



# EDUCATORS' KNOWLEDGE, SKILLS, COMPETENCIES AND PERFORMANCE IN THE FOURTH INDUSTRIAL REVOLUTION, PROVINCE OF LAGUNA

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## ABSTRACT

*This study aimed to determine the basic education educators' knowledge, skills, competencies, and performance for the Fourth Industrial Revolution in the Department of Education, Laguna. Data were gathered from one hundred and ninety-three (193) basic education educators from the Department of Education (DepEd), Division of Laguna. Survey questionnaire with five-scale checklist was adopted and used to gather data. The gathered data was statistically computed and analyzed using the mean, standard deviation, and Pearson r formulas in describing the direction of relationship between the given and among the foregoing variables respectively. They serve as basis for the empirical testing of the null hypotheses at a specified percentage level of significance in order to come up into valid analyses and interpretation of the findings as basis for reliable conclusions and feasible recommendations. Majority of the basic education educators are classified as belonging to Gen X and Gen Y. Only few are said to be Gen Z or popularly termed 'Millennials'. As regard to sex, majority of the educators are female which proved that education is a female world. As to the highest educational attainment, basic education educators have varied educational attainment but the dominant attainment is completion of the Bachelor's degree with Masteral Units. On the length of service, Gen X and Gen Y, have quite spent a number of years from 6 years and above in the service educating learners. It was revealed that majority (76%) of the respondents admitted that they have not experience any form of training, seminar or similar activities which pertains to the Fourth Industrial Revolution. Only 50 or 24% of the respondents were in admission that they have attended some seminars, training, workshops and similar activities related to the Fourth Industrial Revolution. Basic education educators reported that they are knowledgeable (3.69) about the forces that shape education. Likewise, basic education educators admitted that they are knowledgeable. The skills and competencies of basic education educators on general qualities were reported as skilled (4.06) and competent (4.14) respectively; on the use of digital technology- educators said they are skilled (3.92) and competent (4.03) respectively; on developing digital learning resources, they admitted they are skilled (3.96) and competent (4.05) respectively; on re-mix of learning, educators said they are skilled (3.95) and competent (4.02) respectively; in the area of communication, educators said they are skilled (4.16) and highly competent (4.28) respectively; under facilitating learning, educators said they are highly skilled (4.24) and highly competent (4.23) respectively; on pedagogical strategies they admitted they are skilled (4.13) and competent (4.17) respectively; on assessment of learning, educators said they are skilled (4.15) and highly competent (4.22) respectively; and on personal characteristics, educators admitted they are highly skilled (4.29) and highly competent (4.29) respectively. According to the data gathered majority (92.23%) of basic education educators' performance are very satisfactory. Only few (7.77%) were reported outstanding. The relationship between basic education educators' knowledge on the factors affecting education is reported to be weak but significant; on basic education educators' knowledge on the trends in education is moderately but significantly related to their performance. As regard the relationship between the basic education educators' skills and competence on their performance, it is reported that in the area of facilitating learning the relationship is very strong and significant. All other areas for the Fourth industrial revolution were reported to have strong and significant relationship with the basic education educators' performance.*

**INDEX TERMS**— Competencies, Educator's knowledge, Educator's skills, Industrial Revolution, Performance

## 1. INTRODUCTION

The world today is at the threshold of a new era collectively termed 'Fourth Industrial Revolution' or simply written as "4IR". This phenomenal transformation renders the world to experience a wide array of information and communication technology, thereby creating a digital society.

This new pace of virtual world brings along sea of changes in the life of everyone irrespective of distance, time and space (Puncreobutr, 2016). With the current set up, school education and teachers' roles are currently challenged. Since teachers play crucial roles as communicators of knowledge and skills to students, they are responsible for increasing students' interest and developing talents and abilities. Teachers are also relied upon to build analytical, critical and creative thinking skills

in line with the educational thrusts of the society. Likewise, teachers are expected to form individuals who can adapt to the changes that occur around them.

The preceding idea further affirmed that 4IR is an era of accelerating change. It created varied social conditions which necessitate unique skill sets from the individual. In this highly innovative era, the students need to adjust in accordance to the changing behavior with the special characteristics of parallelism, connectivism (Goldie, 2016), and visualization. This learning management must help to develop the learner's ability to apply the new technology, and teachers have to assist the learners develop according to the changes in society. Sinlarat (2016) further argued that the learning management of this era is a new



learning system, allowing the learner to grow with knowledge and skills throughout their lives. That is, not just to know how to read and write, but also to be able to live in a society and to be equipped with the best of his/her ability according to the call of the time.

Given the expectations above, it is important to be knowledgeable about the nature of the 4IR so that proper adjustments can be made to render educational practices according to the demands of the era.

As argued by Ally (2019) though education progresses in the digital era it is not according to the paces of the Fourth Industrial Revolution. In that sense, it is of prime significance to know where are our educators at this point in time so that leaders can quantify and identify what actions can be taken to equip the educators with appropriate skills and competencies to make learning more adaptive and properly adjusted to meet the needs of individual learners. The emerging technology, artificial intelligence, and the internet of things are all important forces that are shaping education and are so potent that the only way to survive is to clinch to the raging change by making modifications to the current practices and processes. This can only be made possible when educators are equally prepared and equipped with the right skills and competence needed in such a milieu.

Against the preceding backdrop the researcher formulated the primary goal of this study which is to determine the educators' knowledge, skills, and competencies for the Fourth Industrial Revolution that can clarify where our basic education educators are right now in relation to the demands of the 4IR. This data may guide the education leaders to plan the possible in-service training programs to further equip the basic education educators in anticipation for a more challenging education environment. Further, these data may enable the researchers to identify issues and gaps, as well as the inadequacies of these education frontliners in the process of curriculum implementation. These factors may provide insights and serve as compass through which the Department of Education can calendar activities according to the sequencing of topics based on standardized approach.

The output of their research can empower every educator to conduct reflection of themselves to determine their status in the continuum of education for the Fourth Industrial Revolution and whether their preparations are still relevant and attuned to the demands of the new era. Also, the information generated from this study can be a motivation to plan and strategize approaches in improving the delivery of teaching – learning processes in the future.

## 2 OBJECTIVES

The primary aim of the study was to determine the basic education educators' knowledge, skills, and competencies for the Fourth Industrial Revolution in the Department of Education, in Laguna. Specifically, the study will attempt to answer the following problems:

1. The demographic profile of the basic education educators in the Province of Laguna in terms of the Age,

Sex, Highest educational Attainment and Length of Service.

