Use of Creative, Innovative and Invention Techniques in Students Assessment in Rivers State Universities: Implications for Sustainable Development

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Abstract

The study focused on the use of creative, innovative and invention techniques in students' assessment in Rivers State Universities for sustainable development. Three objectives, three research questions and three hypotheses were posed to guide the study. The population for the study was 533 (Five Hundred and Thirty Three) in Faculty of Education. The design of the study was descriptive research. The sample size was 159 and the sampling technique used was simple random technique. Data for the study were collected by the means of questionnaire titled "creative innovative and inventive assessment test (CIIAT) was used for the study. Test re-test method was used which yielded reliability index of 0.85. One hundred and Fifty Nine (159) copies of questionnaire were distributed and 146 were retrieved for analysis. Mean and standard deviation were used to answer the research questions while z-test was used to test the hypotheses. Based on the findings, it was found that creative, innovative and inventive techniques were tools in assessing students. The findings revealed that creativity opens the mind, allow students to view and solve problem more openly with innovation. The techniques usually based on design-based learning, problem solving, creative problem solving, creative thinking, research-based learning, problem -learning, project based learning, science, or innovative teaching process will lead to innovative education creatively. Also, using a variety of stimulating ideas to find possible solutions to the problems facilitates, brainstorming will help learners think about new ideas. Results also showed that techniques using questions, classroom discussion, self-directed study, inductive and deductive thinking, media or social media make students to engage in learning activities and creative innovation in learning.

Keywords: Techniques, Invention, Innovation, technology.

Introduction

Education needs to catch up with the new technology and assimilate it into courses. However, innovation in education needs to follow the changing world and solve educational problems effectively (Whattananarong, 2011). Good quality innovation in education could make learners learn more in a shorter time and could promote learning competence. It is crucial and indispensable to create good quality innovation in education. Sintapanon (2009) mentioned that creating innovation in education is vital for learning because it helps learners understand content and lesson clearly. Learners develop their learning processes which affect their desirable characteristics. Hence, creating educational innovation needs to be studied in each type of innovation. Creativity and

innovation are characteristics that people seek to develop to help them look at the world in new ways and form ideas to improve or add to it. They are active characteristics, they have to be used deliberately in order to create something beneficial or authentic.

Francis (2019) sees creativity as a process concerning the making of new idea or concepts, new associations between existing ideas or concepts, and their support into a product that has newness and originality. From a scientific point of view, the products of creative thought (sometimes referred to as divergent thought) are usually painstaking to have both "originality" and "appropriateness". An alternative, more everyday conception of creativity is that it is simply the act of making something new. Creativity is the characteristics of a person to generate new ideas, alternatives, solutions and possibilities in a unique and different way. Creativity is the ability to conceive something unpredictable, original and unique. It must be expressive, exciting and imaginative. It is the mirror of how beautifully a person can think in any given circumstance. It is not genetic but can be developed if someone keeps on learning and comprehending things with a rare and exclusive perception.

Creativity is a brainstorming and mind-blogging activity in which a person has to think beyond his imagination for bringing something worthwhile. It is an activity of unveiling something which was previously hidden (Surbhi, 2018). Generally, creativity can be defined as the creation of original ideas, processes, experiences, or objects. For example, inventions such as the computer and the printing press and paintings such as the Mona Lisa are creative endeavours. Creativity can also be described as the ability to see ordinary things differently. An often-cited example of this kind of creative thinking is the creation of Velcro, which arose from the observation of cockleburs clinging to clothes. The inventor, George deMestral, clearly was able to see a common item in a different and original way and was able to generate a clear, detailed idea that resulted in his million-dollar product. the developers of the iPod, the cell phone, and the YouTube Web site all employed creative thinking in the creation of their products (Egbert, 2017).

Creativity is a crucial thinking skill to create educational innovation that is novel, valuable, and useful in education. Many creative instructional models have been used in higher education to promote creative thinking. For example, Prompan (2007) developed a web-based instructional model based on brain-based learning process in a design course to enhance creative thinking of undergraduate students. This model consisted of principles, objective, instructional process, and evaluation. The principles emphasized the importance of design supporting environments that can motivate learners to maximize their readiness in order to generate optimal learning processes. The principles also emphasized the importance of design of problem-solving activities and of challenging tasks for learners. The instructional process was composed of seven stages;

1. Preparation
2. Setting the learning goals
3. Learning and transformation
4. Defining the concept and application
5. Development
6. Presentation and

7. Evaluation and celebration of the learning. The implementation of this model could increase students' creativity (Prompan, 2007).

