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LEVEL OF AWARENESS AND PREPAREDNESS OF SCIENCE TEACHERS IN FIFTH INDUSTRIAL REVOLUTION

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ABSTRACT

This study examined the level of awareness and preparedness of science teachers at Calasiao II District, Schools Division Office I Pangasinan regarding the Fifth Industrial Revolution during the school year 2023-2024. It specifically sought to determine the profile of science teachers in terms of age, highest educational attainment, and length of service; assessed their awareness and preparedness in using technology in teaching, improving teaching opportunities, and adapting to lifelong learning; explored the relationship between awareness and preparedness levels and profile variables; and proposed a training design to enhance readiness for the Fifth Industrial Revolution. A descriptive-correlational research design was employed, with data gathered through a structured questionnaire administered to 17 science teachers. Results revealed that respondents were highly aware of the Fifth Industrial Revolution, particularly in integrating technology in teaching and sharpening complex problem-solving skills. However, gaps were identified, such as limited awareness in communicating through IR 5.0 technologies. The level of preparedness showed alignment with awareness but highlighted areas needing improvement, particularly in adapting to innovative educational practices. Significant weak negative correlations were observed between age and adapting to lifelong learning, and between length of service and dimensions of awareness, suggesting that older and more tenured teachers experienced challenges in engaging with revolutionary practices. Educational attainment had no significant influence on awareness levels. The findings emphasized the need for targeted professional development programs focusing on hybrid innovations, lifelong learning strategies, and technological integration to prepare teachers for the demands of the Fifth Industrial Revolution, ensuring the alignment of education with emerging global standards.

Keywords*: Awareness, Fifth Industrial Revolution, Preparedness, Professional Development, Technology Integration*

INTRODUCTION

The Fifth Industrial Revolution (5IR) builds on the technological advances of the Fourth Industrial Revolution, emphasizing a human-centered approach to innovation. Unlike its predecessor, which prioritized automation and digital transformation, 5IR focuses on harmonizing technological advancements such as artificial intelligence, robotics, and big data with human well-being, ethical responsibility, and sustainable development. In the context of education, 5IR integrates intelligent systems that blend physical, digital, and biological realms, requiring transformative changes in how students learn, teachers teach, and educational institutions prepare future generations. This shift demands educators to adopt new pedagogies, develop interdisciplinary competencies, and foster creativity and critical thinking to equip learners for the challenges of a rapidly evolving world.

Despite the advancement in technology innovations, the education sector has been reluctant in accepting technology to facilitate teaching and learning, although the use of robots in education, particularly in teaching science, technology, engineering, and mathematics (STEM) subjects, has been around since the 1980s (Tymon, 2020). Moreover, the use of technology has been predominantly limited to a didactic approach of teaching and learning, whereby teaching is facilitated with the use of a personal computer and the provision of electronic teaching materials. However, the use of digital technology underpinning 5IR is beyond the use of computer and e-materials and should be compatible with the learner-centered approach for it to be effective in enhancing students learning experience.

The Fifth Industrial Revolution (5IR) builds on the technological advances of the Fourth Industrial Revolution, integrating automation, artificial intelligence, and digital connectivity with a human-centered focus. Characterized by collaboration between humans and advanced technologies, 5IR aims to enhance economic productivity, drive social change, and improve overall human wellbeing through a harmonized approach to innovation and ethical responsibility (Brougham & Haar, 2018). While the Fourth Industrial Revolution emphasized automation, 5IR shifts attention to personalized, human-centric, and sustainable approaches to technological progress. In education, particularly in science teaching, 5IR presents unique challenges and opportunities that require teachers to adopt new skills, pedagogies, and attitudes to prepare students for the demands of this emerging era. The Fifth Industrial Revolution will dramatically change the way people relate to one another, live, work, and educate children. These shifts are enabled by smart technologies, including artificial intelligence, big data, augmented reality, block chain, the Internet of Things, and automation. These technologies are disrupting every industry across the world at unprecedented speed. For children to be prepared to engage in a world alongside smart machines, they will need to be educated differently than in the past (Marr, 2021). For instance, the advent of technology innovations with the application of smart devices for various uses, such as social media, may reduce face-to-face social interactions (Liu & Stephen, 2020; Saini & Abraham, 2020), and could affect the acquisition of relevant skills (Oke, et. al. 2020). Consequently, 5IR will introduce a drastic decline in demand for many jobs, including those that require manual skills and physical abilities, due to automation with the digitalization of operations process. Throughout time the purpose of education has evolved based on the needs of society during that period. It's no different during this transition. Currently, education serves to prepare people to take on the tasks of a job or discipline to "do" something. As this generation moves farther into the future, education will need to support children to develop the skillset and mindset to do anything in their future (Marr, 2021).

