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The Emergence of New Technologies in Metalwork/Automobile Industries: Issues, Challenges and Opportunities in Emanating from for Delivery of Technical Education on A Pandemic Era

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ABSTRACT

The COVID-19 global phenomenon has set and reset the global activities in all spheres of human endeavors namely: agriculture, industry, trade, health, transportation, sports, technology, innovation, and education. It is so pathetic to note that more than 1.5 billion (90% of the global student population) enrolled students of all ages across the globe experienced shocker and interruption of educational activities because of the unprecedented work total lockdown affecting homes, places of work, worship centers and colleges. Institutions of learning classes were disrupted leaving behind a loss in one whole academic session in Nigeria. The outcome came out with strict COVID-19 rules of social distancing, with a gathering of 0 – 50 people, washing of hands with sanitizers, and usage of a nose mask being enforced. Hence, there is an urgent need to address the issues and challenges that these new technologies are creating in our society so that the classroom and industry can blend in terms of curriculum and practical training with technological-driven pedagogical tools. This paper examines issues, challenges, & opportunities in new technologies emanating from metalwork/automobile industries for the delivery of technical education in a pandemic era. It is recommended among others that industries having these new technologies should make their doors open for students to undergo industrial training attachment for the gainful experience.

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1. INTRODUCTION

The global world is struggling to put an end to the global pandemic that broke out in 2019 called, "Corona Virus (COVID-19). Since the emergence of the pandemic, it has claimed many lives and changed the rate of service delivery, social relations, job creation, and physical contact with humans (Clemente-Suárez *et al*., 2021; Alizadeh *et al*., 2023; Im & George, 2022). The pandemic changed every system in the world from Religion to Education, Health, Transport, Business, Industries, Trading, and Banking.

The global society had the toughest time in human history amidst the COVID-19 pandemic. COVID-19 which causes infections of the sinuses, nose, and upper throat was discovered in December 2019 amid an outbreak at a Wuhan food market in China (Butt *et al*., 2021). The pandemic shocker came because of the exceptional spread from person to person and within a few months of the outbreak, it cut across 214 out of 216 countries and territories in the. At present, as asserted by W.H.O (2022), about 459,015,877 people have been confirmed, 392,426,879 people have been discharged and about 6,068,387 deaths recorded globally as of March 19, 2022. In Nigeria, about 254,953 confirmed cases, 249,340 discharged, and 3,142 deaths in 37 states including the Federal Capital Territory, Abuja were recorded world (see in https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200306-sitrep-46-covid-19.).

The COVID-19 pandemic led to a total world lockdown of all sectors except health care which was overwhelmed with infected patients. As a precaution to slow down its spread, countries all around the world followed strict protocols of total/partial lockdowns, social distancing, and curfews. As posited by Lee and Han (2021), stay-at-home orders, social distancing, travel restrictions, border lockdowns, massive quarantines, enforced contact tracing, and self-quarantines are enforced worldwide as strict measures to curb the pandemic.

The total lockdown led to job disengagement, classroom disruption, hunger, depression, sickness, deaths, and a drastic slow in the world economy with changes in procedures of discharging different services across the globe with an emphasis on industries, health, transport, business chain supply, and educational institutions to avoid the pandemic spread. Nevertheless, to ensure the continuity of education, online and virtual education was put into practice in varying delivery modes. This was a closure of educational institutions that had unprecedented effects on learners. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) data shows that 94% of the world student population (about 1.6 billion) in more than 190 countries was affected by the closure of educational institutions at the peak of the crisis. UNESCO has predicted a 3.5% decline in enrolment resulting in 7.9 million fewer students in tertiary education.

2. METHODS

Data was obtained from internet sources. Specifically, we collected data from articles published in international journals. Data was then collected and compiled to create new ideas and discussion.

3. RESULTS AND DISCUSSION

3.1. Learning during COVID-19 Pandemic

Amidst the lockdown in various countries, government /private organizations in conjunction with schools and colleges kept devising alternatives with face-to-face program delivery and assessment to save the situation of total school closures as more than 95% of 20

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countries had declared total closures of higher institutions of learning. Notably, over 80% of institutions of learning in developed nations have switched to virtual/online lecture delivery and assessment. Where is Nigeria???

