The Role of Mathematics in Enhancing Entrepreneurship Development in Nigeria

Idu, Emmanuel U.

Department of Mathematics, Federal College of Education, Eha-Amufu, Enugu State, Nigeria

Abstract: *Today entrepreneurial activities are no longer based on the use of analogue ready reckoning and balance sheets only, but on online and e-business transactions which require skills in mathematical sciences. Mathematics is inherently a subject of a great utility value. It is so basic to many things we do that it forms part of the very language we speak today. Mathematics is a great part of the heritage of the human race. Mathematics as a subject has contributed to the growth of modern civilization more than any other known subject. The uniqueness of mathematics emanates from the fact that it assumes the culture of all people and tribes. Mathematics is indeed of great significance to the success of all entrepreneurship skills and will continue to helped sciences, technology and entrepreneurship in reaching the position they must occupy in our present civilization. Mathematics is indispensable to all knowledge, and all entrepreneurship education, which does not include mathematics, may be defective in its foundation. The purpose of this paper is to refocus participants' minds on the role of mathematics in enhancing entrepreneurship development in Nigeria*.

1. Introduction

Today the term entrepreneurship has acquired incredible prominence and popularity in the scheme of things throughout the whole world, Nigeria inclusive. The focus of this paper is on the inevitable contributions of mathematics in enhancing entrepreneurship development in Nigeria. The discussion is presented under the following sub-headings:

The arguments by some schools of thought that many of the successful entrepreneurs in the world today were school dropouts remain logical, but no longer realistic. They were not successful because they dropped out of schools. That they dropped out of schools at various stages in their school days does not mean that they did not have some measures of science and mathematics in their heads. They dropped with some untapped mathematical skills in their brains. If the so-called school dropouts or out of schools entrepreneurs are doing well in their businesses then entrepreneurs passing through science and mathematics education in schools will ultimately do better. Note that nearly all the so-called dropouts, did some apprenticeship training in entrepreneurship intentions, involving skills in ready reckoning and other business transactions requiring rudimentary logic and other basic arithmetical processes. The discussion is presented under the following sub-headings:

2. Entrepreneur

An entrepreneur is a person who, after changing a dream into a vision plunges headlong in an attempt to exploit a socio-political and economic landscape of opportunities with unknown amount of risks. An entrepreneur is someone who organises, manages and assumes the risks of a business or an enterprise. They come in all ages, gender, shapes and sizes. They also have many things in common. They often take risks and they are self-starters who think creatively (World Bank, 2012). The most important subject for creative thinking is mathematics. Often the entrepreneur is not a person who actually creates the new good or service. Rather, he or she is the one who has the vision of how that idea and result can be turned into reality for the benefit of every one

(Omogiate-Iwelu, 2016). Mathematics helps an entrepreneur to understand his or her strategies in marketing and how to improve better. Entrepreneurs with sound knowledge of mathematics often perform better than their counterparts who are not proficient in the subject. Knowledge of mathematics helps the entrepreneurs to analyse data, compute probabilities and statistics, understand investment systems, evaluate target consumers and understand taxes (Omogiate-Iwelu, 2016). The critical ingredient is getting off the butt and doing something. A lot of people have ideas, but there are few who decide to do them now, not tomorrow, not next week, but today. The true entrepreneur is a doer, not a dreamer (Bushnell, 2012). Among the credits for entrepreneurs are the abilities to be self-employed, create jobs for others, innovate or create new ideas, and add values to the existing goods and services and ultimately lift the economy to higher levels. They are positively innovative and bear enormous risks. An entrepreneur according to Hisrich, Peters and Shepherd (2008) is one who brings resources, labour, materials and other assets into combinations that make their values greater than before. Entrepreneurs and entrepreneurial organisations always operate at the edge of their competence, focusing more of their resources and attention on what they do not yet know than controlling what they already know. They measure themselves not by the standards of the past but by visions of the future (Hisrich, Peters, Shepherd, 2008).