For this matter, teachers are called to be vigilant and to be ever ready to take actions now, to change the way schools handle education, skills, and value development, as well as the way educators work with each other. Ideally, schools must take an active role in developing human resource. Thus, for this study, teachers' level of awareness to the 5IR is a vital concern being considered.

Furthermore, in a digital world, teachers of the future will need to have a global mindset or international mindfulness. Schools and educators must adapt learning to take this into account. For example, history might not be taught from the perspective of one country but rather with examples from around the world; and instead of teaching the same languages that have always been taught, schools should look at international demand and the languages of emerging markets (Marr, 2021). This will also impact how earlier education levels will need to modify their preparatory classes. For example, it is essential that the seeds for this type of learning are set in schools by offering students the opportunity to learn topics beyond their core curriculum and develop a love for learning.

In addition, the teacher's thinking and teaching must be out of the old way of thinking, first and foremost, the teacher must influence students' critical thinking and learning style. The value of the teacher is not lecture but a guide, catalyst to help students to orient themselves in learning. The role of teachers shifted to a new and broader definition to meet the needs of the learning community. In short, the teacher in the 5.0 revolution needs to understand that change is vital and must be accepted and he/she must be prepared for development.

In summary, the findings of this study may provide valuable insights and directions for future initiatives in professional development, focusing on the preparedness and adaptability of science teachers in the context of the Fifth Industrial Revolution. These findings can be utilized to design targeted training programs and workshops aimed at equipping educators with the necessary skills to integrate advanced technologies into their teaching practices effectively. The increasing relevance of digital tools and intelligent systems in education underscores the need for comprehensive professional development programs that address technological integration, innovative pedagogy, and curriculum adaptation. Consequently, this study will serve as a foundation for enhancing science teachers' competencies in leveraging emerging technologies to foster student engagement and learning outcomes. It investigated teachers' level of awareness and preparedness concerning 5IR in terms of pedagogy, curriculum design, technological competence, and fostering critical and creative thinking. By examining these aspects within the educational setting of Calasiao II District, Schools Division Office I Pangasinan, this research aimed to identify areas for growth and provide actionable recommendations for aligning educational practices with the demands of a digitally driven future. Furthermore, the study aspired to contribute to the broader discourse on the role of educators in shaping a technology-enriched learning environment while addressing global challenges and opportunities brought about by the Fifth Industrial Revolution.

Research Questions

This study focused on assessing the level of awareness of science teachers in the Calasiao II District, Schools Division Office I Pangasinan and their preparedness for the Fifth Industrial Revolution during the school year 2023-2024.

Specifically, it sought to answer the following questions:

1. What was the profile of science teachers in terms of:
   a. age;
   b. highest educational attainment; and
   c. length of service?
2. What is the level of awareness and preparedness for the Fifth Industrial Revolution as applied in the field of education, as perceived by the respondents, in terms of:
   a. using technology in teaching;
   b. increasing opportunities for improving teaching; and
   c. adapting to lifelong learning?
3. What significant relationship exist between the level of awareness and level of preparedness for the Fifth Industrial Revolution and the profile variables?
4. What training design can be proposed to prepare the Science Teachers for the Fifth Industrial Revolution?

METHODOLOGY

Presented in this section are the sampling and data collection to be utilized in the study.

Sampling

The population for the study was composed of 17 science teachers, 7 males and 10 females, in Junior High School and Senior High School at Calasiao II District, Schools Division Office I Pangasinan. The researcher employed the total enumeration sampling technique to select the participants, ensuring that all science teachers within the identified population were included in the study. This method was chosen due to the manageable size of the population and the necessity of obtaining comprehensive data from all members of the group.

Data Collection

The researcher systematically conducted the study following the validation of the research questionnaire. The process began with the design and validation of the research instrument. The main tool of the study was a questionnaire, crafted with indicators derived from readings and studies on the Fifth Industrial Revolution. To ensure its reliability and relevance, the questionnaire underwent content validation by five experts, consisting of two Master Teachers, one Head Teacher in Science, and two School Heads. Suggestions from the validators were carefully considered and incorporated into the final instrument.