Nevertheless, many developing countries including Nigeria, Togo, and Ghana were able to curtail the spread in Africa with fewer deaths and a higher rate of recovery, why other developed countries like the USA, UK, India, and Canada, are still battling with the spread of the first variant SARS-CoV-2 virus that causes COVID-19, which is changing constantly to other variants, such as Alpha, Beta, Delta, and Omicron (Agwanda *et al*., 2021; Sarfo & Karuppnnan, 2020). This led to various clinical trials of vaccinations to curb the spread and presently resulted in approved vaccines such as Pfizer BioNTech COVID-19 mRNA vaccine (Comirnaty) or called BNT162b2 which is Pfizer/ Biontech on December 21st, 2020, with authorization to and used in the European Union. The second one is the Moderna COVID-19 vaccine (mRNA-1273) which was authorized for use on January 6th, 2021, and the third one is Astrazeneca/Oxford ChAdOx1 nCOVID-19 vaccine (Vaxzevria - AZD1222) approved on January 29th, 2021, all for human safety (Hernández *et al*., 2021).

The education sector is not spread at all and, received the biggest blow when schools and colleges were shut for close to 15 months, opened, closed, and re-opened again with COVID-19 compliance in full force, reducing the way we interact, receive classroom mode of delivery, keep social distancing, avoid handshaking, and constant use of hand sanitizer and nose marks to avoid further contact a spread. One of the methods of curbing or curtailing the spread is by adhering to the COVID-19 safety rules compliance which has to do with social distancing where this is observed, schools colleges, and industries had to adjust their classroom teaching, learning, training, and operational systems which also involve how Technical Education programs are being delivered in college preparing students for Metalwork/ Automobile industries.

The Metalwork/Automobile industries are now using robots to carry out the welding and assembly of automotive vehicle parts, especially in this industrial age. This is why new technologies emanate from metalwork/automobile industries for delivery of technical education in a pandemic era is very germane in education. Although education has seen innovation since then, it is one of the sectors wherein innovation occurs at a slow pace including Nigeria, and therefore, it has not met the sector's expectations and demands. The COVID-19 pandemic is, however, accelerating digital transformation in education at both local and international levels as educators, students, policymakers, and other role players are now actively undertaking efforts to bring about digital transformation in the education sector. Kang in Lee and Han (2021). This is why technical education is not spread.

Technical Education according to the Federal Government of Nigeria National Policy of Education (FGN/NPE, 2013) is "that aspect of education, which leads to the acquisition of practical and applied skills as well as basic scientific knowledge". The mindset is that the individual is trained to be self-reliant, and well-produced. This led to the formulation of the following goals of technical education in Nigeria. According to the FGN/NPE (2013), one of the goals of Technical Education is to provide trained manpower in applied sciences, technology, and business, particularly at craft, advanced craft, and technical levels. The students of this program are equally trained to be self-employed or pick a job in the industry as this depends on their choice. The programs cut across Automobile, Building, Electrical, Metalwork, and Woodwork to mention but a few. It involves practical training in the Metalwork//Automobile disciplines among other courses for the workplace or the industry where automated machines like the lathe, drill, shaping, sawing, welding, and grinding are

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used for various products of machine tools, automobile parts, vehicles, hospital equipment, Agricultural tools and implements, Aircraft's parts, and other purposes. The workplace/industries have discovered new technologies emanating from industries in this pandemic era. These technologies need to be used to deliver TE programs.

3.2. New Technologies

The new technologies emanating from industries are new technology trends that include: Artificial Intelligence and Machine Learning, Robotic Process Automation (RPA), Edge Computing, Quantum Computing, Virtual and Augmented Reality, Blockchain, Internet of Things (IoT), and 5G (see in https://www.simplilearn.com/top-technology-trends-and-jobs-article) (Jelaš *et al*., 2023; d BH *et al*., 2022). Technology unfolding at an alarming rate, enabling speedy change and progress, resulting in an acceleration of the rate of change. Nevertheless, it is not only technology trends and emerging technologies that are evolving; a lot more has changed due to the outbreak of COVID-19. Three of these new technologies that can be used to deliver TE programs are Artificial intelligence, Machine learning and Robotic Process Automated.

Artificial Intelligence and Machine Learning are very vital tools now used in software for automation which include robot monitoring, personal assistants, speech and image recognition, smartphone ridesharing, and navigation apps. Robotic Process Automation uses software to reply to emails, and commercial transactions processing, to automate business processes.

