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ROLE OF ICT IN ENTREPRENUERSHIP DEVELOPMENT IN STEM EDUCATION

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Abstract
Entrepreneurship is a key driver of any economy. Entrepreneurship is developed as a way of developing skills such as risk-taking and a problem solving that facilitate the achievement of life goals and in education. The world depend on STEM education as the economy is supported by advancement in science and technology and skills related to them as necessary for economic and social advancement. For innovation and entrepreneurship to impact the economy, the required key and soft skills needed must come from STEM education. This paper looks into the role of ICT in entrepreneurship development in STEM education. The paper reviews the concepts of entrepreneurship, STEM education and relevance of ICT in entrepreneurship development. To achieve a sound entrepreneurship stem education, the paper recommends that, Students should be fully exposed to ICT tools to enable them meet the 21st century skills.

Key words: ICT, entrepreneurship, STEM education.

Introduction

Entrepreneurship is a key driver of any economy. Wealth and a high majority of jobs are created by small businesses started by entrepreneurial minded individuals, many of whom go on to create big businesses. People exposed to entrepreneurship frequently express that they have more opportunity to exercise creative freedoms, higher self-esteem and an overall greater sense of control over their lives. Entrepreneurship education seeks to provide students with the knowledge, skill and motivation to encourage entrepreneurial success in a variety of settings. Entrepreneurship is developed as a way of developing skills such as risk-taking and a problem solving that facilitate the achievement of life goals and in education. Entrepreneurship is the recognition of an opportunity to create value, and the process of acting on this opportunity. It involves the formation of a new entity (FaCs, 2003). However, this view of entrepreneurship has been preceded by certain basic understandings of what entrepreneurs do. For instance, Amina (2022), saw an entrepreneur as person who identifies a need that no business addresses, and determines a solution for that need.

Science Technology Engineering and Mathematics (STEM) Education

STEM is the acronym for science, technology, engineering and mathematics, a term said to have been coined by Dr Judith Ramaley of the American National Science Foundation. It is a curriculum based in educating students in science, technology, engineering, and mathematics in an interdisciplinary and applied approach.

STEM education is the integration and a holistic presentation of concepts, competencies and dispositions of science, technology engineering and mathematics in solving real life problems. It is an intentional and meta disciplinary approach to teaching and learning in which students uncover and acquire a cohesive set of concepts, competences and dispositions of science technology, engineering and mathematics that they transfer and apply in both academic and real life contexts in order to be competitive in the 21st century, Rider-Betrand (2006). These definitions mention the use of integrative approach in the teaching and learning of the subjects rather than presenting them as separate subjects and real life application of STEM, and the cultivation of 21st century skills for solving life equations.

The world depend on STEM education as the economy is supported by advancement in science and technology and skills related to them as necessary for economic and social advancement. This education creates critical thinkers, increases scientific literacy and enables the production of innovators whose innovations lead to new products and processes that can boost and sustain the economy, Amina (2022).

According to the united states department of education in a dynamic complex world, it is more important to prepare youth with knowledge and skills to solve problems, make sense of information and know how to gather and evaluate evidence to make decision.

Entrepreneurship in Stem Education

Entrepreneurship education is a form of education which inculcates into the individual learner concept, skills and knowledge on how to start a new business or create a job, Adiele (2010). Entrepreneurship and creativity are embedded in the hidden and manifest goals of STEM education. The recent yearning for the shift from theory laden curriculum and teaching methodology to more practical one that includes active participation of learners are all geared towards inculcation of creativity which is the bedrock of entrepreneurship. Therefore, it could be agreed that for developing countries like Nigeria to achieve the production of sound creative people whose innovation will enhance entrepreneurship, there must be a total overhaul of the science education curriculum to clearly include its practical application in the production of skills, jobs and services.

