training administered by male science education tutors and by female science education tutors.

item	N	Mean	SD	DF	t-Calculated	t Critical Value (.05)	Remark
attainments of teaching objectives when web-based training administered by male science education tutors	67	3.311	0.169	94	1.143	1.660	Accepted
attainments of teaching objectives when web-based training administered by female science education tutors	29	3.270	0.142				

P= ≤ 0.05 level of significance

Table 8 displays the t-test relationship between the mean of the two variables, male and female science education tutors, shown above. The table revealed that there is no significant difference between the attainments of teaching objectives when web-based training is administered by male science education tutors or by female science education tutors. The result accepts the Null Hypothesis due to its obtained calculated t-value of 1.143 being lower than the t-critical value of 1.660 at a 0.05 level of significance, thus agreeing to the null hypothesis that there is no significant difference between the attainments of teaching objectives when web-based training is administered by male science education tutors or by female science education tutors.

Research Findings

With the fundamental principle of science education in view, the research reveals that an emerging trend in Universities and Colleges of Education in Nigeria highlight an apparent upgrade from the chalk and board system to the use of the Magnetic White Board with specific reasons that Magnetic White Board is an innovative teaching method used nowadays, It reduces the health risk associated with using chalk and black boards, It is convenient for note taking and diagrammatic expressions due to the nonpermanent nature of the ink used, It enhances Classroom Instruction and Learning, and it Portrays professionalism in lecture delivery, thus implying that there is a significant relationship between uses of Magnetic White Board and a dynamic academic environment.

In addition, the study reveals that the use of slide projector based tutoring (SPBT) increases students understanding in science education, on the grounds that Slide projector simplifies teaching nowadays. It is a quick way to get students attention, and it is an effective tool to highlight areas of importance in class discussions, as Diamond (2009) posited that for teaching to be effective in promoting learning, it must involve interaction between teachers and students. One-way delivery from a teacher does not work for the vast majority of pupils. The study further revealed that the use of slide projector based tutoring (SPBT) increases students understanding of the subject matter, and it aids in demonstrations and illustrations that are difficult to explain verbally, also signifying a strong relationship between uses of slide projector based tutoring (SPBT) and increases students understanding in science education. Agreeing to the above

The use of audio-visual teaching material in science education as the study reveals, emerged as a result of a dynamic academic environment which is based on the logic that Audio-visual teaching material consolidates teaching and learning nowadays. This is supported by Boumová (2008) stating that modern methodology is much more student-centred. It automatically makes the teacher a secondary source of information, stating further that it has a lasting imprint in the minds of the learners, simplifying the teaching process, and reinforces what has been learnt especially in science education, also implying that a relationship exists between the use of audio-visual teaching material in science education and a dynamic academic environment.

The study further showed that a slight difference exist between male and female when web-based training is administered by either male or female science education tutors based on the mean values obtained, but generally their mean values is close enough to assert that there is no significant difference between the attainments of teaching objectives when web-based training is administered by male science education tutors or by female science education tutors

Conclusion

This paper therefore highlights these changes in science education in the local academic environment in southern Nigeria. The paper also portrays that the emerging trends in science education are resultant effects of technological developments of the immediate environment, and in Nigeria these development are taking place at a gradual speed.

Recommendations

The researcher recommends based on the foregoing that;

1. Nigerian Government should embark on deliberate technological ventures that will not only develop the nation but also affect the academic environment positively.
2. Nigerian Institutions themselves should embark on innovative research that would translate to workable projects that are usable in everyday lives of Nigerian citizens

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