3. Entrepreneurship

Entrepreneurship is the art or science of being an entrepreneur or one who undertakes innovations, finance and business acumen in an effort to transform innovations into economic goods. The most obvious form of entrepreneurship is that of starting a new business start-up. It may involve the creation of better or more effective products, services, processes, technologies or ideas that are accepted by markets, governments and society (Roth, 2009). As well, entrepreneurship may be defined as the pursuit of opportunity without regard to resources currently controlled. Entrepreneurship ranges in scale from solo projects (even involving the entrepreneur only on part-time, to major undertakings of creating many job opportunities with

attendant risks (Roth, 2009). Entrepreneurship is a process of exploiting the opportunities that exist in the environment or that are created through innovation in an attempt to create value. Generally, many big entrepreneurial businesses seek venture capital or "angel funding" in order to raise capital to build the business. Angel funding or angel investor is an affluent individual in the society who provides capital for a business start-up, usually in exchange for convertible debt or ownership equity. Angel investors generally seek annualized returns of 20-30% and more, as well as extensive involvement in the business (Ajaero, 2010). Entrepreneurship is the process of exploring the opportunities in the market place and arranging resources required to exploit these opportunities for long-term gains. Entrepreneurship is the process of creating something new with value by devoting the necessary time and effort, assuming the accompanying financial, psychic and social risks and receiving the resulting rewards of monetary and personal satisfaction and independence (Hisrich, Peters, & Shepherd 2008). In fact, entrepreneurship is a risk-infested economic venture by a person or group of people in speculative market environments with diverse latent intentions for personal or group satisfactions, with tendencies that may be opportunistic and or exploitative in an attempt to move the society forward.

4. Entrepreneurial Intentions

Intention in business or entrepreneurship may be described as the slim gap between dreaming and reality. Intentions are believed to be very pertinent and important for stimulating one's decision to start a new venture. Entrepreneurial intention is therefore the processing of a person's dream of entrepreneurial idea for a start-up. An entrepreneur is a doer, not a dreamer. The progression of an entrepreneur from dream to reality is referred to as development of vision or business idea. Taking a decision to become an entrepreneur is a very difficult task. Entrepreneurial intention is the search for information that can be used to help fulfil the goal of venture creation. However, literature points out that, two dominant sets of factors influence a person's decision to start a small business from scratch. The potential entrepreneur may be reacting to unfavourable environmental forces such as loss of job, unattractive job, political marginalisation of self or of community, etc. On the other hand, the person may be influenced by impressive stories of entrepreneurs he or she knows and sees. (Ajaero, 2010) categorized factors that can influence entrepreneurial intentions into three general areas – motivational factors, core self-evaluation, and cognition. Motivational factors include need for achievement, risk-taking propensity and desire for independence. Core self-evaluation factors include locus of control and self-efficacy. Cognitions are beliefs and attitudes that influence how a person makes decisions. Irrespective of the angle through which the prospective entrepreneur enters the stage, the challenges are enormous and similar. Invariably, an entrepreneur tends to bite off a little more than he or she can chew hoping that he or she will quickly learn how to chew it (Ajaero, 2010).

Challenges of Starting a Small Business from Scratch

Ajaero (2010) identified ten business challenges of starting a business from scratch. These are:
1) Developing the vision and business idea.
2) Raising capital start-up.
3) Assembling a business team.
4) Finding the right business location.
5) Finding good employees
6) Finding good customers
7) Overcoming competition
8) Unforeseen business challenges and expenses
9) Keeping up with industrial changes, trend and
10) Exiting the businesses

It is worthy of note that challenges of staring business ventures are not limited to the ones above. It is important for mathematics teachers to examine some of the challenges above to see the roles the mathematics teachers can play in order to influence positively the growth of entrepreneurship in Nigeria.

Mathematics and enhancement of entrepreneurship development in Nigeria

Entrepreneurs have long been seen as self-taught, self-made individualists. The perception dates back to the days of men like Carnegie, Edison and others who had little formal schooling (Cone, 2009). However, the great entrepreneurs of the past did not really learn or do it all themselves. In the early industrial cities-which were adventurous places, teeming with entrepreneurial activities in the then-new fields like telegraphy and railroading, entrepreneurs had access to informal communities of teachers and learners. There they were able to tap into rich networks of contacts for the additional skills and resources their own new ventures needed (Cone, 2009).

Today, the learning communities and networks are mostly found in and around college campuses. The campus is where all fields can intersect and cross- pollinate – mathematics, medicine, computer, physics, chemistry and biology, philosophy and public policy, engineering and arts – and where all sectors of the real world economy are represented. Private firms and investors, government agencies, and non-profit organizations, all come to campuses to sponsor research, to bread and recruit talents, to search for new ideas. That is where the high-impact entrepreneurs of tomorrow are. As firms grow too large, and complex for seat-of-the-pant management, there is the need to make the practice more scientific and more learnable (Cone, 2009).

According to Bushell (2012) entrepreneurship is risky mainly because so few of the so-called entrepreneurs know what they are doing. They lack the methodology (especially the scientific and mathematical processes). To fill a key gap in science and mathematics education curricula teachers should be looking at refining, redefining and disseminating a very promising new approach to teaching opportunity recognition. The world in our time –the world these young people will go into is never static; it is always being re-invented. That is precisely what entrepreneurship is about. It

is a means of re-inventing the world through science and mathematics education.