RESULTS

Table 1
Profile of Science Teachers
(N=17)

Profile	Category	Frequency	Percentage
Age (years)	26	1	5.88%
	27	1	5.88%
	28	1	5.88%
	31	3	17.65%
	33	1	5.88%
	36	4	23.53%
	37	1	5.88%
	40	1	5.88%
	41	1	5.88%
	42	1	5.88%
	46	1	5.88%
	55	1	5.88%
	Total	**17**	**100.00%**
Highest Educational Attainment	PhD	5	29.41%
	MEd	9	52.94%
	BSEd	3	17.65%
	Total	**17**	**100.00%**
Length of Service (years)	1	1	5.88%
	5	2	11.76%
	6	3	17.65%
	7	1	5.88%
	8	2	11.76%

9	4	23.53%
10	2	11.76%
11	1	5.88%
15	1	5.88%
Total	**17**	**100.00%**

Table 2.1
Level of Awareness on the Fifth Industrial Revolution along Using Technology in Teaching
(N=17)

Indicators	Mean	Descriptive Equivalent
1. Include the mass infiltration of a more user-generated internet	3.23	MA
2. Own access to information, the option to learn virtually, and platforms to easily connect with faculty and other students	3.18	MA
3. Have own direct connection to a variety of different information sources	3.18	MA
4. Focus on smart technology	3.22	MA
5. Use of blended learning, BYOD (Bring Your Own Device) and flipped classrooms	3.15	MA
6. Communicate with contacts using IR 5.0 technology	1.75	NA
Average Weighted Mean	***2.95***	***MA***

Legend:

Range	**Descriptive**	**Equivalent**
3.28 – 4.00	Very Much Aware	(VMA)
2.52 – 3.27	Much Aware	(MA)
1.76 – 2.51	Slightly Aware	(SA)
1.00 – 1.75	Not Aware	(NA)

Table 2.2
Level of Awareness on the Fifth Industrial Revolution along Increasing Opportunities on Improving Teaching
(N=17)

Indicators	Mean	Descriptive Equivalent
1. Choose a curriculum which is internationally transferable is a key aspect of the globally mobile lifestyle as it enables a smooth transition from one country to the next	3.16	MA

2. Prepare learners for jobs that have yet to be created through cross curricular learning and transferable skills	3.08	MA
3. Sharpen complex problem-solving skills which is important for IR 5.0	3.29	VMA
4. Able to access and use the Internet	3.42	VMA
5. Expand learner's social networks, and provide a catalyst to build a network of peer groups and linkages to the job market	3.08	MA
6. Include knowledge and application capabilities in computer use, programming languages, and database management	1.75	NA
Average Weighted Mean	***2.96***	***MA***

Legend:

Range	**Descriptive**	**Equivalent**
3.28 – 4.00	Very Much Aware	(VMA)
2.52 – 3.27	Much Aware	(MA)
1.76 – 2.51	Slightly Aware	(SA)
1.00 – 1.75	Not Aware	(NA)

Table 2.3
Level of Awareness on the Fifth Industrial Revolution along Adapting to lifelong learning
(N=17)

Indicators	**Mean**	**Descriptive Equivalent**
1. Teach history not only from the perspective of one country but use examples of historical themes and change from across the world	3.08	MA
2. Encourage the development of a more personalized way of learning where the learner's independence and unique approach to study	3.03	MA
3. Provide more opportunities for students to obtain real-world skills that are relevant to the prospecting job opportunities	3.42	VMA
4. Enable personalized learning for students depending on their capabilities	3.38	VMA
5. Increase the need for "essential human skills" commonly referred to as "soft skills" that include creativity, complex problem solving, relationship building, communication, emotional intelligence, and critical thinking	3.52	VMA

6. Produce graduates who are more knowledgeable, competent and familiar with the technology related to IR 5.0	3.53	VMA
Average Weighted Mean	***3.33***	***VMA***

Legend:

Range	**Descriptive**	**Equivalent**
3.28 – 4.00	Very Much Aware	(VMA)
2.52 – 3.27	Much Aware	(MA)
1.76 – 2.51	Slightly Aware	(SA)
1.00 – 1.75	Not Aware	(NA)

Table 3.1
Relationship between the Level of Awareness on the Fifth Industrial Revolution and the Profile Variables
(N=17)

Profile Variable	Level of Awareness	Value	p-value	Interpretation
Age	Using Technology in Teaching	-0.18	0.12	Weak Negative, Not Significant
	Increasing Opportunities on Improving Teaching	-0.25	0.07	Weak Negative, Not Significant
	Adapting to Lifelong Learning	-0.28	0.03*	Weak Negative, Significant
	Length of Service	-0.28	0.03*	Weak Negative, Significant
Highest Educational Attainment	Using Technology in Teaching	0.12	0.15	Very Weak Positive, Not Significant
	Increasing Opportunities on Improving Teaching	0.08	0.2	Very Weak Positive, Not Significant
	Adapting to Lifelong Learning	0.15	0.1	Very Weak Positive, Not Significant
Length of Service	Using Technology in Teaching	-0.21	0.05*	Weak Negative, Significant
	Increasing Opportunities on Improving Teaching	-0.23	0.04*	Weak Negative, Significant
	Adapting to Lifelong Learning	-0.27	0.03*	Weak Negative, Significant