2. The training, seminar/workshop and related activities attended by basic education educators which are related to 4IR.
3. The educators' knowledge, skills and competencies of basic education educators in the Fourth Industrial Revolution.
4. The educators'/teachers' performance based on the variables included in the IPCRF.
5. The significant relationship between knowledge, skills and competencies with the educators'/teacher's performance in the Department of Education (DepEd) Laguna.
6. The recommendations can be forwarded to enhance the educators'/teachers' knowledge, skills, and competencies in the fourth industrial revolution.

## 3. METHODOLOGY

This study used descriptive – quantitative research method being the most commonly used method in educational research. This is the preferred method because it is objective in data collection, quantifies variables and describes phenomena using numbers to characterize them. Saunders et al (2008) assert that concepts, variables and hypotheses are chosen before the study begins and remain fixed throughout the study in a static design. McMillan and Schumacher (201) explain that quantitative methodology uses a deductive form of logic where theories and hypotheses are tested for cause and effect.

The respondents of this study were the basic education educators in public elementary schools in the Division of Laguna. To determine the population, the researcher browsed the master list of schools from the Department of Education (DepEd) Division of Laguna. Due to the bulk of numbers of educators in the basic education in the Fourth Congressional District of Laguna, the researcher consults the opinion of the university statistician whether it was appropriate to apply the Sloven's approach to determining the total respondents for this particular study. So, the researcher will first determine the number of elementary schools in the fourth district and the number of teachers in a particular school. From the total number of teachers, Sloven applied to determine the number of sample population in the study. From the sample population it was divided into the number of schools to determine the number of respondents per school without prejudice whether the school is small or big.

## 4, LITERATURE REVIEW

Going through existing literature, the reader was informed that the industrial revolution started in England in the 18th century. The term "Industrial Revolution" as coined by Auguste Blanqui and made popular by Arnold Toynbee in the eighteenth century simply denotes the economic and social changes arising out of the transition of industrialism. This revolution affects every sphere of human living including manufacturing, production, distribution, the economy, and socialization. The industrial revolutions transformed the world

with the first wave which is the age of mechanical production and water power, the second being the age of science and mass production, and the third being the rise of digital technology. As declared in 2016 by Klaus Schwab, the founder and executive chairman of the World Economic Forum (WEF), the fourth industrial revolution is here already (Marr, 2018).

According to Schwab's visionary work (2016), the Fourth Industrial Revolution is developing at an exponential, not a linear pace that not only changes "what" and "how" to do things, but also "who" we are. Accordingly, the introduction of Industry 4.0 has brought and will continue to bring profound changes in the global economy covering investment, consumption, growth, employment, trade, and so on. Growth and employment are certainly the areas most affected by the introduction of Industry 4.0 innovation.

The notes of Xing and Marwala (2019) both convey related ideas saying that the first industrial revolution was developed in the eighteenth century due to mechanical production obtained by water and steam, with the development of machine tools and an improvement of their efficiency. The second industrial revolution developed with the arrival of electricity and mass production, theorized by Smith and Taylor and implemented by Henry Ford in his Detroit factory for the production of the Model T. The third revolution was characterized by machine automation through the use of electronics and IT applied in the production processes (Xing and Marwala, 2019). The fourth industrial revolution integrates IT systems with physical systems to get a cyber-physical system that brings the real world into virtual reality.

But according to the Elonza (2019), it stated that the fourth industrial revolution is only an evolution of the third industrial revolution. In a straightforward perspective, the 4th industrial revolution, usually called Industry 4.0 or 4IR can simply be referred to as the current and developmental transformation in the ways human's function, which is a result of disruptive technologies and trends such as robotics, Internet of Things (IOT), virtual reality and Artificial Intelligence (AI) (Rouse, 2017). These disruptive technologies and trends have blurred the line between the physical, digital and biological spheres and as opined by (Marr 2018) will impact all disciplines, industries, and economies. According to Fisk (2017), these disruptive technologies are reshaping the world, and as such education in the world at large should focus on training students on these technologies. These include mobile internet, automation of knowledge and work, internet of things, cloud, advanced robotics, autonomous vehicles, genomics, energy storage, 3D printing, advanced materials, advanced oil and gas exploration, and renewable energy.

In affirming the preceding ideas, Lase (2019) claimed that at present, the world has entered the era of the fourth - generation industrial, which was characterized by increasing connectivity, interaction, and development of digital systems, artificial intelligence, and virtual. With the increasingly

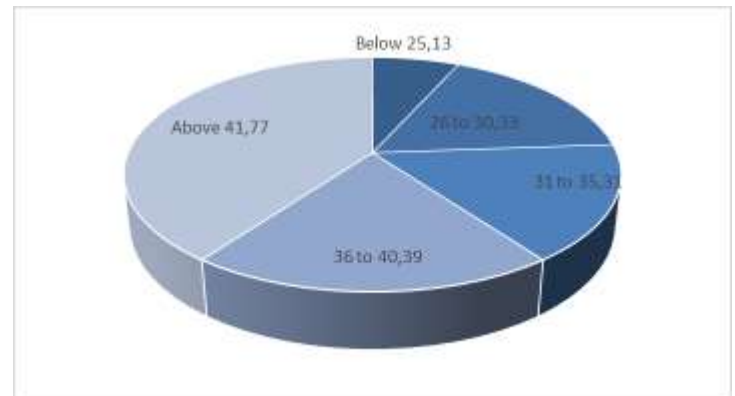
convergent boundaries between humans, machines, and other resources, information, and communication technology certainly have an impact on various sectors.

As a consequence of the preceding occurrences, it is

evident that no one can avoid these changes, so it is necessary to prepare adequate human resources to be ready to adapt and be able to compete on a global scale. Improving the quality of human resources through education is a way to balance the development of IR 4.0 (Lase, 2019).

## 5. DISCUSSION

**Figure 1. Educators' Demographic Profile as to Age.**



The educators' demographic profile was described in terms of age, sex, highest educational attainment, and length of service is shown in figure 1.

It can be noted that 77 of the educators are above 41 years of age (40%) while 39 of them have age that range from 36 to 40 years (20%). Only a small percentage of the educators are below 25 years old (7%). This means that the educators belong to the middle adulthood stage, the stage when they have accumulated knowledge and experience. Majority of the educators belong to Generation X (those who were born between 1965- 1980); Others belong to Gen Y (those who were born between 1981- 1996); the rest of the educators and only few of them are called Gen Z, the newest generation (those who were born between 1997 – 2021/15). They are currently between 6 – 25 years old (Kasasa, 2021).