Innovation, vision, creativity, recognition of opportunity and risks are characteristics of entrepreneurs that the science and mathematics teachers can impart to learners right from primary schools to the universities. Functions of entrepreneurship include self-employment, job creation, income generation and empowerment, and poverty alleviation. Mathematics teaching for entrepreneurship must be multifaceted focusing on developing innovation, risk taking, imagination, problem solving and decision making skills (Omogiate-Iwelu, 2016). In all the mathematics teacher emphasizes practical skills, foresight and vision. It is a general consensus that a well organized practical science classes in entrepreneurial ventures enhances the chances of start-ups and self-employment.

Envisioning entrepreneurial idea is the first true task of an entrepreneur. As an entrepreneur, you must see what others cannot see, while others see problems, you must see opportunities (Ajaero, 2010).As a mathematics teacher your vision must be ahead of all their visions. Remember that "sight is what you see with your eyes, vision is what you see with your mind". This is the entrepreneurial process of creating value out of nothing:Identifying a problem → seeing an opportunity in the problem → coming up with a solution → forging the opportunity into a business idea → integrating your solution into a business plan (Ajaero, 2010).Mathematics must compare the scientific processes and the entrepreneurial processes with a view to integrating them for maximum benefits. The scientific method invariably starts with identification of problem. Mathematics tends to build a wide range of interdisciplinary skills that can prepare students-entrepreneurs adequately for the future. Theoretical approaches to mathematics teaching must be jettisoned and replaced with practical activities. Knowledge entrepreneurship with mathematics bias is recommended for teaching as a good background for young and upcoming entrepreneurs. Knowledge entrepreneurship in mathematics stresses the abilities of both the mathematics teacher and the students to recognize or exploit an opportunity in the society through innovative activities.

It has been argued that knowledge entrepreneurship in the area of science is the most suitable form of entrepreneurship for educators, researchers and educational institutions (Omogiate-Iwelu, 2016). Mathematics teachers must as a matter of necessity include in their entrepreneurial activities in the class sustainable practical skills, excursions, industrial attachments and projects-oriented activities. Agricultural extension programmes and health extension services should be explored. Maintenance culture and security awareness should be integrated into science curricula.

Mathematics uses the method of "systems thinking". System thinking is the process of understanding how things influence one another within a whole. In business organizations, systems consist of people, structures, and processes that work together to make an organization healthy or unhealthy (Ackoff, 2010). Systems Thinking has been defined as an approach to problem solving, by viewing problems or challenges as parts of an overall system, rather

than reacting to specific part, outcomes or events and potentially contributing to further development of "unintended consequences"(Ackoff, 2010).

Unintended consequences or unanticipated consequences or unforeseen consequences are out comes that are not the ones intended by a purposeful action of the teacher. Possible causes of unanticipated consequences include (De Zwart, 2015)
1) Ignorance (It is impossible to anticipate everything, thereby leading to incomplete analysis
2) Error (Incorrect analysis of the problem or following habits that worked in the past but may not apply to the current situation).
3) Immediate interests (which may override long-term interests).
4) Basic values (may require or prohibit certain actions even if the long-term result might be unfavourable these long-term consequences may eventually cause changes in basic values).
5) Self-defeating prophecy (Fear of some consequences drive people to find solutions before the problems occur, thus the non-occurrence of the problem is unanticipated*).* The science teacher is advised to subject all processes and activities to adequate scrutiny and experimentation.

Knowledge workers are those skilled persons in the society that acquire manipulative skills, interpret, and apply information in order to perform multidisciplinary, complex and unpredictable work. They analyze information and apply expertise in a variety of areas to solve problems, generate ideas, or create new products and services (Science teachers as knowledge workers must integrate the principle of research and development (R&D) in the class. R & D refers to creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to device new applications. Research and development activities are often scientific according to the Organization for Economic Co-operation and Development (OECD, 2008). "Research and development" normally refers to future-oriented, long-term activities in science or technology, using similar techniques to scientific research without predetermined outcomes and with broad future forecasts of commercial yields.