Table 3.2
Level of Preparedness on the Fifth Industrial Revolution as it is Applied in the Field of Education along Using technology in Teaching
(N=17)

Indicators	Mean	Descriptive Equivalent
1. Include the mass infiltration of a more user- generated internet	3.32	VMP
2. Own access to information, the option to learn virtually, and platforms to easily connect with faculty and other students	3.08	MP
3. Have own direct connection to a variety of different information sources	3.32	VMP
4. Focus on smart technology	3.30	VMP
5. Use of blended learning, BYOD (Bring Your Own Device) and flipped classrooms	1.75	NP
6. Communicate with contacts using IR 5.0 technology	2.02	SP
Average Weighted Mean	**2.80**	**MP**

Legend:

Range	**Descriptive**	**Equivalent**
3.28 – 4.00	Very Much Prepared	(VMP)
2.52 – 3.27	Much Prepared	(MP)
1.76 – 2.51	Slightly Prepared	(SP)
1.00 – 1.75	Not Prepared	(NP)

Table 3.3
Level of Preparedness on the Fifth Industrial Revolution along Increasing opportunities on improving teaching
(N=17)

Indicators	Mean	Descriptive Equivalent
1. Choose a curriculum which is internationally transferable is a key aspect of the globally mobile lifestyle as it enables a smooth transition from one country to the next	2.53	MP
2. Prepare learners for jobs that have yet to be created through cross curricular learning and transferable skills	2.31	SP

3. Sharpen complex problem-solving skills which is important for IR5.0	3.02	MP
4. Able to access and use the Internet	3.02	MP
5. Expand learner's social networks, and provide a catalyst to build a network of peer groups and linkages to the job market	2.54	MP
6. Include knowledge and application capabilities in computer use, programming languages, and database management	2.12	SP
Average Weighted Mean	**2.59**	**MP**

Legend:

Range	**Descriptive**	**Equivalent**
3.28 – 4.00	Very Much Prepared	(VMP)
2.52 – 3.27	Much Prepared	(MP)
1.76 – 2.51	Slightly Prepared	(SP)
1.00 – 1.75	Not Prepared	(NP)

Table 3.4
Level of Technological Competence of Secondary School Principals in Terms of Instructional Leadership
(N=17)

Indicators	Mean	Descriptive Equivalent
1. Teach history not only from the perspective of one country but use examples of historical themes and change from across the world	2.13	SP
2. Encourage the development of a more personalized way of learning where the learner's independence and unique approach to study	2.33	SP
3. Provide more opportunities for students to obtain real-world skills that are relevant to the prospecting job opportunities	2.42	SP
4. Enable personalized learning for students depending on their capabilities	2.38	SP
5. Increase the need for "essential human skills" commonly referred to as "soft skills" that include creativity, complex problem solving, relationship building, communication, emotional intelligence, and critical thinking	2.52	MP

6. Produce graduates who are more knowledgeable, competent and familiar with the technology related to IR 5.0	3.02	MP
Average Weighted Mean	**2.47**	**SP**

Legend:

Range	**Descriptive**	**Equivalent**
3.28 – 4.00	Very Much Prepared	(VMP)
2.52 – 3.27	Much Prepared	(MP)
1.76 – 2.51	Slightly Prepared	(SP)
1.00 – 1.75	Not Prepared	(NP)

Table 3.5
Relationship between the Level of Preparedness on the Fifth Industrial Revolution and the Profile Variables
(N=17)

Profile Variable	Level of Preparedness	Value	p-value	Interpretation
Age	Using Technology in Teaching	-0.16	0.14	Weak Negative, Not Significant
	Increasing Opportunities on Improving Teaching	-0.12	0.18	Very Weak Negative, Not Significant
	Adapting to Lifelong Learning	-0.2	0.09	Weak Negative, Not Significant
	Length of Service	-0.28	0.03*	Weak Negative, Significant
Highest Educational Attainment	Using Technology in Teaching	0.09	0.2	Very Weak Positive, Not Significant
	Increasing Opportunities on Improving Teaching	0.06	0.27	Very Weak Positive, Not Significant
	Adapting to Lifelong Learning	0.15	0.11	Very Weak Positive, Not Significant
Length of Service	Using Technology in Teaching	-0.21	0.05*	Weak Negative, Significant
	Increasing Opportunities on Improving Teaching	-0.25	0.04*	Weak Negative, Significant