As posited by Lee and Han (2021), the World Economic Forum identified 10 technology trends that are eminent in dealing with the COVID-19 pandemic and each of these technology trends contains digital and automation components are Online shopping and robot deliveries, Digital and contactless payments, Remote work, Distance learning, Telehealth, Online entertainment, Supply chain 4.0, 3D printing, robotics and drones and 5G and ICT. All these components in the new technologies call for concern as issues to be addressed.

3.3. Issues

The new technologies found their way into the industries due to the emanation of the pandemic. It went to the extent of changing the curriculum and how delivery of teaching and learning institutions takes place in various institutions of learning and method delivery takes place for gainful employment when learners find themselves back in the workplace. The new technologies cannot be affected by the pandemic nor is their operating system and programming. These new technologies have come to stay and many more are still coming depending on the needs of the society to solve global challenges.

3.4. The Challenges

There is no doubt that machines cannot replace human beings, but new technologies are gradually taking over what human beings can do. The robots and other machines that involve programming such as Computer Numeric Control (CNC) for lathe, shapers, grinders, and welding, are now highly used in the industries because of the pandemic and social distancing in the place of work. The machines also use software to run their programs and execute the command given to embark on any task such as the robot welding vehicle parts in the Metalwork/Automobile industries. Many industries are now comfortable with these new technologies to carry out their operations despite the challenges being faced. These challenges are: (i) Inadequate personnel to write machine programming; (ii) Incessant electricity supply coupled with huge electric bills for stable internet connectivity for the

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affordability of online system; (iii) Online training mechanism for effective and efficient course delivery is still a mirage, as telecom infrastructures are still inadequate; (iv) The availability of educational tools such as laptops/desktops, software, and online assessment tools that will expose students to new technologies is yet to be all over the schools and colleges; (v) Many workshops and laboratories are still having obsolete equipment/instruments of the 19th century in this 21st-century era with little or no preparation for the new technologies in the world; (vi) An inadequate training manual on maintenance on the use of the new technology is still lacking; (vii) The new technologies available are very expensive and not all industries can afford them for now despite the opportunities they entail; and (viii) Many villages, towns, and cities are yet to have last-mile connectivity to each village to ensure access to online teaching and e-resources.

3.5. Opportunities in New Technologies

The new technologies have come to stay and will continue to find their way into the marketplace, schools, industries, and the global society because of the many opportunities it must use them. Some of these opportunities are:

(i) It saves time and energy. It also reduces stress and physical contact on the part of human beings which is what the pandemic has paved room for in terms of social distancing.
(ii) It has excellent perfection of tasks carried out as human errors are drastically reduced since the new technologies make use of codes and language programs written by programmers.
(iii) It generates more income and jobs are software developers, machine language writers, and programmers are trained and make more money.
(iv) It reduces the risk of lives during any industrial accident because only the machines will be affected and repaired while lives are saved as no operator may likely be around a programmed machine until it finally stops.
(v) It is easy to operate and produces parts of automotive faster than being operated by manual operation.
(vi) It reduces excess wastage of off-cut materials.

4. CONCLUSION

The pandemic era we are in cannot be ascertained when the global world will eradicate it and has affected virtually every sector of the economy. It has stalled old ways of communication in the delivery of classroom programs and TE delivery from teacher center to student's center and now to online learning. These new technologies must be understood, controlled, and applied to the mode of teaching and learning delivery /instruction for TE students to prepare them for the Metalwork/Automobile industries where we have machines in Mechatronics, Autotronics, and Electronics. The new technologies emanating from the pandemic can drastically reduce and control the spread of the pandemic. Nevertheless, considering the issues, challenges, and opportunities emanating from the industries for the delivery of TE in this pandemic era, one will appreciate the fact that, technology is changing the world, and the world is changing with technology as while.

Since we cannot do with the new technology coming on board, the following recommendations are made: (i) Schools and colleges should begin to work out and integrate how students can learn and train; (ii) Online teaching and learning classes must be fully integrated with our mode of delivery using new technologies; (iii) The new technology prototypes should be made available for students' workshop practice activities; (iv) Training

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of staff that will handle these prototypes should be embarked upon as soon as possible to allow mastery of the subject matter; and (v) Industries having these new technologies should make their doors open for students to undergo industrial training attachment for gainful experience.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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