For innovation and entrepreneurship to impact the economy, the required key and soft skills required must come from STEM education. These are the set of skills graduates of science, technology, engineering and mathematics are expected to possess which are required in today's workplace and they include the following skills;

a. Problem solving skills. Problem is solved when they are broken down from complexity to simpler components by recognizing the cause and effect relationships among the various parts.

b. Analytical skills for research, project planning and drawing inference from research results.
c. Mathematical skills for measurement and calculations.
d. Communication and cooperative skills to present ideas relate with customers and interact with partners.
e. Leadership skills to lead projects and help customers.
f. Technical skills to trouble shoot source of problems and to repair machines or debug operating systems, and to stay abreast of new software and equipment.

The importance of these skills cannot be overemphasized as it is the avenue for youths and our country to compete globally, create employment and ensure the wellbeing of her citizen. Research by DiaBden, Oni and Adekola (2000) have come up with the result that Nigerian graduates lack employable skills which are synonymous with STEM skills. There seem to be some disconnect between what our institutions are teaching and what the industries are looking for. Even the large volumes of thesis and projects undertaken by students in Colleges and Universities and Research Institutes remain at the library shelves, simply because the industries cannot use them. There ought to be some sought of synergy between the Colleges, Polytechnics, Universities and Private Sector in order to ensure the type of collaboration that will result in Research and Development.

Relevance of ICT in Entrepreneurial Education

The improvement of the educational system over the years has been the concern of educators and researchers, in both the sciences and in the humanities. This yearning is not unconnected with the undisputable fact that National Development is hinged on the successful development, use and execution of research findings in the application of ICT tools in teaching and learning. For the purpose of this presentation, ICT is defined as the integration and utilization of the innovation of computer technology for the purpose of organizing, encoding, packaging and dissemination of information and skill acquisition to target destination or consumer without the constraint of time and space (Okoye, 2005). This is to say that an ICT-based instructional system operates a continuous lifelong training process. This definition, no doubt, implies more freedom for the teachers and more opportunity to use initiatives for the learners. The time gained by teachers will necessarily be employed for better scientific planning of instructional content and delivery strategies. The overall effectiveness of an ICT driven instructional system is relatively high. The multiplier benefit of a networked instructional system ensures a future of educational excellence, expansion and efficiency at reduced cost. ICT removes age, distance and time constraints in any learning process and ensures immediate provision of knowledge in relevant areas with the ease and speed that could never be got from traditional learning system. In addition, the information comes in the proper structure that allows the receiver to use it with minimum efforts.

Role of ICT in Entrepreneurship Development

Information and Communication Technology has the potential to widen access to educational resources, improve the quality of learning and improve management efficiencies of educational system. ICT use in entrepreneurial education is not all about

ICT literacy but it also involves the building of high order skills, i.e. knowing and understanding what it means to live in a digitized and networked society and use digital technology in everyday life. The learners will seem to take ownership of the management of ICT based instruction in the classroom, Because of their growing confidence and levels of expertise with the technology, and this is an evidence of ICT contribution to independent learning and the enhancement of enthusiasm for entrepreneur education. Independent learning is generally used in schools to mean that learners are able to find out specific information or perform particular tasks without the teacher having to present it. However, being a competent life-long learner also encapsulates the skill of knowing what kinds of questions are appropriate and important to rise in order to engage meaningfully with information on a subject. This may be part of the model of independent learning applied within entrepreneurial education based mainly on content and skill acquisition.

ICT in the Pedagogical Preparation

a) Active learning: ICT enhanced learning by providing a platform for student inquiry, analysis and construction of new information. Learners therefore learn as they do and, whenever appropriate, work on real-life problems in-depth, making learning less abstract and more relevant to the learner's life situation.

b) Online collaborative learning: ICT-supported learning encourages interaction and cooperation among students, teachers, and experts regardless of where they are. Apart from modelling real-world interactions, ICT-supported learning provides learners the opportunity to work with people from different cultures, thereby helping to enhance collaboration and communicative skills as well as their global awareness. It models learning done throughout the learner's lifetime by expanding the learning space to include not just peers but also monitors and experts from different fields. Online discussions can be used to foster critical thinking.

c) Facilitating the acquisition of basic skills: The transmission of basic skills and concepts that are the foundation of higher order thinking skills and creativity can be facilitated by ICTs through drill and practice (Fred, 2015).