5. Raising capital for Start-up

The most stressful hurdle to cross after conceiving a business idea is that of raising capital. Trying to convince people that you are trustworthy is a difficult task especially when you are a beginner. (Akinola and Okonkwo, 2012) For a beginner to even get bank facilities is like an elephant passing through the eye of a needle. For example, we planned to start an organization when we were in 300 -level. That was when we set up a cybercafé on campus. We felt we could do something like that on campus. But we faced the issue of money to fund it. We were five friends, Omoniyi, I, and three others. . (Akinola and Okonkwo, 2012). We ran around thinking that our friends and parents would lend money after listening to us, and we were looking for about N150000 - N180000. After sharing the vision with friends and family members who we thought could lend us the

money, we were disappointed because all of them were not ready to give us money to do business, we didn't get much because they really didn't believe in us; they couldn't see what we saw.

To overcome the challenge of raising capital for start-ups the science teacher must teach skills of persuasive communication and storytelling. Your presentation must be graphical, highlighting areas of strength while playing down on loopholes. All your ideas must be schematically arranged so that you launch your points when they will have greatest impression or impact on your listeners.

Mathematics the Heart of Entrepreneurship

Mathematics is inherently a subject of a great utility value. It is so basic to many things that it forms part of the very language we speak today. Mathematics activities according to (Idu, 2013) are part of the heritage of the human race. By its aid, man has measured the distance to the stars, forecasted eclipse, navigated the seas and the space, made maps of the earth, built cathedrals and brides, split atoms and designed machines from the simple lever to the most complicated space satellites and electronic computers. All the elaborate business transactions between men and women in the market and between nations are founded on knowledge of mathematics. The subject is growing and will not relent until the full knowledge of entrepreneurship is accomplished.

Mathematics as a subject has contributed to the growth of modern civilization more than any other known subject. The uniqueness of mathematics emanates from the fact that it assumes the culture of all people and tribes. Mathematics has indeed been a beacon of light to all the sciences and entrepreneurship skills acquisition. It will continue to helped sciences, technology and entrepreneurship in reaching the position they must occupy in our present civilization. Mathematics is indispensible to all knowledge, and all entrepreneurship education, which does not include mathematics, may be defective in its foundation.

Idu (2013) summarized the objectives of teaching mathematics at all levels of education as follows: Developing originality, creativity and curiosity in the learners, acquiring relevant manipulative skills, emphasizing the wide applicability of mathematics in various fields, leading the learners to discover and appreciate the beauty and elegance of mathematics and bringing out positive mental attitudes to mathematics in the learners. These are basically the skills required by the entrepreneur in order to succeed.

6. Conclusion

Entrepreneurship has a lot of promise in a developing country like Nigeria because of the level of poverty in the land. Major objectives of entrepreneurship include self-employment, general employment in public and private sectors, innovations, sustainable education, growth of industries, creativity, fighting corruption, recognition of opportunities, ability to minimize risks and entrenchment of peace and security. Science and mathematics teachers as

knowledge workers are well endowed and positioned as catalysts to help in achieving the entrepreneurship objectives through sustainable science, mathematics and technology education in Nigeria.

7. Recommendations

1) Mathematics curricula should be reviewed and restructured to include more practical activities relevant to entrepreneurship.
2) Mathematics students should be involved in industrial attachments.
3) Governments should be more committed in the training and re-training of mathematics teachers.

References

[1] Ackoff, R. L. (2010) System Thinking for Curious Managers. USA, Triarchy Press.
[2] Ajaero, A. M.(2010) How To Start a Business. *www.StrategicBusiness team.com*
[3] Akinnola, O. And Okonkwo, O.(2012) "How we made Nigeria's first PC Tablet". Vantium Project, Sunday Sun, May 20, 2012.
[4] Bushnell, N.(2012) Entrepreneurship. Retrieved from: www.ThinkExist.com Quotations, 04-06-2012
[5] Cone, J. (2009) Teaching Entrepreneurship in Colleges and Universities: How (and Why) a New Academic Field is Being Built. University of Carolina, *Chapel Hill*
[6] De Zwart, F(2015) Unintended but not Unanticipated Consequences. *Springer.* The Netherlands
[7] Hisrich, D. R; Petres, P. M. and Shepherd, D. A. (2008) Entrepreneurship. New York. McGraw Hill International Companies.
[8] Idu, E.U.(2013) Effects of Computer Assisted Instruction on the Achievements of Pre-Nce Students in Geometry. Unpublished PHD Project, Department of Science Education, UNN.
[9] Omogiate-Iwelu, L (2016). Relevance of Mathematics in an Emerging Economy, www.LinkedIn
[10] OECD(2008) Science, Technology and Industry Outlook
[11] Roth, S.(2009) New for whom?, Initial Images from the Social Dimensions of Innovation. International.*Journal of Innovation and Sustainable Development*, 4(4), 231-252
[12] Worldbank (2012) Gender Equity and Development:You Think. Retrieved from Worldbank.org/issues/employ…