

# Readiness of Education 4.0 in Ghana

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## Abstract

The era of “4.0” industrial revolution is when knowledge and skills are supreme for one to stay relevant and remain competitive in the job market for which education is core. This study aimed to explore Ghana’s readiness in implementing Education 4.0 and especially to create awareness of the famous catchphrase Education 4.0 in Ghana. The target population was Ghanaians of categorical groups in the educational system from the student to the retired educationist in the greater Accra region. Randomly selected education administrators, teachers/lecturers and students and pensioners totaling 133 in the Accra metropolis made up the study’s sample. The data collected was analyzed using descriptive and percentages. The outcome showed that Ghana is ready for the implementation of Education 4.0 with a recording of over 80% yes to the readiness. It was recommended that; the government of Ghana should make everything possible by bringing all stake holders on board to move the industrial action revolution.

## Keywords

Education, Revolution, Industrial, Readiness

## 1. Introduction

The era of “4.0” industrial revolution is when knowledge and skills are supreme for one to stay relevant and remain competitive in the job market for which education is core. What is Education 4.0? How do educators understand it? Is Ghana ready to follow suit from the happenings of the world or passively following without knowing its impact, though the Government has adopted digitization as a key policy objective and has recently introduced a number of programs designed to develop a more digitally accessible public sector and encourage transparency and efficiency, in order to drive growth in all aspects of the

country's economy. To understand Education 4.0, it is important to understand the Industrial Revolution (IR) 4.0.

What is Industrial Revolution (IR) 4.0? Hussin (2018) provides an example that helps to understand how the industrial revolutions changed over time. "During the 1<sup>st</sup> IR, water and steam were used to mechanize production. During the 2<sup>nd</sup> IR, electric power was used to create mass production. During the 3<sup>rd</sup> IR, electronics and information technology were used to automate production. The 4<sup>th</sup> IR is beyond an enhancement of the 3<sup>rd</sup> IR, in which the advancement of new technologies blurs the lines between the physical, digital and biological worlds. It is clear that the new technologies evolve at exponential pace and there is no historical precedent that marked the beginning of the evolution, hence being called disruptive technologies". These advancements are led by the emergence of artificial intelligence, robotics, the internet of things, autonomous vehicles, bio and nanotechnology, 3-D printing, material science, quantum computing and energy storage (Tandon & Tandon, 2020). The IR 4.0 affects not only the business, governance and the people, it also affects education as well, and thus name Education 4.0 came to existence. Education 4.0 is a response to the needs of IR 4.0 where human and technology are aligned to enable new possibilities. Hussin (2018) explains that the new vision of learning promotes learners to learn not only skills and knowledge that are needed but also to identify the source to learn these skills and knowledge. Learning is established on the activity or process of gaining knowledge or skill by studying, practicing and experiencing something. Where and how to learn track performance is normally done through data-based customization for which technology is the key. As learning becomes very significant among the growing individuals, peers learn together and from each other and as teachers assume the role of facilitators in learning process, the industrial revolution is seen as the fuel to drive the progression.

The Government of Ghana has adopted digitization as a key policy objective and has recently introduced a number of programs designed to develop a more digitally accessible public sector and encourage transparency and efficiency, in order to drive growth in all aspects of the country's economy. Education is the key to this drive cannot be overlooked as it is the basis for growth for every economy. According to Dzandza (2020), seven out of the nine libraries in Ghana's public universities have embarked on some sort of digitization initiative, and all libraries studied are using the same digital asset management system. The industrial revolution is being implemented reflexively with less force. Education 4.0 should therefore be the way to go by making it loud enough for all stake holders to jump on board for economic development. To Fisk (2017), there are nine trends related to Education 4.0. Firstly, "learning can take place anytime anywhere. e-Learning tools offer great opportunities for remote, self-paced learning". Flipped classroom approach plays a huge role as it allows interactive learning to be done in class, while the theoretical parts are to be learned outside the class time. This creates a lot of opportunities for learners to explore both the

face-to-face classroom and e-Learning. Secondly, “learning will be personalized to individual students”. Here, Individuals will only be introduced to more difficult tasks after achieving a particular degree of mastery. If the instructors believe it is necessary, more practices will be supplied. Also, pleasant reinforcement is used to encourage students to have a positive learning experience and to increase their confidence in their academic ability. Thirdly, “students have a choice in determining how they want to learn”. Despite the fact that the learning outcomes of a course are determined by the institutions/bodies in charge of the curriculum, students are still free to use whichever learning tools or approaches they like. Blended learning and flipped classrooms approaches are some of the choices that lecturers can use to encourage students to be more creative in their learning.