The Strategies of Integrating ICTs in Entrepreneur STEM Education

The areas of ICT entrepreneur development are the business centres, graphics centres, music studios, the internet centres, computer training centres, computer technicians, web designers, internet employment agency service, internet advertisements, internet tourist, videography, decorations, photographic and cinematography, agriculture (poultry and aquaculture).

The business centers: provide services for communication of information to customers. The services provided by the business centers changes to include more interesting services which are required by the service unit.

The graphics centers: are also another area where entrepreneurs using ICT tools like computers, scanners, internet and other accessories to design graphics.

The internet centers: is another area ICT tools can be utilized, these centers Provide internet services for people with a minimal cost. The services provided improve

the people standard of living and also employ hundreds of individuals directly or indirectly by the entrepreneurs.

Skills development is the intended output of education and training efforts and it is an enabler for growth. As an entrepreneur, the growth in business and the establishment of a legacy are paramount. Development of skills enhances the capability of employees to improve the company's efficiencies in the employee's specific sphere of influence, and thus ultimately improving the bottom line revenue of the company. Employee individual capability development skill is fundamental to the success of the entrepreneurial education. Skills development therefore can be defined as what one does to improve productivity in the workplace and the competitiveness of business and to improve the quality of life of workers, their prospects at work and their mobility.

Studies by Praag, Teskz and Peterson (2000) revealed that successful entrepreneur education depends on integrating ICT infrastructure, technical kills and user time. Therefore, organizations with higher levels of technological capability show the likelihood to innovate. Technology relates to ICT infrastructures, internet skills and ecommerce know-how. ICT infrastructure provides a platform upon which e-commerce is built. Internet skills offer the technical know-how needed to develop entrepreneurial applications (Migisha, 2011). By implications, technology capability goes beyond physical assets to include intangible resources which perhaps generate competitive advantages for entrepreneurs. Entrepreneurial skills development and team-based entrepreneurial activities are the primary determinants of ICT entrepreneurial education in an institution. However, experimental activities in terms of testing and prototyping, videography, agriculture, photography and cinematography, access to resources, coaching and experience sharing is a key constructs that determine ICT integration and the success of entrepreneurial education, in tertiary institutions.

Entrepreneurial skills defined the intended output of education and training efforts using ICT applications which will increase job related productivity, effectiveness and performance within the institution (Larry and Best, 2011). Entrepreneurial skills development is one of the determinants of ICT integration and can provide diagnostic insights on new innovation. Entrepreneurial skills development has direct effects on innovation in terms of number of innovation transferred, total funds, invested in innovation projects and improved time to market for new innovations. The development of entrepreneurial skills paves way for small business innovation. Ballam and Festus (2007) did a similar work in explaining the construct of entrepreneurial skills development into employee's specific sphere of influence which helps in improving the bottom line revenue of the company, thus provides more specific insights into understanding development of entrepreneurial skills. Yi, Audrey and Santos (2006) further expanded entrepreneurial skills development by the use of internet technology in the development process and proposed that internet technology is positively related to development in entrepreneurial skills.

Conclusion

The world depend on STEM education as the economy is supported by advancement in science and technology and skills related to them as necessary for economic and social advancement. This education creates critical thinkers, increases scientific

literacy and enables the production of innovators whose innovations lead to new products and processes that can boost and sustain the economy.it is therefore increasingly evident that STEM education leads to the innovation of jobs and in a bi-directional relationship, these jobs creates a need for advanced courses and researches in STEM education. Stem based jobs are at top of the list of prestigious entrepreneurial innovations today. The role of ICT in entrepreneurship development in STEM education cannot be overemphasized as one cannot underestimate the reputation of such jobs as software development, chemical engineering, information technology, biotechnology, computer networking, aerospace engineering etc. in advancing the world and provision of money making ventures.

Recommendation

To achieve a sound entrepreneurship stem education, the following should be adopted

1. Students should be fully exposed to ICT tools to enable them meet the 21st century skills.
2. Practical based teaching- learning methodologies should be adopted with help of technological tools to prepare the student meet the needs of the 21st century jobs and also make them to be self-employed.

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