Scholars have pointed out that creative ideas are often the foundation for innovation (Scott & Bruce in Christen & Knezek, 2019; Wright, 2012). While creativity and innovation are closely related, creative thinking differs, in that it may include a wide range of ideas that are not useful. Innovation has been described by Isaksen et al (2010) as having a close and complementary relationship with creativity in problem-solving. Innovation is an act of application of new ideas to which creates some value for the business organisation, government and society as well. Better and smarter way of doing anything is innovation. It could be the introduction of:

1. New technology
2. New product line or segment
3. A new method of production
4. An improvement in the existing product

Innovation is closely tied to creativity i.e putting creative ideas into action is an innovation, whose consequences should be positive. It is the process of doing something better for the first time, which was not previously done by any entity. It can also be termed as a change which can bring a new edge to the performance and productivity of the company. It is of two types i.e evolutionary and revolutionary (Surbhi, 2018). Innovation is a new thing or partial new one that is created by a systematic approach and then improved by doing research, and it is not appeared in a daily working system (Songkhram, 2013). The common procedures in creating educational innovation are as follows:

1. Study problems or need
2. Specify the problem
3. Specify the goals
4. Study the limitation
5. Create the educational innovation
6. Develop the educational innovation
7. Diffuse the educational innovation, and
8. Study the effects of diffusion's educational innovation (Kaewpradit, 2002; Khammani, 2013; Phumipak, 2006).

Songkhram (2013) said that innovation is products, techniques, new procedures, new knowledge that have been never happened or, existed products, techniques, procedures but revised or developed and good results. Therefore, creating an innovative product need to be followed by learning actives that help students create innovation by themselves. The learning activities are the important procedures including diverse procedures and technique. Teachers can apply these activities in their classroom efficiency, and proposed that a tool to evaluate innovation should include three parts (1) standard procedures of innovation development, (2) degree of valuable innovation, and (3) innovative characteristics. A composite score from these three types of rubrics indicates an innovation level. If the score of innovation is at a low level, it should be revised to make more innovative. Sometime

people are afraid to try new ideas on the basis that it may fail. Innovation in education is allowing imagination to flourish and not to be afraid to try new things.

Innovation will form the following importance in teaching

1. Challenge students by giving them a problem that is both authentic and interesting
2. Give students the basics in problem solving
3. Encourage students to research independently
4. Build complex skill in students
5. It help to check if students have understood the concepts
6. Confirm that students know what they still need to learn

Invention is leap in capacity beyond innovation. Some inventions combine several innovations into something new. Invention certainly requires creativity, but it goes beyond coming up with new ideas, combinations of thought, or variation on a theme. Innovation Education is a student-centered approach that empowers students to solve the problems they wish to (Sahlberg, 2012). Inventing means building something new or making something better and is often thought of as a purely creative act (Sahlberg, 2011). In fact, invention demands much more than a vision. It requires previous knowledge and new information; the ability to observe, analyse, and identify problems; and the utilisation of critical-thinking skills to find appropriate and workable solutions. Inventions and the process of inventing, requiring students to utilise all those skills in productive and enjoyable ways (Educationworld, 2023). Skukauskaite, Flynn and Couch (2019) sees invention education as a term that refers to deliberate efforts to teach people how to approach problem finding and problem solving in ways that reflect the processes and practices employed by accomplished inventors. Basically, innovation in education are as follows as seen in (Stephen, et al., 2017).

Innovation in instructional practices, innovation in class organisation, innovation in the use of text books in classroom, innovation in teaching styles, innovation in the availability in computer and internet in the classroom, innovation in the use of computer, innovation in the method of assessment used in the classroom. Below are the examples of innovation in education:

1. In pedagogical practice, teachers have innovated in their use of assessment and in the accessibility and use of support resources for instruction.
2. Educational organisations have innovated in the areas of special education, creation of professional learn communities for teachers, evaluation and analytics and relationship building with external stakeholders (such as parents).

There has been more innovation at the classroom than at the school level.

3. Countries with greater level of innovation have seen increase in certain educational outcomes.
4. Innovation is not a positive performance on itself. Systems with poor educational performance may innovate more than system with better results as they are trying to improve their results. While the effort is laudable, there is no guarantee that improvement will be achieved conversely; good system may fill less pressure to innovate, they may also consider that their

good performance allows them to take the risk of bold innovations. Innovation can as well involved methods of assessment used in class.