Fourthly, “students will be exposed to more project-based learning”. Students must put their knowledge and skills to use by completing a few short-term projects. With this, they are honing their organizational, collaboration, and time management skills by participating in the projects, which will be important in their future academic careers. Fifthly, “students will be exposed to more hands-on learning through field experiences such as internships, mentoring projects and collaborative projects”. As technology advances, it becomes easier to master certain topics, allowing more time to focus on abilities that require human understanding and face-to-face interaction. Sixthly, “students will be exposed to data interpretation in which they are required to apply their theoretical knowledge to numbers and use their reasoning skills to make inferences based on logic and trends from given sets of data”. Because computers will be used to undertake statistical analysis and forecast future trends, the manual portion of mathematical literacy will become obsolete. Seventhly, “students will be assessed differently and the conventional platforms to assess students may become irrelevant or insufficient”. In this case, students’ factual knowledge can be assessed during the learning process, and their ability to apply that knowledge can be tested while working on field projects.

Eighthly, “students’ opinion will be considered in designing and updating the curriculum”. This is because students’ suggestions assist curriculum designers in keeping the program current, relevant, and valuable. Lastly, “students will become more independent in their own learning, thus forcing teachers to assume a new role as facilitators who will guide the students through their learning process”. The key learning responsibilities are shifting from the instructors to the learners as a result of these nine Education 4.0 industrial revolution tendencies tallied by [Fisk \(2017\)](#). Instructors must therefore play a part in supporting the transition in this new normal age, and should never consider it as a threat to the traditional teaching profession. Ghana’s willingness to therefore embrace and publicize this change is critical because, over the years, governments in Ghana have made many attempts to improve the quality of education. candidates underperform in most of the courses taught especially in the sciences and chief

examiners reports have recommended that learners should be exposed to numerous practical lessons in order to improve their performance (Narh-Kert & Ampadu, 2020). It was earlier noted by Opoku-Asare and Siaw (2015) that students from rural schools, which typically lack resources for practical lessons and trained teachers to teach the various courses, are the most affected candidates. This New Age disruption, fueled by Industry Revolution 4.0, is also altering business operations. This, in turn, has an impact on the job market and the types of skills and talent that organizations seek. To keep up with this demand, educational institutions must drastically change their approach to education or transition to Education 4.0. Tandon & Tandon (2020) says that the advancement of technologies keeps on changing and transforming the teaching method and the setting of the learning process. Actually, there will be more changes in the future as the industrial revolution evolves. Some of the common changes that have been embraced by institutions include lecturers posting students' grades and assignment online, students usage of collaborative software/application to complete group tasks, students completing their assignments online and uploading them in an online class portal or the institution learning management system, students' high dependency on cloud storage to store their work and communication among students, parents, lecturers and administration are all done via social media platforms. Dunwill (2016) earlier predicted how an average classroom will look like in the near future;

- 1) "A huge change in the layout of the classroom".
- 2) "Virtual and augmented reality will change the educational landscape".
- 3) "Flexible assignments will accommodate multiple learning styles and other online learning options will impact secondary education".

Dunwill (2016) focuses on the changes that will take place in the teaching method and the setting of the learning process for secondary education. Similar transformation has already taken place in the tertiary education setting in Ghana which was fueled by COVID-19 pandemic. The classroom layout has evolved throughout time, from clean rows and chairs to flexible seating arrangements that allow for both independent and collaborative workstations. Furthermore, constructed or selected responses are no longer the exclusive kind of student assignments but accommodating variety of learning styles, alternative assessments have been established. Alternative assessments used currently include portfolios, project papers, skill demonstrations, and rating systems.

