



INFLUENCE OF MATHEMATICAL EPISTEMOLOGY ON DEVELOPMENT OF ENTREPRENEURSHIP SKILLS AMONG PRE-SERVICE TEACHERS

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Abstract:

Epistemologically, all knowledge normally has assurance if validated in solid foundation, especially in its functionality, pragmatism, workability and productivity. This epistemic assurance created room for creative entrepreneurial skill-laden base to tinker on. Therefore, the study investigated the influence of Mathematical epistemology on the development of entrepreneurial skills among pre-service teachers. A sample of 300 pre-service teachers from Alvan Ikoiku Federal College of Education Owerri, Imo State, Nigeria was used for the study. The study adopted the descriptive survey research design. The instrument for data collection was a researcher made 16-item questionnaire titled "Mathematical Epistemology and Development of Entrepreneurship Skills (MEDES)". The instrument had reliability coefficient of 0.84 determined using Cronbach's alpha formula. The data generated from the study were analyzed using mean and standard deviation to answer research questions while the hypothesis was analyzed using t-test statistical tool tested at 0.05 level of significance. The result of the study revealed that Epistemology of Mathematics enhanced the development of entrepreneurship skills among pre-service teachers. Based on the result it was

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recommended that basic Mathematics should be taught across discipline in pre-service teacher education.

Keywords: mathematical epistemology, entrepreneurship skills, development, pre-service teachers

1. Introduction

Nigeria like other nations in Africa is bedeviled with the social monster called unemployment and this has eaten deep into the social fabrics of the nation. Oviawe (2010) stated that Nigeria like most developing nations of the world is faced with myriad of problems and hearse realities which include poverty, unemployment, conflicts and diseases. Most of the graduates in the society today are unemployed as a result of their over dependence on government jobs or white-collar jobs which are nowhere to be found. This situation seems to have defiled solutions due to the nature of education available. Diejomal and Orimolade cited in Udonsa (2015) and Dabelen, Oni and Adekola (2000) stated that the massive unemployment of Nigerian graduates from various institutions of higher learning is traceable to the disequilibrium between labour market requirement and lack of essential employable skills by the graduates. Ocho (2005) indicated that functional education is the process through which individuals are made participating members of their society. It enables them to become capable of living in the society and contribute towards its economic development. The realization of this brought about the introduction and emphasis on entrepreneurial education since it was believed that its introduction into tertiary education would lead to acquisition of skills that would enable its graduates to be self-reliant and consequently reduced unemployment problem (Nwangwu, 2006). For Abubakar (2010) entrepreneurship has been identified as a means of providing employment and income generation in the country and a panacea to poverty reduction and pathetic unemployment situation.

Entrepreneurship is the willingness and ability of a person or persons to acquire educational skills to explore and exploit investment opportunities, establish and manage a successful business enterprise (Unachukwu, 2009). Suleiman (2006) defined Entrepreneurship as the willingness and ability of an individual to seek for investment opportunities, to establish and run an enterprise successfully. Nwangwu (2006) stated that entrepreneurship is the willingness and the ability of an individual or a firm or an organization to identify an environmental change and exploit such a opportunity to produce goods and services for public consumption. Entrepreneurship is the willingness and the ability of an individual to develop a business vision, remain resolute and focused in the pursuit of the vision bearing all risks and benefits associated with it. Iheonunekwu (2003) defined entrepreneurship as the attitude, skills and actions of an individual or individuals for starting a new business. He further added that an individual private entrepreneur is a creative person and a risk bearer who is good at recognizing opportunity, analyzing at, making a decision to act upon it, marshalling necessary