Innovative assessment can be considered as any form or method of assessment, which brings something new or try to do something different in any educational context (McDowell, 2002). Innovative assessment tools and strategies have the potential to shape the quality of learning process without considering the attempt to provide readily assessable and comparable results for external stakeholders. Innovation form of assessment is being introduced by university as a substitute for traditional written essays. Below are examples of innovation assessment one can employ in schools: conference as assessment effectives and efficient feedback, using twitter, whatsapp, google form as a form of assessment, audio-visual feedback etc.

These learning model has the ability to enhance problem solving abilities. Chitcharoen (2014) proposed a teacher training approach to enhance teacher competency in educational innovation and information technology course for pre-service teacher education. The teacher training process composed of 4 components:

1. People in a teacher network
2. A teacher competency in educational innovation and information technology
3. Technology tools, and
4. Evaluation.

The development phase composed of 4 steps:

1. Increases knowledge
2. Design stage to actual implementation
3. Join the network, and
4. To share the experience

Statement of the Problem

Students are faced with lack of clear, consistent criteria for measuring and comparing different innovations, students are not exposed to innovation assessment. Hence, they often do not see the need to think critically and invent new ideas. Thus, lack innovation strategies, lack internal and external collaboration.

Purpose of the Study

The purpose of this study is to determine the use of innovative, inventive and creative technique in assessing students in secondary schools. Specifically, the study seeks to:

1. Investigate the extent to which innovative technique affect students' assessment in Rivers State for sustainable development;
2. Ascertain the extent to which creative technique affect students' assessment in Rivers State for sustainable development; and

3. Assess the effectiveness invention techniques in assessing students' assessment in Rivers State for sustainable development

Research Questions

The following research questions will guide the study

1. To what extent does innovative technique affect students' assessment in Rivers State for sustainable development?
2. To what extent does creative technique affect students' assessment in Rivers State for sustainable development?
3. To what extent does a technique affect students' assessment in Rivers State for sustainable development?

Hypotheses

The following null hypotheses tested at 0.05 level of significance guided the study.

1. There is no significant difference in the mean rating of Rivers State University and Ignatius Ajuru University of Education students on the extent to which lecturers used creative technique in assessing student for sustainable development.
2. There is no significant difference in the mean rating of Rivers State University and Ignatius Ajuru University of Education students on the extent to which lecturers used innovative technique in assessing student for sustainable development
3. There is no significant difference in the mean rating of Rivers State University and Ignatius Ajuru University of Education students on the extent to which lecturers used invention technique in assessing student for sustainable development

Methodology

Descriptive survey design was used in conducting the study. The study focuses its attention on the two universities in Rivers State; specifically, Faculty of Education, Rivers State University and Ignatius Ajuru University of Education. The population for the study was 533 (Five Hundred and Thirty Three) Education students. Education graduates from 2020 to 2021 from the two tertiary institutions offering Education. The sample for the study consists of 30 percent of the total population making a total of 159 education students drawn from the institutions under study. The sampling technique that was used was simple random sampling technique as all the respondents were given equal opportunity. An instrument named creative, innovative and inventive assessment test (CIIAT) was used in collecting data for the study and was developed by the researcher. The instrument utilized a modified four point likert rating scale of strongly agree to strongly disagree. The instrument used for this study was subjected to face and content validation. Test-retest was used to establish the reliability of the instrument whereby it was administered to the same level of students (trial group of an intact class of 40 students outside the sample). Pearson product moment correlation coefficient was used to correlate the two results and reliability coefficient index of 0.85 was obtained.

Results

Analysis was made and mean and standard deviation was used for the analysis. Data was collected and presented in tables according to each research questions. The statistical tool used for the hypotheses testing was the z-test statistical tool and decisions for the hypotheses were made according to the decision rule z-test.

Table 1: Population distribution

S/N	**Institution**	**Education Graduates**
1	Rivers State University	234
2	Ignatius Ajuru University of Education	299
	Total	533

Source: (Field Study, 2021)

Research Question 1: To what extent does innovative technique affect students' assessment in Rivers State for sustainable development?