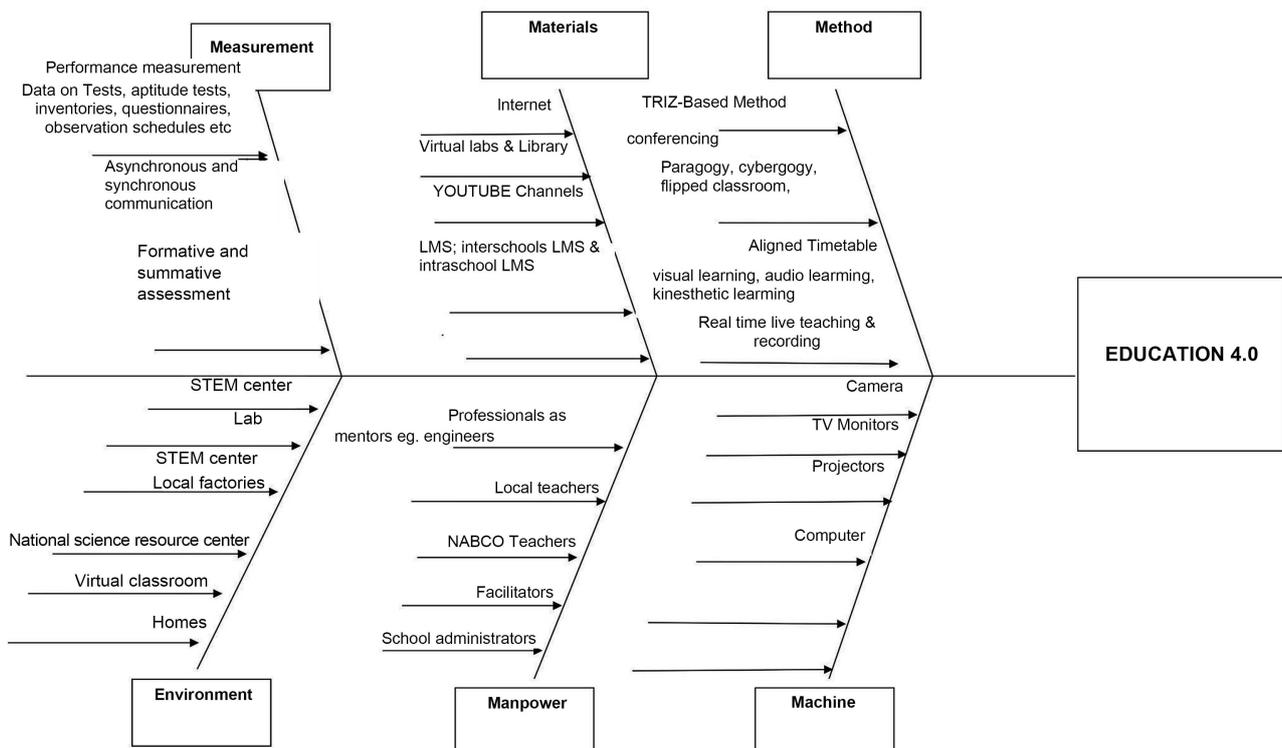
Apart from changes in the classroom layout and the types of assessment, tertiary education has started using online learning platforms in teaching and learning. The "chalk and talk" approach, for example, might be unproductive for teaching especially when better alternatives are now present that make learners more invested in their learning. "Education 4.0" technological advances are indeed opening up opportunities for learning, anytime and anywhere. This research article is an effort to highlight these issues to bring to fore the readiness of Ghanaians to embrace Education 4.0 industrial action for change. With Education

4.0, [Himmetoglu, Aydiug & Bayrak \(2020\)](#) calls it an innovation producing process, concepts like meaning, technology, teaching, schools, and teacher have been redefined. Accordingly, meaning is built via innovation-focused practices facilitated by individuals or teams. Technology changes continuously with inputs brought by students who have a crucial role in innovation producing process. Teaching is enhanced by positive innovation feedback loops. Teaching, at the same time, gains a continuous occurrence at each moment of daily life, learning life and work life. Schools are situated in human bodies which are globally networked. This position transforms schools into an innovative construct that replaces with classroom by continuously evolving. Teachers of Education 4.0 are defined as everybody, everywhere and seen as innovation producing sources.

Education 4.0 can be seen as new paradigm which reinterprets the concepts as learning, student, teacher and school according to needs of Industry Revolution 4.0 in Ghana. One of the examples of innovative teaching and learning practices as a part of Educations 4.0 is flipped classroom model. In flipped classrooms, students can investigate lesson-related digital sources such as videos, presentations materials, e-materials out of school and they can acquire the knowledge they need out of traditional classrooms. So, students can utilize classroom time for activities such as discussion, analysis and problem solving ([Youngkin, 2014](#)). The flipped classrooms can be accepted as a blended learning process since this model utilizes online learning materials while transforming traditional classrooms and enhances education process with these materials ([Gleason, 2018](#); [Adnan, Ahmad, Yusof, Mohd Kamal & Mustafa Kamal, 2019](#)). So, flipped classroom is a teaching-learning model which makes students responsible for their own learning, is practice-based, gives students individualized education opportunities and gives the opportunity of learning anywhere and anytime. Therefore, it can be said that flipped classroom model is coherent with qualifications of Education 4.0. Flipped classrooms which give the opportunity of blended learning can be evaluated as a mode developed example of Education 3.0 and distance education practices. During Education 3.0 process issues like how to integrate education and technology, how to include technology in present educational programs which are already very crowded and intense or how to overcome inconsistency between schooling and information Technologies were discussed ([Ballantyne, Wong, & Morgan, 2017](#); [Collins & Halverson, 2010](#); [Sendov, 1987](#)). However, the answer to the question of Ghana's readiness to embrace Education 4.0 is what is sought and further propose the implementation with the use of the fish bone model created by Kaoru Ishikawa of the University of Tokyo, [Clary & Wandersee \(2010\)](#). In adapting this model and creating awareness of Education 4.0, it will go a long way in solving educational related problems such as school placement from junior high school to senior high school, promoting STEM education in Ghana, minimizing the use of unqualified teachers because of the lack and many other benefits. This study adapts and designs the fish bone model to suit the implementation of Education 4.0 in

Ghana;