	Adapting to Lifelong Learning	-0.27	0.03*	Weak Negative, Significant

DISCUSSION

The profile of the science teachers includes age, highest educational attainment and length of service is shown in Table 1. These factors provide essential context for understanding their potential influence on their level of awareness and preparedness for the Fifth Industrial Revolution,

The data indicate a diverse age distribution among the science teachers, with the majority clustered within the early-to-mid career stage. Notably, teachers aged 31 to 36 years constitute the largest proportion (41.18%), suggesting that most are relatively young yet already gaining substantial professional experience. This stage is often associated with a balance of enthusiasm and competence, enabling teachers to effectively adapt to pedagogical innovations, as emphasized by Day and Gu (2010). Meanwhile, the presence of older teachers aged 46 and above (11.76%) reflects institutional diversity, which can promote mentorship and collaborative professional development, consistent with the findings of Ingersoll and Strong (2011).

In terms of educational attainment, the data reveal a strong inclination toward advanced academic qualifications. A majority of the teachers hold graduate degrees, with 52.94% possessing master's degrees and 29.41% holding doctoral degrees. This high level of academic preparation supports the assertion of Darling-Hammond (2017) that advanced education significantly enhances teacher effectiveness and improves student learning outcomes. Conversely, the 17.65% of teachers with only bachelor's degrees may represent early-career educators who could benefit from further professional development and opportunities for graduate studies, particularly in the context of evolving educational demands brought about by the Fifth Industrial Revolution.

Regarding length of service, the majority of respondents (58.82%) have between 6 to 10 years of teaching experience. This aligns with the "consolidation stage" identified by Huberman (1989), where teachers refine their instructional practices and strengthen their pedagogical skills. Additionally, 23.53% of teachers have more than 10 years of service, indicating the presence of experienced educators who contribute to institutional stability and mentorship, as supported by Bickmore and Bickmore (2010). On the other hand, 17.64% of teachers have less than 6 years of experience, representing novice educators who may bring innovative ideas but require structured support systems, as highlighted by Kraft et al. (2018).

The results in Table 2.1 reveal that the respondents are generally much aware, as reflected by an average weighted mean of 2.97. This indicates that teachers possess a relatively strong understanding of how emerging technologies influence instructional practices.

The findings support the study of Ally (2019), who emphasized that various forces are creating an urgent need for the education system to transform in response to rapid technological advancements, including those associated with the Fifth Industrial Revolution. These transformations significantly reshape the role of teachers, requiring them to integrate digital tools and innovative strategies into their teaching.

Among the indicators, the highest level of awareness was observed in the inclusion of a more user-generated internet (mean = 3.23). This suggests that teachers are highly familiar with participatory online platforms. In the context of education, social media and digital platforms enable teachers to access professional development opportunities such as Massive Open Online Courses (MOOCs), which provide flexible, stand-alone online instruction. As noted by Wanli (2015), MOOCs expand access to education and support continuous learning. Furthermore, these platforms have transformed the dissemination of knowledge and professional information in teaching and learning, as highlighted by García-Peñalvo (2018) and Park (2018).

Conversely, the lowest level of awareness was recorded in the indicator related to communicating with contacts using Fifth Industrial Revolution technologies (mean = 1.75), indicating that teachers are less familiar with more advanced or emerging communication tools. This suggests a gap in deeper technological integration. In the context of the Fifth Industrial Revolution, education systems are expected to prioritize both evolutionary and revolutionary innovations. Evolutionary innovations involve improvements to existing technologies, while revolutionary innovations focus on the creation of entirely new technologies. According to Wanli (2015), although hybrid innovation—combining both approaches—is considered ideal, it remains challenging to implement in practice.

Table 2.2 reveals that science teachers are generally much aware of the Fifth Industrial Revolution in terms of improving teaching opportunities, as reflected by an average weighted mean of 2.96. This indicates that respondents perceive themselves as having a substantial understanding of the competencies required in an evolving educational landscape.

Notably, teachers are very much aware of sharpening complex problem-solving skills (mean = 3.29), which is a critical competency in the context of the Fifth Industrial Revolution. This suggests that educators recognize the importance of equipping learners with higher-order thinking skills necessary for future careers. As emphasized by Bhattacharjee and Ray (2017), students must develop readiness skills that enable them to succeed in post-secondary education and transition effectively into career pathways with opportunities for advancement. This underscores the responsibility of both educators and school management to ensure that students are adequately prepared for the demands of the modern workforce.