Table 2: Mean and standard deviation on how creativity technique affects students' assessment

S/N	**Item**	**Male = 63** X^2	**Sd**	**Remark**	**Female = 83** X^2	**Sd**	**Remark**
1	I think of myself as someone who is creative in my everyday life.	3.43	0.92	HE	3.35	1.02	HE
2	Students are not motivated to learn what is not being assessed.	3.05	1.01	HE	3.24	0.98	HE
3	Teachers find it difficult to assess students' creativity.	3.10	1.03	HE	3.12	0.88	HE
4	Creativity can be enhanced by using technology.	3.29	0.95	HE	3.41	0.84	HE
	Total Mean SD	**12.87**	**3.91**		**13.12**	**3.72**	
	Grand Mean SD	**3.21**	**0.97**		**3.28**	**0.93**	

Source: Field Survey, 2023

Table 2 which is for research question 1 showed that all the items were responded to high extent that means Education students used technology creatively. The information was made with a grand mean of 3.21 and 3.28 and standard deviation of 0.97 and 0.93 as responded by both male and female students of the two universities.

Research Question 2: To what extent does creative technique affect students' assessment in Rivers State for sustainable development?

Table 3: Mean and standard deviation on how innovative technique affects students' assessment

S/N	Item	Male = 63 X^2	sd	Remark	Female = 83 X^2	sd	Remark
1	Project work gives me the chance to take a leading role in the group	3.06	1.11	HE	3.51	0.84	HE
2	Inventing new solutions to problems could turn into an important part of who i am	2.95	1.08	HE	3.36	0.89	HE
3	I want my future work to be based around a set of challenges that i would find interesting	2.95	1.05	HE	3.20	0.97	HE
4	Once i start something, i like to finish it	3.14	0.96	HE	3.61	0.77	HE
	Total Mean SD	**12.1**	**4.2**		**13.68**	**3.47**	
	Grand Mean SD	**3.02**	**1.05**		**3.42**	**0.86**	

Source: Field Survey, 2023

Table 3 which is for research question 2 showed that all the items were agreed by the respondents to high extent that Education students use innovative technique by inventing new solutions to problems. The confirmation was made with a grand mean of 3.02 and standard deviation of 1.05 for male while that of female were 3.42 and 0.86 for mean and standard deviation.

Research Question 3: To what extent does invention technique affect students' assessment in Rivers State for sustainable development?

Table 4: Mean and standard deviation on how invention technique affects students' assessment

S/n	Item	Male = 63 X^2	Sd	Remark	Female = 83 X^2	Sd	Remark
1	Which effort did your teacher made to encourage you to perform better	3.02	1.02	HE	3.35	0.95	HE
2	My teacher has fair rules for the class and is extremely impartial	3.35	0.95	LE	1.01	1.01	HE
3	My teachers ask each one of us whether we have understood what she taught and helps us in case we have doubts	2.90	1.11	HE	1.07	1.07	HE
4	My teacher has made me develops leadership skills	3.16	0.96	HE	0.97	0.97	HE

Total Mean SD	**12.43**	**4.04**	**12.44**	**4.0**
Grand Mean SD	**3.10**	**1.01**	**3.11**	**1.0**

Source: Field Survey, 2023

Table 4 which is for research question 3 showed that all the items were agreed to by the respondent to high extent except item 2 that was low extent that inventive techniques affect students. The confirmation was made with a grand mean of 3.10 and 1.01 while standard deviation of 3.11 and 0.10 for both male and female.

Test of Hypotheses

1. There is no significant difference in the mean rating of Rivers State University and Ignatius Ajuru University of Education students on the extent to which lecturers used creative technique in assessing student for sustainable development.

Table 5: z-test analysis of mean ratings of the male and female respondents on how lecturers used creative technique in assessing students in Rivers State Universities for sustainable development

Respondents	**N**	**Mean**	**SD**	**sd Error**	**DF**	**P**	**Z-Cal**	**Z-Crit**	**Decision**
Male	63	3.21	0.97	0.024	144	0.05	0.46	1.96	**Significant**
Female	83	3.28	0.93						

Source: Field, 2021

The data in table 5 revealed that the calculated z-test value of male was 3.21 and 3.28 for female, the standard deviation of 0.97 for male and 0.93 for female which gave a critical t-value of 1.96 and a z-cal of 0.46 with a degree of freedom of 144 at 0.05 significance level. Therefore, the null hypothesis was accepted.