The fishbone diagram, often known as a cause-and-effect diagram or the Ishikawa diagram, created by Kaoru Ishikawa of the University of Tokyo, [Clary & Wandersee \(2010\)](#), has played major roles in conceptualizing industrial action replicated for Education 4.0. It is a graphic pedagogical methodology used by the teaching community to describe various fundamental causes of an issue. Using the fishbone diagram in this study, the head of the fish represents the problem or notion, the ribs indicate the fundamental causes, and the riblets reflect the relationship between the causes in the fish-shaped [Figure 1](#). The fishbone diagram concept is a widely used pedagogy in the teaching-learning process ([Bryk et al., 2015](#)). Empirically, students' critical thinking abilities were assessed using multiple problem-based learning models, including the fishbone diagram, problem-based learning model, and expository learning model ([Istikomah et al., 2017](#)). According to him, there is a considerable gap between students' critical thinking capacity and that of the teachers. [Sufeni and Fatimah \(2018\)](#) examined the teaching of writing discussion texts using a fishbone diagram with senior high school students and found positive results. The efficiency of the fishbone diagram as a teaching tool was tested among nursing students at a nursing college, and it was discovered that the fishbone diagram was an effective tool for laboratory experiments to develop promising nursing education methodologies ([Latha & Merlin, 2019](#)). The deployment of fishbone diagram was used to address the role of self-education and self-study techniques.



**Figure 1.** Fishbone model.

This study on Ghana's readiness in implementing Education 4.0 is of the view that, when the fishbone diagram is adapted in the teaching and learning of courses in the Ghanaian educational system particularly in the area of STEM, it will go a long way in improving on performance and most especially meeting the 21<sup>st</sup> century essential skills in nation development but the question is; to what extent is Ghana aware of Education 4.0 and how ready Ghana is in implanting it? Technology has changed the system of production in human nature. Beginning with collaboration to productivity, working via virtual anywhere, developing new hiring skill are the trends in technology change developing in the new era. The trends can be also seen from the rapid change emphasizing in education since the development of as 1) Education 1.0 emphasizing of memorizing experience; 2) Starting with Internet education; 3) Knowledge consuming and producing era; 4) Innovation empowering education system. From the trends of activities in both internationally and nationally following COVID-19 pandemic which has actually driven technology, Ghana must be ready for the Education 4.0 industrial action.

## **2. Materials and Methodology**

Based on the research literature reviewed, an empirical inquiry was carried out for about three months to explore Ghanaian's readiness to Education 4.0 industrial revolution. Analytical cross-sectional survey design was used for this study. The target population was Ghanaians of categorical groups in the educational system from the student to the retired educationist. Because of the nature of the population, quantitative designs were used to collect the data. The quantitative design was used to help quantify Ghanaian's readiness in embracing the Education 4.0 industrial action. Randomly selected education administrators, teachers/lecturers and students and pensioners who used to be in Ghana's education system totaling 133 in the Accra metropolis made up the study's sample with their age categories ranging from 15 to 70 years. These categories represent the youth of the school going age from senior high school to university first degree, the prime working class from which we have the lectures and the teachers and the 60 to 70 age brackets are mostly pensioners who were heads of institutions and officers for whom some still work as consultants. Permissions were sought from the participants directly since most of them were above the age where they could give their own consent to issues. Data of the study was obtained through questionnaires which is a very useful data collection tool because it emphasizes certain aspects of the research problem and flexible enough to allow participants to present their views without bother especially in this COVID-19 pandemic. Questions were asked on their digital use, behavior, and habits, and about some knowledge on Education 4.0. The simple questions asked on the questionnaire were positive and demanded simple answers as yes, no and not sure as well as very high, high, not sure, low and very low. On the data of the use of "yam phone", yam phone is a parlance used to describe a phone that is small and does

not have features of sleek phones or tablets, and mostly does not support internet use. Descriptive statistical method and percentages were employed concurrently to analyze the data using Statistical Package for Social Sciences (SPSS) software.

### 3. Results

**Table 1** shows the demographics of all the participants in the study. It could clearly be seen that there were more female than male as well as more students than the other categories. The study cannot readily explain why there were more male than female but for the students, they are actually many in all categories. Out of 94 students, 60% were male whilst 40% were female. For teachers and lectures, out of the 20 participants, 65% were males whilst 35% were females. Also, out of the 11 officers, 63% were males and 37% were females. The study had 8 education pensioners participating, 63% were males whilst 37% were females.

From **Table 2**, 51% of the students have heard about industry 4.0 revolution representing almost half of the student sampled whilst 15% responded no to the question. Almost the same percentage answered the same way to the Education 4.0 revolution. On the question of the knowledge of the flipped classroom, 82% of the student has knowledge of it whilst only 6% responded no. On the enjoyment of the use of either print or gargets, most of the students representing 75% said yes. 5% said no to use of print though 28% were not sure of which they enjoy.