Based on the categorization above, majority of the educators belonged to Gen X and Gen Y and are considered migrants to the world of Gen Z which is technologically dominated.

**Figure 2. Educators' Demographic Profile as to Sex.**

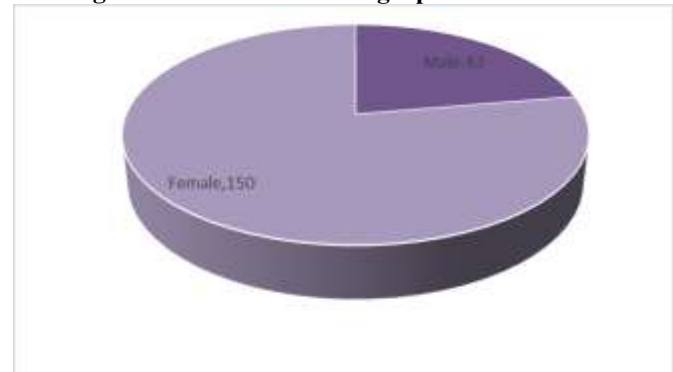




Figure 2 showcases the educators' demographic profile in terms of sex.

Obviously, there are 150 female respondents representing 78% and only 43 (22%) respondents are males. Information technology is driving everything and has reduced the whole world into a global village. Amid the campaign for gender equity promoting equal opportunity and fair treatment for males and females, it still can be observed that there is a low participation of females in information technology compared to males due to their gender and roles.

**Figure 3. Educators' Educational Attainment Profile.**

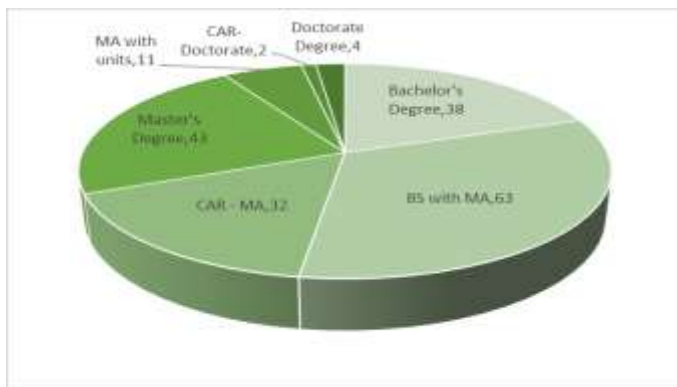


Figure 3 highlights the educational attainment of the respondents.

Based on the data illustrated in Figure 4, majority of the educator – respondents (63 or 33%) have earned MA units on top of their BS degree; while 43 or 20% of the educators are Master's degree holder; 38 or 20% are still with Bachelor's Degree.

The rest admitted they have either completed the academic requirements in their MA; some with MA units. Only few educators have Doctorate degree and others have completed their academic requirement in the said program. Nowhere in the literature review has suggested that educational attainment impacted the use of digital technology. But what is evident in literature is the role of digital technology in enhancing learning.

**Figure 4. Educators' Length of Service' in Teaching.**

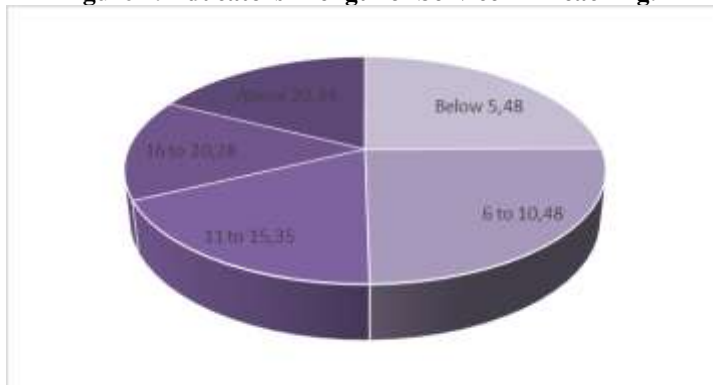
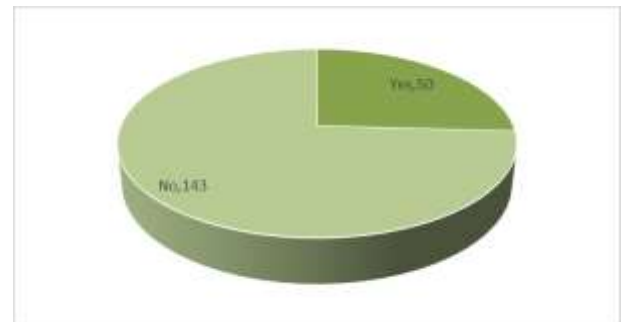


Figure 4 summarizes the teacher- respondents' number of years in service.

Initial appreciation of the data summarized in Table 5 suggests that majority of the teacher – respondents (48 Or 25%)

have served as teacher between 6 – 10 years; another quarter of them served (48 or 25%) for 5 years and below ; still some respondents reported to be in service (34 or 18%) for more than 20 years and the same number of teachers served between 11 to 15 years in serves; and only 28 teachers or 14% admitted they were in service for at least 16 – 20 years. It can be noted that majority of the educator – respondents have been serving as teacher for quite a number of years. This means that these teachers/educators have a long experience in the field of teaching.

**Figure 5. Educators' Educational Attainment Profile.**



The educators were asked if they had attended trainings related to the Fourth Industrial Revolution. Their responses are presented in Figure 5.

Obviously, almost three-fourths of the respondents admitted that they have not attended any form of professional development training, seminar or other forms of academic updating related to the 4th Industrial Revolution. Only 50 educators or 26% admitted that they have underwent some seminar, training, conferences, workshops and other related activities for the 4th Industrial Revolution.

This means that the majority of the educator – respondents have no exposure to the demands of the rapidly changing education environment and therefore, they could not bring to the students' the expected services that will empower the students to live in the challenging world of the 4th Industrial Revolution.