resources and implementing a programme leading to a new enterprise and profit. Udu, Udu and Eze (2008) indicated that entrepreneurship is a process by which economic and commercial activities necessary for improvement of the standard of living of the society are created by entrepreneurs, institutions, individuals, corporations and government. Entrepreneurship enables individuals to be self-reliant and not dependent on government or white-collar jobs. Entrepreneurial programme if properly planned and executed will ensure that the issue of self-employment and job creation will increase. It has several multiplier effects on the economy, spurs innovation and fosters investment in people by creating new enterprises, new commercial activities and new economic sectors which generate jobs for people to the development of the society (Unachukwu, 2009). Entrepreneurship skill is associated with creativity, innovations and critical thinking abilities. According to Odumosu and Olusesan (2016) no one can succeed in life endeavours in general and the entrepreneurship in particular through sheer luck except through creative ideas, extensive research work, plenty of trials, doggedness, innovative ideas, precise decision making, accurate problem solving, good managerial ideas and consistent persistence of efforts, all these and more that make entrepreneurship activities a success can be provided through the Epistemology of Mathematics. Mathematics is the study of quantity, structure, space and change; it has historically developed, through the use of abstraction and logical reasoning from counting calculation, measurement, and the study of the shapes and motions of physical objects (Roohi, 2014). The Epistemology of Mathematics is required much more than ever in our nation Nigeria due to its contributions in the development of human mind and progress of the society. Yara (2009) opined that, the contribution that Mathematical knowledge and skills has made to economics, industrial and technological growths of modern world are quite obvious to almost everyone. Iji cited in Akase, Mwekaver, Awuhe and Tomburua (2015) stated that, statistics have shown that Mathematics has a key role to play in job creation, wealth generation, poverty alleviation, economics and finance, management, business and enterprise, information technology, agriculture and natural resources which are the core components of vision 20; 2020. Mathematics is important in the development of technical and vocational skills such as tailoring, carpentering, surveying, welding, etc. According to Udonsa (2015) since entrepreneurship is about creativity and innovation, mathematics plays a significant role in its development. Venturing into a new business requires a careful appraisal to measure the viability of such ventures. Such appraisal requires Mathematical techniques to make it a reality, while undergoing feasibility and viability appraisal, Mathematical skills are required to put in place the projected cash flow, budget, projected statement of income and so on.

Epistemology is a derivative of two Greek words. *Episteme* meaning knowledge and *logos* depicting science, study. Epistemology is the science or study of knowledge. It inquiries into the knowledge or truth of things. It sets the criteria for the validation or invalidation of affirmation. Ofoegbu (2017) stated that epistemology is the study of the method of acquiring knowledge. It answers the questions, how do we know?

It encompasses the nature of concepts, the constructing of concepts, the validity of the senses, logical reasoning, as well as thoughts, ideas, memories, emotions, and mental. Alvarez and Barney (2010) stated that two approaches to study opportunities have emerged in the entrepreneurship literature. First of these approaches focuses on how alert entrepreneurs discover objective opportunities formed by exogenous shocks in an existing market adopts critical realist perspective. The second approaches focus on opportunities that are endogenously enacted by the actions of entrepreneurs themselves and do not have an existence independent of those human actions adopts an evolutionary realist perspective. Differences between these epistemological assumptions have an important impact on opportunity research in the field of entrepreneurship, and thus are likely to have an important impact on the evolution of research, practice, and teaching in the field of entrepreneurship as a whole.

These subjects that go beyond classroom teaching and learning to enhance individual and societal economic growth are the most feared subjects at all levels of education. There is dare need to encourage students to be more committed to the subjects such as mathematics with respect to the projected importance associated with them.

At this juncture, we deemed it necessary to conceptualize in minutest form, the core of our paper. The pre-service teacher is a student teacher undergoing learning processes in order to be a qualified teacher.

2. Statement of the Problem

Entrepreneurship education has come to stay in the curriculum of our tertiary institutions in Nigeria. skills needed to become a successful entrepreneur such as creativity, critical thinking abilities and innovation, problems solving and computation seems to be lacking among pre-service teachers.

This study therefore investigates the perceptions of pre-service teachers on the influence of Mathematical epistemology on the developing entrepreneurship skills.