**Table 1.** Demographic data.

| No of students participating             | Male            |         | Female   |         |
|--|-----------------|---------|----------|---------|
|  | # Number        | Percent | # Number | Percent |
| 94                                       | 56              | 60      | 38       | 40      |
| No of teachers/lecturers participating   | Male            |         | Female   |         |
|  | Female teachers |         |          |         |
|  | #               | %       | #        | %       |
| 20                                       | 13              | 65      | 7        | 35      |
| No of education officers participating   | male            |         | Female   |         |
|  | #               | %       | #        | %       |
| 11                                       | 7               | 63      | 4        | 37      |
| No of education pensioners participating | male            |         | Female   |         |
|  | #               | %       | #        | %       |
| 8  | 5               | 63      | 3        | 37      |

**Table 2.** Knowledge about Education 4.0.

|                 |   | Percentage responses (%) |          |    |
|-----------------|---|--------------------------|----------|----|
|                 |   | Yes                      | Not sure | No |
| <b>Students</b> | I have heard about Industry Revolution 4.0                  | 51                       | 34       | 15 |
|                 | I know about Education 4.0                                  | 51                       | 34       | 15 |
|                 | I have heard of the flipped classroom                       | 82                       | 12       | 6  |
|                 | I enjoy learning using print (text book, hand out, etc.)    | 67                       | 28       | 5  |
|                 | I enjoy learning using gargets (smart phone, lap top, etc.) | 75                       | 15       | 10 |

From **Table 3**, 64% of the students have heard about industry 4.0 revolution representing more than half of the teachers and lecturers sampled whilst 8% responded no to the question. Almost the same percentage answered the same way to the Education 4.0 revolution. On the question of the knowledge of the flipped classroom, 82% of the teachers and lecturers have knowledge of it whilst only 6% responded no. On the enjoyment of the use of either print or gargets for teaching, most of the teachers and lecturers representing 75% said yes. 10% said no to use of print though 15% were not sure of which they enjoy.

From **Table 4**, 38% of the education officers have heard about industry 4.0 revolution representing less than half of the education officers sampled whilst 28% responded no to the question. Almost the same percentage answered the same way to the Education 4.0 revolution. On the question of the knowledge of the flipped classroom, 52% of the teachers and lecturers have knowledge of it whilst only 7% responded no and 41% were not sure of it. On the enjoyment of the use of either print or gargets for learning and demonstrations, about half of the education officers representing 52% said yes. 20% said no to use of print though 28% and 30% were not sure of which they enjoy.

From **Table 5**, 28% of the education pensioners have heard about industry 4.0 revolution representing less than half of the education pensioners sampled whilst 38% responded no to the question whilst 34% were not sure of it. Almost the same percentage answered the same way to the Education 4.0 revolution. On the question of the knowledge of the flipped classroom, 30% of the education pensioners have knowledge of it whilst only 28% responded no and more than half of them, representing 52% were not sure of it. On the enjoyment of the use of either print or gargets for learning and demonstrations, almost all of the education pensioners representing 75% said yes. 17% said no to use of print though 68% were not sure of the use of gargets.

From **Figure 2**, 88% of the students normally use desk top or laptop, teachers/lecturers, education officers and pensioners recorded 85%, 88% and 67% respectively reported on often usage of desktop/laptop. As it was expected all the categories recorded more than 50% of regular usage of smart phones though

there were some variations of the use of tablet. Very few of the students representing 12% used the said “yam” phone whilst 46% of the pensioners use it often. This implies that, almost all the categorized have and use gargets that support the mounting of Education 4.0 in Ghana especially among the youth who are the future leaders.

**Table 3.** Knowledge about Education 4.0.

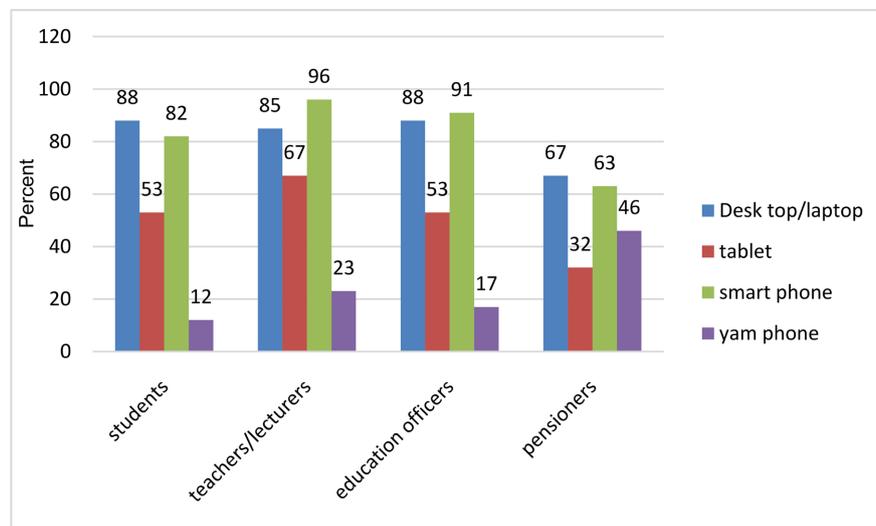
|                                |   | Percentage responses (%) |          |    |
|--------------------------------|---|--------------------------|----------|----|
|                                |   | Yes                      | Not sure | No |
| <b>Teachers<br/>/Lecturers</b> | I have heard about Industry Revolution 4.0                  | 64                       | 28       | 8  |
|                                | I know about Education 4.0                                  | 64                       | 28       | 8  |
|                                | I have heard of the flipped classroom                       | 82                       | 12       | 6  |
|                                | I enjoy teaching using print (text book, hand out, etc.)    | 52                       | 6        | 42 |
|                                | I enjoy teaching using gargets (smart phone, lap top, etc.) | 75                       | 15       | 10 |