**Table 1. Educators' Knowledge of the Forces that Shape Education.**

Forces that Shape Education	Mean	Standard Deviation	Verbal Interpretation
Globalization	3.83	0.574	Knowledgeable
Fourth Industrial Revolution	3.47	0.771	Knowledgeable
New Generation of Learners	3.94	0.639	Knowledgeable
Open Education Resources	3.86	0.642	Knowledgeable
Artificial Intelligence	3.48	0.771	Knowledgeable
Information Explosion	3.44	0.827	Knowledgeable
Big Data	3.38	0.815	Knowledgeable



Internet of Things	3.85	0.709	Knowledgeable	trends from given sets of data			
Learning Analytics	3.46	0.721	Knowledgeable	7. Students will be assessed differently and the conventional platforms to assess students may become irrelevant or insufficient.	3.94	0.666	Knowledgeable
Education for All	4.18	0.669	Knowledgeable	8. The student's opinion will be considered in designing and updating the curriculum.	3.92	0.692	Knowledgeable
<b>Overall Mean</b>	<b>3.69</b>		<b>Knowledgeable</b>	9. Students will become more independent in their learning, thus forcing teachers to assume new roles as facilitators who will guide the students through their learning process.	4.02	0.641	Knowledgeable
<p>These trends and forces drastically change the role of the teachers. Some of the trends and forces mentioned are events that pose challenges such as: the 4th Industrial Revolution, the output of the World Education Forum, innovative pedagogy proposed by some scholars, information explosion due to the increasing use of the internet, life-long learning, artificial intelligence and a move to open education resources.</p> <p>The educators are knowledgeable of the forces and trends that shape education particularly the concepts about Education for All (M=4.18, SD=0.669), New Generation of Learners (M=3.94, SD=0.639), Open Education Resources (M=3.86, SD=0.642), and Internet of Things (M=3.85, SD=0.709). They also disclosed that they are knowledgeable of concepts like globalization, learning analytics, artificial intelligence, information explosion, fourth industrial revolution, and big data. The overall mean of 3.69 signifies that the educators are knowledgeable of the concepts about the 4th Industrial Revolution. This means that the educators are familiar with technological advancements that shape education. They are aware of the changes that are happening across the globe.</p>				<b>Overall Mean</b>	<b>3.98</b>		<b>Knowledgeable</b>

Preliminary observation of the data suggests that teachers/educators are knowledgeable about the nine trends in education. The educators' responses on their knowledge about the trends in education are reported as knowledgeable particularly trend number 1 which says that 'learning can take place anytime, anywhere learning tools offer great opportunities for remote self – paced learning' (M=4.12, SD=0.633), trend number 3 'students have choice in determining how they want to learn' (M=4.04, SD=0.664) and trend number 9 'students will become more independent in their learning, thus forcing teachers to assume new roles as facilitator who will guide the students through their learning process' (M=4.01, SD=0.645).

The educator – respondents also reported that students will be exposed to more kinds of learning through intern ships, mentoring, project and collaborative projects; more project based- learning; students will be assessed differently, students' opinion will be considered in designing and updating the curriculum and 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.

The overall mean of 3.98 signifies that the educators are knowledgeable of the educational trends brought about by the 4th Industrial Revolution. This means that the educators are sensitive to the challenges they will soon encounter due to technological advancements that set educational trends. They are aware of the impending changes that are happening across the globe in general and the Philippine education in particular.

**Table 2. Educators' Knowledge of the Trends in Education.**

Trends in Education	Mean	SD	Verbal Interpretation
1. Learning can take place anytime, anywhere learning tools offer great opportunities for remote self – paced learning.	4.12	0.633	Knowledgeable
2. Learning will be personalized to individual students	4.01	0.645	Knowledgeable
3. Students have a choice in determining how they want to learn.	4.04	0.664	Knowledgeable
4. Students will be exposed to more project – based learning.	3.91	0.635	Knowledgeable
5. Students will be exposed to more kinds of learning through internship, mentoring projects, and collaborative projects.	3.98	0.653	Knowledgeable
6. 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	3.88	0.647	Knowledgeable



**Table 3. Shows the Educators' General Qualities**

Indicators	Skills			Competencies		
	Mean	S. D.	V. I.	Mean	S. D.	V. I.
1. I am comfortable working in a virtual environment.	3.80	0.648	S	4.04	0.598	C
2. Provide support of learners regardless of location and time.	4.03	0.628	S	4.16	0.565	C
3. Work from anywhere and at any time.	4.05	0.667	S	4.16	0.577	C
4. Teach students life skills.	4.13	0.552	S	4.15	0.540	C
5. Keep up with emerging learning technologies to use in education.	4.01	0.604	S	4.10	0.568	C
6. Keep current in the content area to facilitate learning	4.06	0.588	S	4.13	0.519	C
7. Encourage students to be good citizens.	4.39	0.578	HS	4.26	0.600	HC
8. Basic knowledge of artificial intelligence.	3.74	0.681	S	3.98	0.625	C
9. State of the art (current) knowledge in the subject area.	3.96	0.649	S	4.11	0.572	C
10. Collaborate virtually with other teachers to share information on learners' progress.	4.12	0.591	S	4.20	0.571	HC
11. Share effective learning practices with other teachers.	4.18	0.568	S	4.19	0.574	C
12. Prepare learners to live in harmony with the environment.	4.18	0.562	S	4.20	0.571	HC
<b>Overall Mean</b>	<b>4.06</b>	<b>Skilled</b>		<b>4.14</b>	<b>Competent</b>	

over-all mean of skills is 4.06 verbally interpreted as skilled; Competencies earned an over-all mean of 4.14 also with verbal interpretation of competent.

This means that these educators - respondents are generally consistent in integrating citizenship education in their daily class routine since they have already developed competence and therefore are skillful in handling the activities that promote citizenship training among their students.

Table 3 shows the general qualities based on skills and competencies for the fourth industrial revolution. However, indicators 10 and 12 'collaborate virtually with other teachers to share information on students' progress' and 'prepare learners to live in harmony with the environment' respectively were reported to register means of 4.20 and verbally interpreted as highly competent. It seems that the respondents are getting confused. One could not be reported as highly competent but only skillful.

The unparalleled report between skills and competencies simply confirmed the idea that our educator- respondents have no adequate preparation yet for the 4th Industrial Revolution. Though they admitted to

have knowledge on the factors and trends affecting education brought by the 4th Industrial Revolution the educator – respondents are not yet totally prepared to embrace the changes.