In addition, teachers are very much aware of accessing and using the Internet (mean = 3.42), indicating strong familiarity with fundamental digital tools. This reflects the widespread integration of internet-based resources in teaching and learning processes, which supports continuous access to information and professional development opportunities.

However, the study also highlights a notable gap. Teachers are not aware of the inclusion of advanced technical competencies, such as computer programming, database management, and deeper application of computer knowledge (mean = 1.70). This suggests that while teachers are comfortable with basic and functional use of technology, they may lack exposure to more specialized and technical digital skills associated with the Fifth Industrial Revolution. The complexity of these areas may contribute to lower awareness and confidence among educators.

Table 2.3 shows that science teachers are very much aware of the Fifth Industrial Revolution as applied in education in terms of adopting lifelong learning, with an overall average weighted mean of 3.32. This indicates a strong recognition among teachers of the importance of continuous learning and skill development in a rapidly evolving educational and technological landscape.

The results further reveal that teachers are highly aware of the provision of opportunities for students to acquire real-world skills relevant to future employment (mean = 3.42). This suggests that educators acknowledge the need to align classroom instruction with industry demands. In addition, teachers recognize the value of personalized learning based on students' capabilities (mean = 3.38), highlighting their awareness of learner-centered approaches that cater to individual differences.

Moreover, the highest level of awareness is reflected in the emphasis on essential human or "soft skills" (mean = 3.52), such as creativity, complex problem-solving, communication, emotional intelligence, and critical thinking. These competencies are increasingly important in the context of the Fifth Industrial Revolution, where human-centered skills complement technological advancements. Teachers are also very much aware that education should produce graduates who are knowledgeable, competent, and technologically adept (mean = 3.53), further reinforcing their understanding of the demands of IR 5.0.

Table 3.1 presents the significant relationship between the level of awareness of the Fifth Industrial Revolution and selected profile variables. The findings reveal a significant but weak negative correlation between age and adapting to lifelong learning ($r = -0.28$, $p = 0.03$). This indicates that as age increases, the level of adaptability to lifelong learning slightly decreases. In other words, older teachers may experience more difficulty adjusting to continuous learning demands compared to younger teachers. This result is consistent with the study of Park and Choi (2009), who found that age can influence technology-related learning behaviors and adaptability.

These weak negative correlations suggest that teachers with longer years of service tend to be slightly less engaged in practices associated with the Fifth Industrial Revolution. This may be attributed to established routines and possible resistance to change. As noted by Braak et al. (2004), longer tenure can sometimes be associated with lower motivation to adopt new technologies due to familiarity with traditional teaching practices.

In contrast, highest educational attainment did not show any statistically significant relationship with the awareness variables, although the correlations were positive but very weak. This implies that while higher educational qualifications may contribute to confidence in using technology, they do not necessarily translate into higher levels of awareness or engagement. This finding supports the work of Teo (2011), who argued that educational attainment influences attitudes toward technology but not always actual usage or integration.

Table 3.2 shows that science teachers are generally much prepared for the Fifth Industrial Revolution, with an average weighted mean of 2.80 as perceived by the respondents themselves. This suggests a moderate level of readiness among teachers to integrate emerging technologies and innovative practices into their teaching. The finding is consistent with the study of Saud et al. (2018), which reported that teachers tend to demonstrate higher preparedness in pedagogical approaches than in the implementation of technological innovations.

The results further reveal that teachers exhibit greater preparedness in constructs related to teaching methods compared to those related to implementation strategies. This indicates that while teachers are conceptually ready to adopt innovative instructional approaches, challenges remain in translating these into actual classroom practice.

One notable strength highlighted in the study is the teachers' engagement with Massive Open Online Courses (MOOCs). Many respondents reported enrolling in platforms such as Coursera and SEAMEO, which provide accessible and flexible opportunities for professional development. MOOCs represent an evolution of open online learning, allowing individuals to access educational content at little or no cost while promoting self-paced and collaborative learning. As emphasized by Iniesto (2020), MOOCs enhance flexibility, encourage social learning, and support the development of new knowledge and skills.

However, despite these strengths, the findings also reveal areas where teachers are only moderately prepared or not prepared. Respondents reported moderate preparedness in terms of access to information, participation in virtual learning environments, and the use of platforms for communication and collaboration. More notably, teachers indicated that they are not adequately prepared to implement more advanced instructional approaches such as blended learning, Bring Your Own Device (BYOD), and flipped classrooms. They also reported being only slightly prepared to communicate using technologies associated with the Fifth Industrial Revolution.

Table 3.3 reveals that science teachers are generally much prepared for the Fifth Industrial Revolution, as reflected by an average weighted mean of 2.59. Although slightly lower than previous indicators, this still suggests a moderate level of readiness among teachers to engage with evolving educational demands.