**Table 4.** Knowledge about Education 4.0.

|                               |   | Percentage responses (%) |          |    |
|-------------------------------|---|--------------------------|----------|----|
|                               |   | Yes                      | Not sure | No |
| <b>Education<br/>officers</b> | I have heard about Industry Revolution 4.0                  | 38                       | 34       | 28 |
|                               | I know about Education 4.0                                  | 38                       | 34       | 28 |
|                               | I have heard of the flipped classroom                       | 52                       | 41       | 7  |
|                               | I enjoy learning using print (text book, hand out, etc.)    | 52                       | 28       | 20 |
|                               | I enjoy learning using gargets (smart phone, lap top, etc.) | 52                       | 30       | 18 |

**Table 5.** Knowledge about Education 4.0.

|                                 |   | Percentage responses (%) |          |    |
|---------------------------------|---|--------------------------|----------|----|
|                                 |   | Yes                      | Not sure | No |
| <b>education<br/>pensioners</b> | I have heard about Industry Revolution 4.0                  | 28                       | 34       | 38 |
|                                 | I know about Education 4.0                                  | 28                       | 34       | 38 |
|                                 | I have heard of the flipped classroom                       | 30                       | 52       | 28 |
|                                 | I enjoy learning using print (text book, hand out, etc.)    | 75                       | 8        | 17 |
|                                 | I enjoy learning using gargets (smart phone, lap top, etc.) | 25                       | 68       | 7  |



**Figure 2.** Which of the following devices do you normally use?

From **Figure 3** on the activities the sample perform with their gargets, 88% of the students said they normally read and send email. 85% of teachers/lecturers, 67% of education officers and 37 pensioners recorded 85%, 88% and 67% respectively reported on read and send email. Most of the categories recorded just around 50% of use of office suite with teachers and lecturers recording the highest. For reading and downloading, the students recorded 82% when the teachers and the lecturers recorded 75% though there were some variations on doing on-line research. Very few of the pensioners could manage websites and 83% of the teachers and lecturers could manage websites whilst the students who are the future leaders and on their lap is where industrial action can be realized recorded 75% of web management.

From **Figure 4**, almost all the categories in the sample responded yes to the level of importance attributed to interact teachers even during class through the use of personal gargets like laptops, tablets and phones which are also the basic gargets for implementing Education 4.0.

Though the use of flipped classroom was not known to the sample, almost all the categories in the sample responded yes to the level of importance attributed to the use of flipped classroom in Ghanas' education system from **Figure 5** which is also a recipe for implementing Education 4.0.

From **Figure 6**, almost all the categories in the sample responded yes to the level of importance of implementing Education 4.0 in Ghana. The most interesting part of the study was that, the sample who the study collected data from had the opportunity to hear about Education 4.0 and also understand what it is and the benefits Ghana stands to derive from it in its implementation.

Again from **Figure 7**, almost all the categories in the sample responded yes to Ghanas' readiness in implementing Education 4.0. 15% of the Education officers as well as 12% of the pensioners were not sure of the implementation of Education 4.0 in Ghana.

### 4. Discussion

This industrial revolution focuses on smart technology, artificial intelligence, and robotics; all of which now impact our everyday lives. For universities to continue to produce successful graduates, they must prepare their students for a world where these cyber-physical systems are prevalent across all industries. This means teaching students about this technology as part of the curriculum, changing the approach to learning altogether, and utilizing this technology to better improve the university experience.