**Table 4. Educators' Skills and Competencies as to Use of Digital Technology.**

Indicators	Skills			Competencies		
	Mean	S. D.	V. I.	Mean	S. D.	V. I.
1. Be digitally literate.	4.02	0.625	S	4.08	0.577	C
2. Integrate technology in the curriculum seamlessly.	3.95	0.619	S	4.07	0.560	C
3. Be comfortable when using technology.	4.02	0.653	S	4.08	0.586	C
4. Use learning analytics to monitor individual learner progress.	3.88	0.617	S	3.99	0.573	C
5. Use assistive technology to provide support to learners with special needs.	3.86	0.682	S	3.99	0.595	C
6. Integrate augmented reality, virtual reality and mix reality to learners a real-life experience.	3.84	0.719	S	3.99	0.591	C
7. Trouble shoot basic technology problems.	3.72	0.741	S	3.93	0.649	C

Tables 3 to 11 summarize the skills and competencies of educator-respondents of the current study. Table 3 next page showcases the general qualities of teacher/educator-respondents for the 4th Industrial Revolution. Initial appreciation of the data suggests that the respondents' general qualities shown in the



8. Adapt to emergency technology.	3.84	0.715	S	4.00	0.568	C
9. Use multimedia technologies to deliver learning materials in a variety of formats.	4.01	0.653	S	4.03	0.590	C
10. Ability to independently learn how to use new technology and software.	3.85	0.653	S	4.01	0.577	C
11. Use technology to provide efficient support to learners.	3.97	0.628	S	4.11	0.547	C
12. Have knowledge of the culture and local practice to select the most appropriate technology.	3.90	0.658	S	4.03	0.563	C
13. Explore emerging technologies for learning.	3.94	0.631	S	4.05	0.593	C
14. Use features of the technology to enrich the learning process.	3.94	0.605	S	4.06	0.583	C
15. Adapt the technology to the needs of the learners.	4.03	0.616	S	4.09	0.551	C
<b>Overall Mean</b>	<b>3.92</b>	<b>Skilled</b>		<b>4.03</b>	<b>Competent</b>	

**Table 5. Educators' Skills and Competencies on Developing Digital Learning Resources.**

Indicators	Skills			Competencies		
	Mean	S. D.	V. I.	Mean	S. D.	V. I.
1. Have knowledge of the content.	4.01	0.595	S	4.10	0.564	C
2. Select the appropriate digital technology to match the content and the learning outcome.	3.95	0.571	S	4.07	0.578	C
3. Create high quality digital learning materials.	3.82	0.664	S	3.95	0.584	C
4. Develop learning materials to meet specific learning needs.	3.98	0.573	S	4.05	0.566	C
5. Develop learning materials with limited knowledge of the learner's language, culture, and situation.	3.90	0.645	S	4.04	0.557	C
6. Identify quality and valid learning materials for learners to access.	3.96	0.572	S	4.07	0.578	C
7. Use different strategies for different learning situations.	4.02	0.595	S	4.06	0.556	C
8. Use problem-based learning to develop learners' high-level knowledge and skills.	3.96	0.557	S	4.06	0.614	C
9. Share learning resources with other teachers.	4.03	0.577	S	4.08	0.524	C
<b>Overall Mean</b>	<b>3.96</b>	<b>Skilled</b>		<b>4.05</b>	<b>Competent</b>	

Table 4 highlights the skills and competencies of educators on the use of digital technology.

Indicator No. 3- 'Be comfortable when using technology (M-4.08, SD- 0.586). Likewise, educators claimed they are competent in all other indicators under the use of digital technology.

Over-all, the educators claimed they are skilled and competent in the use of digital technology as shown by the means of 3.92 and 4.03 respectively. These findings are congruently aligned with the pronouncement of Ally (2019) who said that in the digital era, especially in the Fourth Industrial Revolution, the teachers should be digitally literate to use technology to deliver and support education.

Table 5 summarizes educators' skills and competencies on developing digital learning resources.

Under this category, there are 9 indicators through which educators rate their skills and competencies. Preliminary appreciation of the data reports that educators claimed they are skilled in Indicator no. 9- 'Share learning resources with other teachers' (M-4.03, SD- 0.577) Indicator no. 7-

'Use different strategies for different learning situations' (M-4.02, SD- 0.595); Indicator No 1- 'Have knowledge of the content' (M- 4.01, SD- 0.595). Educators also admitted that they are skilled in all other indicators under this category.





As to the educators' competencies, they claimed that they have competencies in Indicator no. 1- 'Have knowledge of the content' (M- 4.10, SD- 0.564); Indicator No 9- 'Share learning resources with other teachers' (M-4.08, SD- 0.524); Indicator no 2- 'Select the appropriate digital technology to match the content and learning outcome' (M- 4.07, SD- 0.57); Indicator no. 6- 'Identify quality and valid learning materials for learners to access' (M-4.07, SD- 0.578). All other indicators were reported by educators that they have competencies.

**Table 6. Educators' Skills and Competencies on the Re-mix**

Indicators	Skills			Competencies		
	Mean	S. D.	V. I.	Mean	S. D.	V. I.
1. Select appropriate digital learning resources to maximize learning.	3.94	0.588	S	4.01	0.550	C
2. Access appropriate open education resources to integrate into the curriculum.	3.93	0.569	S	4.00	0.540	C
3. Modify the learning resources to align with the learning outcome.	4.00	0.577	S	4.04	0.514	C
4. Re- mix open education resources to meet the needs of individual learners.	3.92	0.589	S	3.99	0.500	C
5. Assess the quality of open education resources.	3.94	0.605	S	4.05	0.533	C
<i>Overall Mean</i>	<i>3.95</i>	<i>Skilled</i>		<i>4.02</i>	<i>Competent</i>	

Table 6 showcase the educators' skills and competencies on the re-mix of learning resources.

There are many kinds of AT that help kids with learning and attention issues. These tools can help them work around their challenges while playing to their strengths. This helps them become more successful, productive students. At the same time, their confidence and independence can grow.

**Table 7. Educators' Skills and Competencies on Communication.**

Indicators	Skills			Competencies		
	Mean	S. D.	V. I.	Mean	S. D.	V. I.
1. Communicate at the level of the learners.	4.21	0.558	HS	4.26	0.547	HC
2. Use appropriate non – verbal communication when interacting with the learners using two – way video and text.	4.08	0.577	S	4.18	0.562	C
3. Model good digital citizenship when using social media to communicate with learners and peers.	4.17	0.607	S	4.21	0.579	HC
4. Communicate in the language of the learners.	4.17	0.635	S	4.23	0.552	HC
<i>Overall Mean</i>	<i>4.16</i>	<i>Skilled</i>		<i>4.22</i>	<i>Highly Competent</i>	

Table 7 showcases the educators' skills and competencies on communication. As observed, there are only 4 indicators in communication.

Of the four indicators, only Indicator 1- 'Communicate at the level of the learners' earned (M- 4.21, Sd-0.558) the highest mean which has an interpretation of 'highly skilled'. All other three means though registered varied means are interpreted as skilled. This finding means that educators are doing their responsibility as educators since they are really expected to communicate at the level of the learners to maximize and achieve positive learning outcomes.