2. There is no significant difference in the mean rating of Rivers State University and Ignatius Ajuru University of Education students on the extent to which lecturers used innovative technique in assessing student for sustainable development

Table 6: z-test analysis of mean ratings of the male and female respondents on how lecturers used innovative technique in assessing students in Rivers State Universities for sustainable development

Respondents	**N**	**Mean**	**SD**	**std Error**	**DF**	**P**	**Z-Cal**	**Z-Crit**	**Decision**
Male	63	3.02	1.05	0.024	144	0.05	2.66	1.96	Significant
Female	83	3.42	0.86						

Source: field survey, 2023

The data in table 6 revealed that the mean and standard deviation for male were 3.02 and 1.05 respectively while for female 3.42 and 0.86. The critical t-value was 1.96 with a z-cal of 2.66 a degree of freedom of 144 at 0.05 significance level. Thus, the null hypothesis was rejected.

3. There is no significant difference in the mean rating of Rivers State University and Ignatius Ajuru University of Education students on the extent to which lecturers used invention technique in assessing student for sustainable development

Table 7: z-test analysis of mean ratings of the male and female respondents on how lecturers used inventive technique in assessing students in Rivers State Universities for sustainable development

Respondents	**N**	**Mean**	**Sd**	**std error**	**df**	**P**	**z-cal**	**z-crit**	**Decision**
Male	63	3.10	10.1	0.028	144	0.05	0.06	1.96	Significant
Female	83	3.11	1.00						

Source: field survey, 2023

The data in table 7 revealed a mean value for male as 3.10 and standard deviation of 10.1 and mean value for female as 3.11 and standard deviation of 1.00, the critical t-value was 1.96 which gave a z-cal of 0.06 with a degree of freedom of 144 at 0.05 significance level. Therefore, the null hypothesis was accepted.

Discussion of Findings

One of the finding of this study showed that creativity technique affects students' assessment through the following items: I think of myself as someone who is creative in my everyday life. Students are not motivated to learn what is not being assessed. Teachers find it difficult to assess students' creativity and creativity can be enhanced by using technology. Creativity is a brainstorming and mind-blogging activity in which a person has to think beyond his imagination for bringing something worthwhile. It is an activity of unveiling something which was previously hidden. The finding in view of Francis (2019) opined that we can be creative by the following examples: try your hand at arts and crafts, learn to look at situations differently, cook new recipes or create your very own, challenge your thoughts, redecorate a room in your home, don't be afraid to be original, take more photos of things and places, not people, find a problem to solve, take up painting or pottery, talk to someone with a difference of opinion, write a story, song lyrics or a poem. The study however revealed that invention technique affects students' assessment.

My teacher has rules for the class and is extremely impartial. My teachers ask each one of us whether we have understood what she taught and helps us in case we have doubts and my teacher has made me develops leadership skills. The finding agrees with Francis (2019) who says that invention education help students to discover and create new possibilities for themselves and their world. It builds self-assurance by creating a new sense of their identity, their abilities, and their

future. It is also in opinion of transforming the way students see themselves their abilities, latent roles in the world, and competence to create something new and unique. Finally, the finding of the study also revealed that innovation technique affect students assessment through project work gives me the chance to take a leading role in the group, inventing new solutions to problems could turn into an important part of who I am, I want my future work to be based around a set of challenges that I would find interesting and once I start something, I like to finish it. The study is in support of Thompson (2023) who opined that innovation in education comes from identifying problems, watching and learning from others, to develop new methods to address these problems, and iterating on them when these experiments don't necessarily give the results you need.

Conclusion

Education is crucial for us to survive and flourish. It should not only be widespread, sustainable and excellent, but must continuously advance to meet the challenges of the fast-changing and impulsive globalised world. This growth must be systemic, consistent and scalable; therefore, teachers, professors, administrators, researchers and policy makers need to innovate constantly the theory and practice of teaching and learning, as well as all other aspects of this ecosystem to ensure quality preparation of all students to life and work. Finally, creativity is the root of problem solving. Creative thinking and innovation will contribute to student assessment in education.

Recommendations

The following recommendations were made based on the findings of the study.

1. Lecturers should be provided with new technologies at highly subsidised rate to enable them make effective utilisation of them and become conversant with creative technique.
2. Education students should avail themselves opportunities of short training programmes regularly to enable them keep abreast of current technological innovations needed in the business world.
3. Government should assist students that have the ability to come up with original ideas, think outside the box, and solve problems with innovative technique.

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