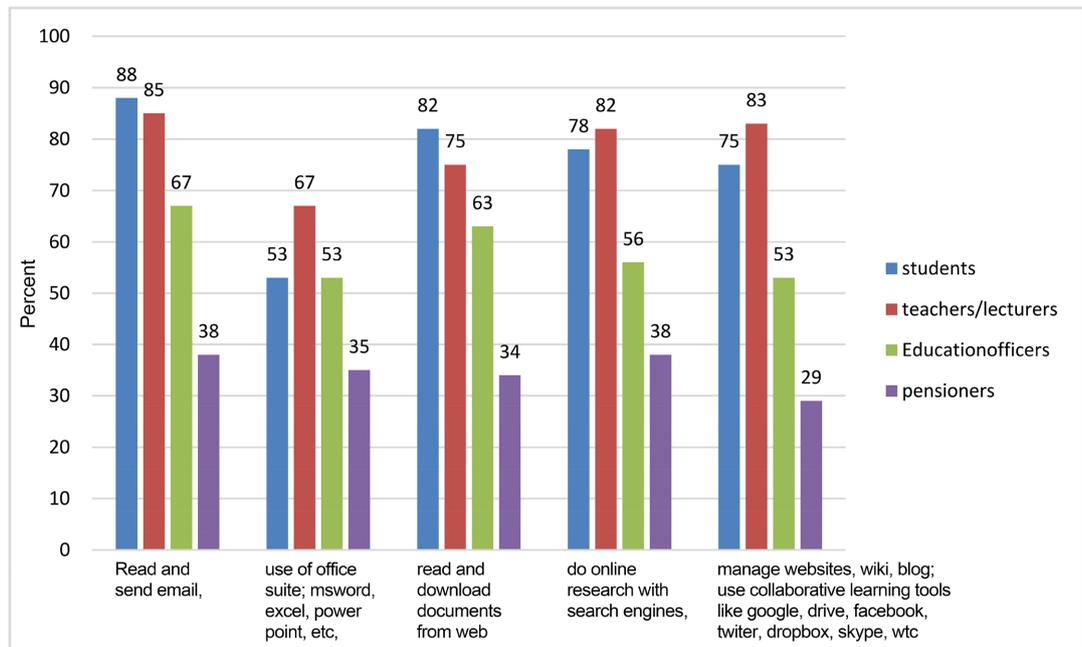


Figure 3. Which of the following activities do you perform regularly?

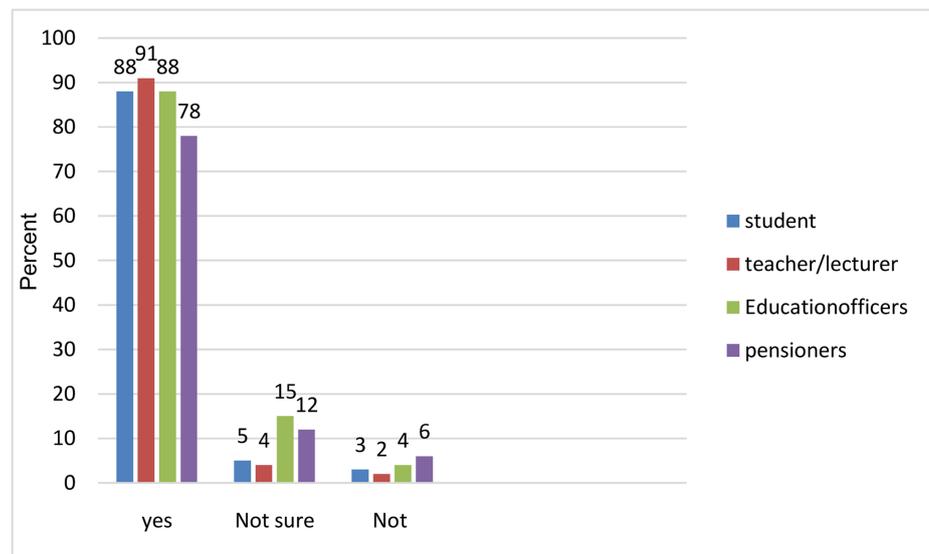
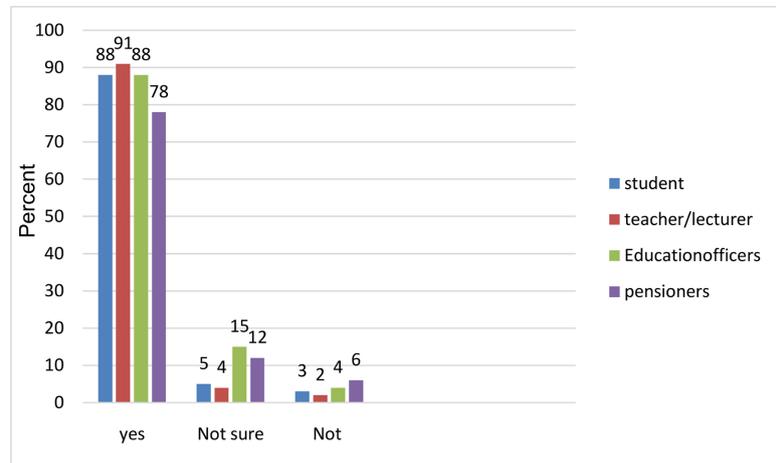
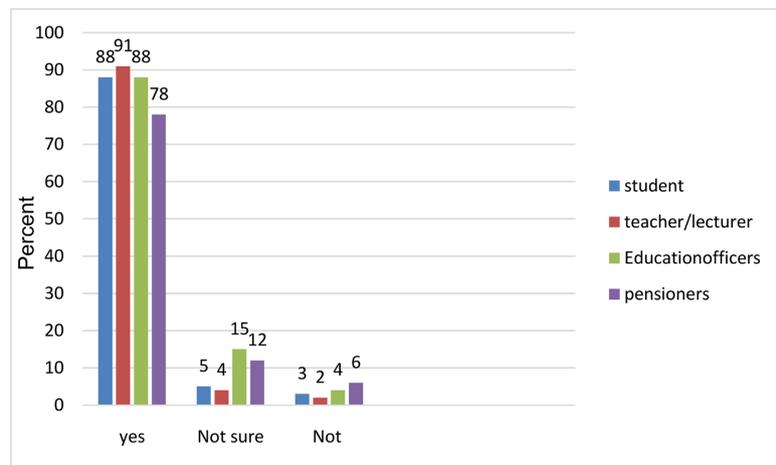