On the area of competencies, three of the four indicators earned means with verbal interpretation of highly competent, namely: Indicator 1 – 'Communicate at the level of the learners' (M-4.26, SD- 0.547); Indicator no 4 – 'Communicate in the language of the learners' (M- 4.23, SD- 0.552); Indicator No. 3- 'Model good digital citizenship when using social media to communicate with learners and peers' (M- 4.21, SD- 0.579). The other indicator was considered by educators that they are competent.

Based on the over-all mean of skills (M- 4.16) and competencies (M- 4.22) interpreted as skilled and highly competent respectively, it can be deduced that educators are skilled in communication and highly competent communicators.

Therefore, education should be turned to a life-long activity and should be restructured by taking into account the technological developments and adjustment to the globalizing world (Buyukbaykal, 2018).

The preceding idea is emphasized by Ally (2019) who reiterated that an important area of teachers' responsibilities is communicating with learners using digital technology.





**Table 8. Educators' Skills and Competencies on Facilitating Learning.**

Indicators	Skills			Competencies		
	Mean	S. D.	V. I.	Mean	S. D.	V. I.
1. Personalize the learning for individual learners.	4.08	0.549	S	4.12	0.551	C
2. Respond to learners' questions in a timely manner.	4.21	0.570	HS	4.24	0.566	HC
3. Ability to change strategies when supporting the learner to meet the learner needs	4.11	0.572	S	4.18	0.571	C
4. Respect different learner types and adapt to the learner.	4.24	0.573	HS	4.31	0.591	HC
5. Encourage creativity.	4.25	0.578	HS	4.25	0.562	HC
6. Encourage innovation.	4.26	0.600	HS	4.26	0.557	HC
7. Be a good listener.	4.33	0.606	HS	4.34	0.582	HC
8. Promote appropriate feedbacks.	4.25	0.598	HS	4.26	0.547	HC
9. Show enthusiasm about the learning materials.	4.29	0.558	HS	4.26	0.557	HC
10. Model working in the digital age.	4.11	0.581	S	4.16	0.568	C
11. Motivate learners to learn.	4.36	0.588	HS	4.33	0.597	HC
12. Encourage social interaction between learners.	4.30	0.562	HS	4.26	0.557	HC
13. I have the ability to formulate good questions when interacting with learners.	4.20	0.561	HS	4.21	0.541	HC
14. I model good virtual behavior.	4.30	0.580	HS	4.25	0.578	HC
15. I am approachable.	4.37	0.616	HS	4.38	0.575	HC
16. I promote and model virtual citizenship and responsibility.	4.32	0.578	HS	4.25	0.571	HC
17. I encourage authentic learning.	4.29	0.567	HS	4.22	0.547	HC
18. I inspire learners.	4.35	0.576	HS	4.30	0.578	HC
19. I create a comfortable learning atmosphere.	4.33	0.572	HS	4.27	0.577	HC
20. I provide feedback to individual learners to meet their individual needs.	4.30	0.569	HS	4.23	0.559	HC
21. I interpret learners' dashboard to monitor each learner's performance.	4.13	0.611	S	4.15	0.607	C
22. I interpret learners' question.	4.22	0.556	HS	4.19	0.540	C
23. I solve learners' problems.	4.11	0.575	S	4.13	0.552	C
24. I provide support to learners who are on the go.	4.23	0.595	HS	4.18	0.568	C
25. I act as a coach for learners.	4.30	0.569	HS	4.24	0.573	HC
26. I act as a mentor for learners.	4.30	0.569	HS	4.25	0.598	HC
27. I support learners using digital technology.	4.15	0.568	S	4.13	0.571	C
28. I am an expert in the content to help learners who will be at different points in the learning process.	4.06	0.565	S	4.13	0.561	C

Initial observation of the data in Table 8, suggest that of the 29 indicators, the respondents registered 22 indicators reported were highly skilled and only 7 indicators where the respondents claimed they were skilled. The top 5 indicators respondents claimed they are highly skilled were: Indicator no. 15 – 'I am approachable' (M- 4.37, Sd-0.616); Indicator no. 11- 'Motivate learners to learn' (M-4.36, SD- 0.588); Indicator no.18-'I inspire learners' (M-4.35, SD- 0.576); Indicator no. 7- 'Be a good listener'(M-4.33, SD- 0.606); Indicator no 19 – 'I create a comfortable learning atmosphere'(M-4.33, SD- 0.372). The top 3 indicators that were reported by respondents that they are skilled are: Indicator no 27- 'I support learners using digital technology' (M-4.15, SD-m0.568); Indicator no. 21-'I interpret learner's dashboard to monitor each learner's performance' (M-4.13, SD- 0.611); Indicator No 23-'I solve learners' problem' (M-4.11, SD- 0.575).

On competencies, it was reported that educators do have 19 indicators where they reported to be highly competent

and 10 indicators where they are competent. The top five indicators where the respondent claimed to be very competent are: Indicator no. 15 –'I am approachable' (M-4.38, SD- 0.575). It can be observed that this is also the indicator in the skills where the respondents got highest mean. This consistency of admission is a manifestation that teachers should really be approachable so that students will not feel threatened every time they want to seek assistance from their teachers. Perhaps, this is the most important character that every teacher should possess.

The next indicator which gained second highest mean is Indicator no. 7- 'Be a good listener' (M-4.34, SD-0.582); Indicator No 11- Indicator no. 11- 'Motivate learners to learn' (M-4.33, SD- 0.597); Indicator no. 4- 'Respect different learner types and adapt to the learner' (M-4.31, SD- 0.591); Indicator no 18- 'I inspire learners' (M-4.30, SD- 0.578).

The top 5 competencies indicators which were reported by respondents that they are competent are: Indicator no 22- 'I interpret learners' questions' (M-4.19, SD-0.540); Indicator no. 3- 'Ability to change strategies when supporting the learners to meet the learning needs' (M-4.18, SD- 0.671); Indicator No 10- 'Model working in the digital age' (M-4.16, SD-0.568); Indicator no 21- 'I interpret learners' dashboard to monitor each learners performance' (M-4.15, SD-0.607); Indicator no. 23- 'I solve learners problems' (M- 4.13, SD- 0.552).

With the preceding data, the overall mean under the area of skills is 4.24 verbally interpreted as highly skilled and the over-all mean under competencies is 4.23 verbally interpreted as highly competent. Collectively, it can be concluded that the educator – respondents are doing their most important responsibility to their students. This finding is supported a vivid idea that teacher's main role is as a facilitator – there to offer support and advice when needed, and to provide the necessary scaffolding and teaching of skills when necessary. It is vital that teachers remember to teach and instruct their students in any particular skill.