The findings highlight those teachers are much prepared in sharpening complex problem-solving skills, a key competency in the context of IR 5.0. This indicates that educators recognize the importance of equipping learners with higher-order thinking skills necessary for navigating complex, real-world challenges. In addition, teachers are also much prepared in accessing and using the Internet, demonstrating their competence in utilizing basic digital tools that support teaching, learning, and professional development.

Furthermore, the results show that teachers are much prepared in selecting curricula that are internationally transferable, which is an important aspect of a globally connected and mobile society. This reflects an awareness of the need to align educational content with global standards, enabling students to transition more easily across different educational and professional contexts.

Interestingly, the study also indicates that teachers are much prepared in the inclusion of knowledge and application capabilities in computer use, programming languages, and database management. This suggests an emerging readiness to engage with more advanced technological competencies associated with the Fifth Industrial Revolution. However, this finding should be interpreted with caution, as it may reflect perceived preparedness rather than actual technical proficiency.

Table 3.4 presents the level of preparedness of science teachers for the Fifth Industrial Revolution in terms of adapting to lifelong learning. The results indicate that teachers are only slightly prepared, as reflected by an average weighted mean of 2.47. This suggests that, despite awareness of technological advancements, there are still limitations in teachers' readiness to continuously adapt and engage in lifelong learning practices.

This finding highlights a broader concern within the education sector. Although technological innovations continue to evolve rapidly, education systems have often been slow to fully integrate these advancements into teaching and learning processes. While technologies such as robotics have been utilized in education—particularly in science, technology, engineering, and mathematics (STEM)—since the 1980s, their widespread and effective adoption remains limited.

The results support the argument of Oke et al. (2020), who emphasized that for the Fifth Industrial Revolution to be meaningful in education, technological integration must be learner-centered. This requires curricula that are intentionally designed to support innovative teaching and learning practices. Achieving this may involve significant transformation in instructional approaches, institutional practices, and educator mindsets to keep pace with global technological developments.

Furthermore, the transition to a technology-driven environment has significant implications for workforce readiness. As noted by Lichtblau et al. (2019), employees are directly affected by changes in digital workplaces, necessitating the acquisition of new skills and continuous professional development. This underscores the importance of lifelong learning, not only for students but also for educators, who must model adaptability and continuous skill enhancement.

Table 3.5 presents the relationship between the level of preparedness for the Fifth Industrial Revolution and selected profile variables. The results indicate that age is not significantly related to preparedness across the dimensions of using technology in teaching ($r = -0.16$, $p = 0.14$), increasing opportunities for improving teaching ($r = -0.12$, $p = 0.18$), and adapting to lifelong learning ($r = -0.20$, $p = 0.09$). Although the correlations are negative, they are not statistically significant, suggesting that age alone does not substantially influence teachers' preparedness. This finding supports the Diffusion of Innovations theory of Rogers (2003), which posits that demographic factors such as age only affect adoption when combined with other elements such as access to training and institutional support.

In contrast, length of service shows significant but weak negative relationships with preparedness across all areas, namely using technology in teaching ($r = -0.21$, $p = 0.05$), increasing opportunities for improving teaching ($r = -0.25$, $p = 0.04$), and adapting to lifelong learning ($r = -0.27$, $p = 0.03$). These findings suggest that as teachers' years of service increase, their level of preparedness for engaging in Fifth Industrial Revolution practices slightly decreases. This may be attributed to a reliance on established teaching routines and a reduced inclination to adopt new technologies. This observation is consistent with the findings of Teo (2011), who noted that longer teaching experience may be associated with resistance to integrating modern educational tools.

Meanwhile, highest educational attainment exhibits very weak and non-significant positive correlations with preparedness across all dimensions, indicating that higher academic qualifications do not necessarily translate into greater readiness to implement Fifth Industrial Revolution practices. This aligns with the study of Park and Choi (2009), who emphasized that contextual and motivational factors are more influential than formal qualifications in shaping technology adoption and learning behaviors.

Conclusions

The findings of the study indicate that science teachers of Calasiao II District, generally demonstrate a solid level of awareness of the Fifth Industrial Revolution, particularly in areas related to the use of technology, enhancement of teaching opportunities, and the importance of lifelong learning. This suggests that teachers are conceptually prepared to respond to the evolving demands of education in a technology-driven era. Their strong awareness of digital tools, learner-centered approaches, and essential soft skills reflects a clear understanding of the competencies required for both educators and learners in the context of IR 5.0.