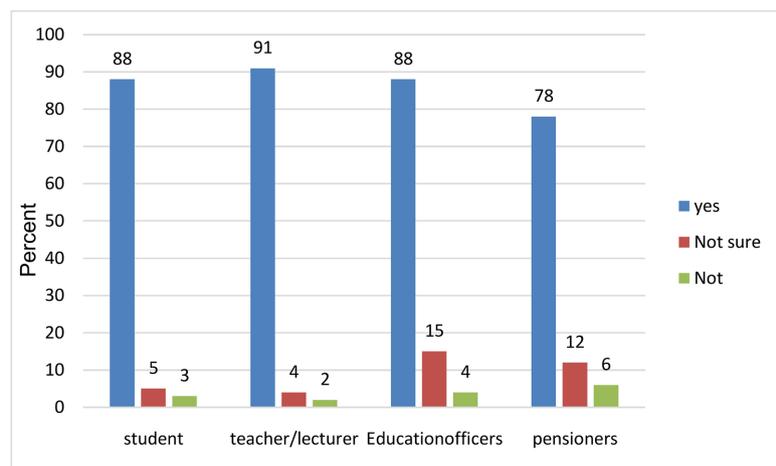
Figure 4. Would you want to interact with the teacher, even during class, through the use of personal digital devices (smart phones, tablets, PCs, etc.).



**Figure 5.** Do you think a flipped classroom is important in Ghana's educational system?



**Figure 6.** If Education 4.0 is a desired approach to learning that aligns itself with the emerging fourth industrial revolution, what is your level of importance will you recommend its use in Ghana's educational system?



**Figure 7.** I would say Ghana is ready to take up education 4.0 knowing what it is now.

The present tertiary students aged between 18 to 23 years old and who belong to Generation Z (Gen Z) are so revolutionized by technology, [Kozinski \(2017\)](#). The learning preference of the Gen Z students is different from the previous generation as they are more hands-on and directly involved in the learning process. [Kozinski \(2017\)](#) highlighted the following learning preferences of Gen Z students. Gen Z students are those who are fully engaged in their learning process. They welcome challenges and enjoy group discussion and highly interactive learning environment. For them, learning is without boundaries; they can learn anywhere and anytime and have unlimited access to new information as was reported by [Narh-Kert \(2021\)](#). Learning that involves active collaboration with their team members and learning at places other than their classroom interest them. On top of that, the use of digital tools and online forums are preferred as they prefer them to be integrated in their learning process. Since the Gen Z students are so much into the digital tools from the results of this study, they expect the tools are available whenever they need them with at low access barriers. These Gen Z students need to be prepared to thrive in the Fourth Industrial Revolution.

Instructors need to relearn and equip themselves with digital tools to meet the learning preference of Gen Z students. But interestingly, the teachers and the lectures in Ghana are indirectly ready from the results of this study. There are many digital tools available online that instructors can choose from. Educational Technology and Mobile Learning have been driven by the famous COVID-19 pandemic and it will move it to the next level. By aligning teaching and learning methods with the skills needed in the future, universities can be sure they are successfully preparing their students for the fourth industrial revolution. One method of doing so is by encouraging accelerated remote learning, which is the idea that students will learn theoretical knowledge remotely using digital means, whilst ensuring any practical skills are still learned face-to-face. This is a more flexible way of learning that requires accountability and good time management; skills that will be relied on due to the rise in the freelance economy. The move towards this way of working will also require students to learn how to adapt quickly to new situations they may face in their evolving careers. Project-based learning highlights the importance of studying a wide set of skills that can then be applied to each scenario, as opposed to sticking to a set of skills directly linked to a specific job role.

## 5. Conclusion and Directions for Future Research

From the results of this study, the education officers are previewed to the emerging technologies in schools in Ghana and are in full support of their implementation. The amazing group from this study who were fun to collect data from were the pensioners. Though most of them did not have so much power over technology which pushed them in using the “yam” phone, they still had a good heart for the implementation of Education 4.0 in Ghana for a better future. This

study is boldly reporting that Ghana is ready to implement Education 4.0 and concludes that almost all the stakeholders in Ghana's education responded "yes" to the implementation of Education 4.0. It is therefore recommended that; all efforts should be made by government to enforce the implementation of Education 4.0.

Finally, while we sought to synthesize ideas from existing research as well as actual industry instances, it is obvious that there are significant gaps. As a result, we conclude our study by recommending several promising future research directions:

Using Education 4.0 to reduce the quality STEM education gap in remote senior high schools and marketing strategies must be used to promote enrolment in STEM courses in higher education.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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