This is further supported by Ally (2019) who emphasized that the preceding results are an indication that a major role of the digital teacher is as a facilitator of learning. In the digital era, learners will be learning virtually when there is physical separation of the digital teacher and the learners.

Preliminary observation of the data in Table 9, suggest that the 12 indicators were rated variedly by the respondents. But despite its varied means, its verbal interpretation showed similarity except on 2 indicators, namely Indicator no 9 – 'I encourage learners during the learning process'(M-4.20, SD- 0.523); Indicator no. 12-'I encourage learners to learn independently' (M- 4.20, SD-0.526).

In the case of competencies, the respondents also showed varied ways of perceiving their competencies. But despite varied means, it also shares similar interpretation except on two indicators which was initially identified under the column of skills.



**Table 9. Educators' Skills and Competencies on Pedagogical Strategies.**

Indicators	Skills			Competencies		
	Mean	S. D.	V. I.	Mean	S. D.	V. I.
1. I use appropriate pedagogical approach.	4.04	0.529	S	4.18	0.524	C
2. I use appropriate learning theories to develop learning strategies to maximize learning.	4.06	0.561	S	4.15	0.524	C
3. I offer choices and multiple options for presenting concepts through resources and support options.	4.11	0.547	S	4.17	0.524	C
4. I prescribe learning activities for individual learners.	4.13	0.539	S	4.13	0.509	C
5. I use appropriate collaborative on-line learning framework to encourage interaction between learners and between the teacher and the learners.	4.08	0.612	S	4.11	0.553	C
6. I suggest remedial activities to help learners who need them.	4.16	0.540	S	4.18	0.540	C
7. I use a variety of learning strategies to develop high level knowledge and skills.	4.15	0.559	S	4.16	0.540	C
8. I use interactive strategies such as serious games and simulations to motivate learners.	4.09	0.561	S	4.16	0.568	C
9. I encourage learners during the learning process.	4.20	0.523	HS	4.23	0.552	HC
10. I suggest additional learning activities for learners who need them.	4.16	0.530	S	4.19	0.527	C
11. I use problem- based learning to encourage high level learning.	4.14	0.546	S	4.17	0.527	C
12. I encourage learners to learn independently	4.20	0.526	HS	4.23	0.543	HC
<b>Overall Mean</b>	<b>4.13</b>	<b>Skilled</b>		<b>4.17</b>	<b>Competent</b>	

Table 9 summarizes the educators' skills and competencies on pedagogical strategies.

This finding is supported by Ally (2019) who stressed that teachers have to use appropriate pedagogical strategies to allow students to achieve the learning outcomes.

In the case of competencies, the respondents also showed varied ways of perceiving their competencies. But despite varied means, it also shares similar interpretation except on two indicators which was initially identified under the column of skills. These are: Indicator no 9 – 'I encourage learners during the learning process' (M-4.23, SD-0.552); Indicator no. 12- 'I encourage learners to learn independently' (M- 4.23, SD-0.543).

The over-all mean under skills is 4.13 and under competencies is 4.17 both have interpretation of highly skilled and highly competent respectively. This simply confirms the previous findings that majority of the educator- respondent have been in service for 10 years or more. This proved that they are experienced and knowledgeable on their craft. Thus, they are highly skilled and highly competent in their used of pedagogic strategies.

Table 10 summarizes the educators' skills and competencies on assessment of learning.

As illustrated in Table 10 next page the 4 indicators characterizing the assessment of learning practiced by educators in the classroom manifest variety of perceiving the educators assessing practices. Only 1 of the four indicators of assessment skills was reported that educators were highly skilled.

Indicator no 2 – 'I use assessment strategies to measure the learners' performance' (M-4.20, SD- 0.545). All other indicators were reported with means whose verbal interpretation is skilled.

On competencies, there are three indicators which

earned means with verbal interpretation of highly competent, namely: Indicator no 4 – 'I provide feedback to learners' (M-4.26, SD-0.545); Indicator No 1- 'I select assessment strategies to meet the learning outcomes' (M- 4.25, SD- 0.559); Indicator no 2- 'I use assessment strategies to measure the learners performance' (M- 4.24, SD- 0.555).

The other indicator was reported by the respondents that they are also competent in doing it. Over-all mean of skills earned a mean of 4.15 and competencies registered a mean of 4.22 which are verbally interpreted as skilled and highly competent respectively. This finding means that educators are skilled in using assessment tools in assessing students' learning and are highly competent in its implementation.

**Table 10. Level of Educators' Skills and Competencies on Assessment of Learning.**

Indicators	Skills			Competencies		
	Mean	S. D.	V. I.	Mean	S. D.	V. I.
1. I select assessment strategies to meet the learning outcome.	4.17	0.537	S	4.25	0.559	HC
2. I use assessment strategies to measure the learner's performance.	4.20	0.545	HS	4.24	0.555	HC
3. I use virtual assessment strategies to assess performance.	4.03	0.608	S	4.12	0.608	C
4. I provide feedback to learners.	4.19	0.530	S	4.26	0.545	HC
<b>Overall Mean</b>	<b>4.15</b>	<b>Skilled</b>		<b>4.22</b>	<b>Highly Competent</b>	

This is emphasized by Ally (2019) who subscribe to the idea that teachers must provide feedback to learners and assess learner's performance using appropriate assessment strategies. The assessment must be authentic to improve learner's performance and it allows learners to receive academic credit on the lesson or courses they would complete.

The same belief was reiterated by Conrad and Openo (2018) who encourage the teachers to adopt authentic assessment so that the students are properly guided on what area to improve, which one skill needs to be sustained in order to direct the student's effort and maximize its resources to achieve the target outcome.

Table 11 highlights the educators' skills and competencies on personal characteristics.

There are 15 indicators on personal characteristics. As manifested in Table 11, the respondents have varied perceptions about their personal characteristics as shown by the mean in each indicator. Educators reported that they are highly skilled in 14 indicators. Only in Indicator 9 - 'I think digitally' (M-4.13, SD-0.533) where the educator- respondents claimed they are skilled. As regard their competencies, the same numbers of indicators were reported by the educators that they are highly competence except in Indicator 9 – I think digitally (M- 4.18, SD 0.534) which they reported that they are competent. This finding is in consonance with the thoughts forwarded by Ally (2019) who said that a digital teacher should have personal characteristics to be a



good role model, provide quality education and support to learners' inability to think digitally which maybe brought about limited resources either at home or in the workplace.