2.1 Purpose of the Study

The study aimed at investigating the perceptions of pre-service teachers on the influence of Mathematical epistemology on the development of entrepreneurship skills. Specifically, the study sort to determine:

1. Pre-service teachers' perceptions towards Mathematical epistemology and development of entrepreneurship skills.
2. Gender influence on pre-service teachers' perceptions towards influence of Mathematical epistemology on the development of entrepreneurship skills.

2.2 Research Questions

The following research questions guided the study:

1. What are the perceptions of pre-service teachers towards Mathematical epistemology and development of entrepreneurship skills?

2. What is the difference between the response mean of male and female pre-service teachers towards influence of Mathematical epistemology and development of entrepreneurship skills?

2.3 Hypothesis

H₀: There is no significant difference between the response mean of male and female pre-service teachers on the influence of Mathematical epistemology and the development of entrepreneurship skills.

3. Methodology

The study adopted the descriptive survey research design to determine the influence of Mathematical epistemology on the development of entrepreneurship skills among pre-service teachers. The population of the study consists of all the final year degree pre-service teachers of Alvan Ikoku Federal College of Education, Owerri, Imo State, Nigeria. A sample of three hundred (300) pre-service teachers was drawn from six schools of the institution through stratified random sampling technique, this includes one hundred and twenty three (123) males and one hundred and seventy seven (177) females. Fifty (50) participants were drawn from each school out of six (6) schools. The instrument for data collection was a researcher made 16-items 4-points likert type questionnaire titled "Mathematical Epistemology and Development of Entrepreneurship Skills (MEDES)". The instrument was divided into two parts, Part A dealt with participants' demographic variables while Part B dealt with items related to the objectives of the study. The responses ranged as follows, Strongly Agree (SA) = 4 pts, Agree (A) = 3 pts, Disagree (D) = 2 pts and Strongly Disagree (SD) = 1 pt. The face and content validity of the instrument were determined by one expert each from Entrepreneurship education, Mathematics education and Measurement and Evaluation from the same institution. Their inputs guided the restructuring of the instrument where necessary. To determine the reliability of the instrument, 30 copies were administered to pre-service teachers who were not part of the study but had the same characteristics. The results of their responses were collated and analyzed using Cronbach's alpha formula which gave a reliability coefficient of 0.84 which was acceptable for the study. The instrument was administered to the participants on face to face basis through the help of the appointed leaders in various groups. The researcher informed the participants of the objectives of the study and assured them that any information given will serve for the purpose of the study only. After that, the leaders distributed the questionnaires which the participants filed out and returned to the researcher on the spot. The researcher recorded 100 percent return of the instrument as the entire process lasted for two days. The data generated were analyzed using mean and standard deviation to answer research questions. Any responses mean greater than the criterion mean of 2.50 was accepted while any below was rejected. The hypothesis was analyzed using t-test statistical tools tested at 0.05 level of significance.

4. Results

Research Question 1: What are the perceptions of pre-service teachers towards Mathematical epistemology and development of entrepreneurship skills?

Table 1: Summary of pre-service teachers' responses

S/N	Item	Mean	SD	Remark
1.	Epistemology of Mathematics helps in developing business ideas	3.21	0.85	Accept
2.	Calculation of business proceeds is aided by basic Mathematics epistemic.	3.20	0.81	„
3.	Creativity in the field of business is enhanced by knowledge of Mathematics	2.74	1.00	„
4.	Entrepreneurs need good knowledge of Mathematics in making business projections	2.63	1.23	„
5.	Knowledge of Mathematics helps entrepreneurs in making business decisions	2.81	1.01	„
6.	Mathematics knowledge is paramount in business innovation of entrepreneurs	2.80	1.02	„
7.	Entrepreneurship skill acquisitions is enhanced by Mathematical knowledge	2.93	1.08	„
8.	Acquisition of skills in carpentry, tailoring, bakery, etc is enhanced by knowledge of Mathematics	3.25	0.71	„
9.	Critical thinking abilities of entrepreneurs help in development of business products	3.01	0.83	„
10.	The knowledge of addition, subtraction, multiplication, division, percentages and fractions is needed for pricing of product.	3.20	0.65	„
11.	Basic Mathematical skills help entrepreneurs in purchase of materials	2.97	1.03	Accept
12.	Computational skills enable entrepreneurs in recording and profit making in business.	3.21	0.70	„
13.	Knowledge of Mathematics aids entrepreneurs in making budgets	3.00	0.93	„
14.	Knowledge of Mathematics is required by entrepreneurs in handling business risks.	3.33	0.70	„
15.	Knowledge of Mathematics is needed in business management	3.20	0.67	„
16.	Investment of business proceeds is enhanced by knowledge of Mathematics	3.05	0.74	„
Grand mean = 3.03				