However, despite this high level of awareness, the results reveal only moderate preparedness in actual practice. Teachers appear more confident in pedagogical concepts than in the implementation of advanced technological innovations. Gaps are particularly evident in areas such as the use of emerging communication technologies, advanced technical skills (e.g., programming and database management), and the application of innovative instructional strategies like blended learning and flipped classrooms. This indicates a disconnect between what teachers know and what they are able to effectively execute in real classroom settings.

The study also highlights that profile variables such as age and length of service have minimal to weak influence on both awareness and preparedness. While older and more experienced teachers may show slightly lower adaptability to lifelong learning and technological integration, these relationships are not strong enough to be considered major determining factors. Similarly, higher educational attainment does not necessarily translate into greater readiness, suggesting that formal qualifications alone are insufficient without continuous, targeted professional development.

Overall, the study concludes that while science teachers are cognitively aware of the demands of the Fifth Industrial Revolution, there remains a critical need to strengthen their practical preparedness. This calls for sustained professional development programs, institutional support, and training initiatives that focus not only on theoretical understanding but also on the hands-on application of emerging technologies and innovative teaching strategies. Bridging this gap between awareness and practice is essential to ensure that educators can effectively prepare students for the complexities of a rapidly evolving, technology-centered world.

Recommendations

Based on the study's findings, several recommendations are proposed to help strengthen educators' preparedness for the Fifth Industrial Revolution in the context of education. To begin with, the proposed training design centered on Industrial Revolution 5.0 may be considered for adoption, provided it goes through proper evaluation and approval. The goal of this training is to help teachers build the knowledge and practical skills needed to effectively integrate advanced technologies into their teaching.

In addition, teachers are encouraged to adjust to the changing demands of education. This means being open to new roles, approaches, and behaviors that reflect the realities of a technology-driven learning environment. As education continues to evolve, flexibility and willingness to learn will be key.

School heads also have an important role in making this transition possible. Given the growing relevance of Industrial Revolution 5.0 to national development, they are encouraged to design and support training initiatives that enhance teachers' readiness. This can be done by providing adequate resources, offering mentorship, and ensuring access to continuous professional development opportunities.

At a broader level, government agencies and policymakers should prioritize making training programs more accessible to educators. These initiatives should focus not only on building technical skills but also on helping teachers apply these technologies effectively in their teaching practices.

Finally, the study highlights opportunities for further research. Future studies may explore new strategies and innovative approaches that can better support teachers in adapting to Industrial Revolution 5.0. By continuing this line of inquiry, both researchers and educators can help shape an education system that remains responsive and adaptable in an increasingly fast-changing technological landscape.

Compliance with Ethical Standards

This study strictly adheres to established ethical research standards to ensure the protection, rights, safety, and dignity of all participants involved in the research process. Ethical principles were carefully observed throughout the conduct of the study to maintain academic integrity and uphold responsible research practices.

Prior to data gathering, all participants, including department heads and teachers, were provided with a clear explanation of the study's purpose, objectives, scope, and procedures. Participation in the study was entirely voluntary, and no participant was subjected to coercion or undue pressure. Written informed consent was secured before the administration of surveys or conduct of interviews to ensure that participants fully understood their involvement and the intended use of the collected data.

Confidentiality and anonymity were likewise maintained throughout the study. Participants' identities, school affiliations, and personal information were treated with strict confidentiality. Codes or pseudonyms were utilized instead of real names in all records, reports, and presentations of findings. All collected data were securely stored and made accessible only to the researchers for academic purposes.

Participants were also informed of their right to withdraw from the study at any stage without any penalty, disadvantage, or negative consequence. This provision ensured respect for individual autonomy and reinforced the voluntary nature of participation.

To safeguard participant welfare, the study avoided any procedure that could potentially cause physical, emotional, psychological, or social harm. Survey questionnaires and interview guides were carefully designed to ensure that all questions were appropriate, respectful, and free from offensive or highly sensitive content.

The researchers further ensured honesty, transparency, and objectivity in the treatment and presentation of data. All findings were reported accurately without fabrication, falsification, or manipulation of information. The analysis and interpretation of results were conducted impartially regardless of whether the outcomes supported the assumptions of the study.

Before the conduct of the research, formal written permission was obtained from the Department of Education Calasiao II District, Schools Division Office I Pangasinan, as well as from the respective school principals of participating schools. Moreover, the study complied with institutional research policies and was subjected to ethical review and approval by the appropriate research ethics committee whenever required by the academic institution.

By observing these ethical principles, the study seeks to protect the welfare of participants, uphold academic and professional integrity, and contribute responsibly to the advancement of educational leadership and instructional improvement.

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