Indicators	Skills			Competencies		
	Mean	S. D.	V. I.	Mean	S. D.	V. I.
1. I am socially responsible for the use of resources and also environmental friendly.	4.27	0.540	HS	4.33	0.561	HC
2. I am a good role model for learners.	4.29	0.585	HS	4.31	0.554	HC
3. I work in virtual teams to share information with other teachers.	4.20	0.545	HS	4.21	0.579	HC
4. I accept innovation in the learning system.	4.32	0.569	HS	4.25	0.552	HC
5. I show enthusiasm virtually.	4.26	0.555	HS	4.27	0.552	HC
6. I am a lifelong learner.	4.38	0.556	HS	4.33	0.553	HC
7. I keep learners' information confidential.	4.37	0.609	HS	4.36	0.570	HC
8. I consider privacy issues and keep learners' information.	4.37	0.563	HS	4.34	0.566	HC
9. I think digitally.	4.13	0.533	S	4.18	0.534	C
10. I am open – minded.	4.35	0.559	HS	4.33	0.561	HC
11. I am sensitive to learners' individual differences.	4.36	0.553	HS	4.33	0.570	HC
12. I use good social skills when working virtually.	4.23	0.540	HS	4.27	0.568	HC
13. I am flexible and adaptable in the modern digital age.	4.22	0.575	HS	4.21	0.585	HC
14. I show	4.28	0.535	HS	4.28	0.554	HC

empathy by maintaining humanity virtually.						
15. I model good virtual behavior.	4.31	0.537	HS	4.30	0.587	HC
<b>Overall Mean</b>	<b>4.29 Highly Skilled</b>			<b>4.29 Highly Competent</b>		

The basis of the performance of the basic education educators is the IPCRF results. It comprises ratings for content knowledge and pedagogy learning environment, curriculum and planning, assessment and reporting, and plus factor.

Table 12 summarizes the educators' performance based on the IPCRF.

Majority of the educators got very satisfactory ratings for content knowledge and pedagogy (89.64%), learning environment (91.71%), curriculum and planning (91.19%), assessment and reporting (91.19%), and plus-factor (92.23%). Only few of the educators got outstanding ratings for these areas. Looking at their over-all performance rating, 178 of the educators got very satisfactory rating (92.23%) and 15 of them got outstanding rating (7.77%).

**Table 12. Basic Education Educators' Performance based on IPCRF**

Performance	Outstanding		Very Satisfactory	
	f	%	F	%
Content knowledge and pedagogy	20	10.36%	173	89.64%
Learning environment	16	8.29%	177	91.71%
Curriculum and planning	17	8.81%	176	91.19%
Assessment and reporting	17	8.81%	176	91.19%
Plus-factor	15	7.77%	178	92.23%
Overall Rating	15	7.77%	178	92.23%

This means that the educators were able to perform their major task as facilitator of learning and other related roles and responsibilities assigned to them as educators. Thus, they got very satisfactory rating. On the other hand, those with outstanding rating excel in all aspects of the educative process and other auxiliary functions assigned to them which only few can assume the roles brought about by some factors that can limit or spur one's capability.

The present study determined the correlation between the educators' performance and their perceived knowledge, skill, and competencies in the technological advancement in education. It was found that there is a very strong correlation between the educators' performance and their skill in facilitating learning ( $r=0.916$ ). The correlation is significant at a p-value of 0.000.



This means that as the educators' skill in facilitating learning increases their performance rating also increases.

Table 13 summarizes the relationship between educators' performance and their perceived knowledge, skills and competencies for the fourth Industrial Revolution.

**Table 13. Relationship between Educators' Performance and their Knowledge, Skills and Competencies.**

Knowledge, Skills and Competencies	r-value	p-value	Degree of correlation	Analysis
Forces that shape education	0.371	0.000	Weak	<i>Significant</i>
Trends in education	0.501	0.000	Moderate	<i>Significant</i>
General Qualities	0.699	0.000	Strong	<i>Significant</i>
Use of digital learning resources	0.603	0.000	Strong	<i>Significant</i>
Development of digital learning resources	0.601	0.000	Strong	<i>Significant</i>
Re-mix of learning resources	0.623	0.000	Strong	<i>Significant</i>
Communication	0.718	0.000	Strong	<i>Significant</i>
Facilitating learning	0.916	0.000	Very strong	<i>Significant</i>
Pedagogical strategies	0.737	0.000	Strong	<i>Significant</i>
Assessment of learning	0.663	0.000	Strong	<i>Significant</i>
Personal characteristics	0.719	0.000	Strong	<i>Significant</i>

## 6. CONCLUSION

Based on the summary of findings presented above, the conclusion is hereby drawn: There is significant relationship established between basic education educators' knowledge, skills, and competencies for the fourth Industrial Revolution and their performance based on the IPCRF. Therefore, the null hypothesis is rejected.

## 7. RECOMMENDATION

Based on the foregoing findings and conclusions, the following recommendations are respectfully endorsed:

1. The competency profile of basic education educators may guide and assist educational leaders on what areas of will be organized to equip the educators further to render them fit to the demands of the Fourth Industrial Revolution.

2. There is a need to conduct further studies on the challenges brought by the Fourth Industrial Revolution to gain clearer and in – depth knowledge on how to prepare educational systems especially in the developing world like the Philippines.
3. The Fourth Industrial Revolution should be reviewed thoroughly especially the issues and challenges accompanying it so that the education sector could also plan relevant programs to equip its educators in carrying out changes necessary for the changing time.
4. Teachers, without bias and prejudice may be given enhancement seminars and workshops by inviting resource speakers who are well informed about the Fourth Industrial Revolution to clarify its impact on the educational system and may provide ways and means of educating teachers to fit the demand of the era.
5. Administrators and teachers are encouraged to work together through proper consultation with one another and agree on priorities, and emphasis should be on the pedagogy by means of the latest technological stretching-the-mold approach in order to enhance further the learning of the complicated applications in making instructional delivery mechanisms effective.
6. Administrators' and teachers' excellent and very satisfactory performance ratings may be further reviewed and move to authentic assessment of teachers to generate real state of Philippine educational system so that when time comes that artificial intelligence will be implemented there is less problem than anticipated.
7. The future researcher may include a wider scope of study particularly the number of respondents and maybe in another level of education to ascertain how prepared are our schools in embracing the tasks embedded in the Fourth Industrial Revolution (Education 4.0),
8. Trainers of teachers must stay abreast of emerging technologies particularly the future of Artificial Intelligence (AI), robotics and internet of things. Future researchers should consider and determine the role of the human teacher in relation to the robotic teacher.

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