Table 1 above shows that all the items were accepted as they had response mean greater than the criterion mean of 2.50, also the standard deviation indicates the variation of the responses. A grand mean of 3.03 is an indication that pre-service teachers have high positive perceptions towards influence of Mathematical epistemology on development of entrepreneurship skills.

Research Question 2: What is the difference between the response mean of male and female pre-service teachers towards Mathematical epistemology and development of entrepreneurship skills?

Table 2: Summary of pre-service teachers' responses by gender

Gender	N	Mean	SD	Diff.	df	t-cal	t- 0.05	Remark
Male	123	3.07	0.82	0.03				
Female	177	3.10	0.78		298	0.094	1.96	NS

Table 2 shows that male pre-service teachers had response mean of 3.07 and standard deviation 0.82 while their female counterparts had response mean of 3.10 and standard deviation 0.78 which gave a difference of 0.03 in favour of female pre-service teachers.

H0: There is no significant difference between the response mean of male and female pre-service teachers on the influence of Mathematical epistemology on development of entrepreneurship skills.

Table 2 shows that the calculated t-value (0.094) is less than the critical t-value (1.96) at 0.05 level of significance and degree of freedom 298. Based on the result, the null hypothesis is upheld which implies that, there is no significant difference between the response mean of male and female pre-service teachers towards Mathematical epistemology and development of entrepreneurship skills.

5. Discussion

The result of the study revealed that pre-service teachers have high positive perceptions towards influence of Mathematical epistemology on development of entrepreneurship skills. All the items projected in the questionnaire were accepted as they had response mean greater than the criterion mean. The pre-service teachers agreed that, Mathematical epistemology helps entrepreneurs in developing business ideas, calculating of business proceeds, being creative, think critically, make decisions, being innovative, acquiring skills, handling business risks, making profits, investment, etc. This result is in line with Odumosu and Olusesan (2016) who carried out similar research and discovered that pre-service teachers agreed that some important skills such as computational skills, problem solving skill, innovative skill, analytic skill, decision making skill and creativity skill, analytic skill, decision making skill and creativity skill acquired in Mathematics are essential ingredients for success in entrepreneurship activities.

The result also revealed that gender did not affect pre-service teachers' perceptions on the influence of Mathematical epistemology and development of entrepreneurship skills. This result contradicts that of Odumosu and Olusesan (2016) which showed that, there was a significant difference in the opinion of pre-service teachers towards the relevance of Mathematics to entrepreneurship development based on gender.

6. Conclusion

The result of the study revealed that Mathematical epistemology has a great influence on the development of entrepreneurship skills among pre-service teacher. Gender was not a barrier on the opinion of pre-service teachers towards the influence of mathematical epistemology on development of entrepreneurship skills.

6.1 Recommendations

Based on the result of the study, the following recommendations were made:

- 1) Curriculum planners should ensure that basic Mathematics is taught across disciplines in pre-service teacher education to enable pre-service teachers benefit and apply same in their entrepreneurship pursuit.
- 2) Emphasis should be laid on practical aspect of entrepreneurship education as to allow pre-service teachers exhibit and apply their Mathematical knowledge.

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