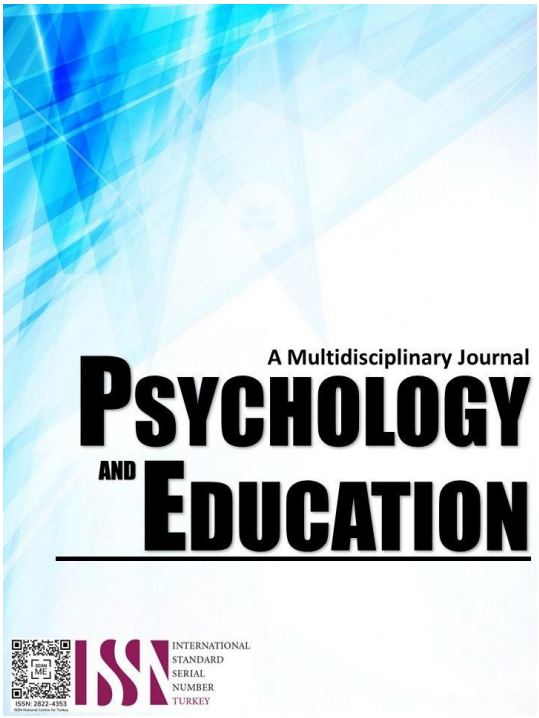
EDUCATION 4.0: AWARENESS, READINESS, AND DIGITAL COMPETENCE OF HIGHER EDUCATION INSTITUTIONS (HEIs) FACULTY IN REGION XII



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Research Article

Education 4.0: Awareness, Readiness, and Digital Competence of Higher Education Institutions (HEIs) Faculty in Region XII

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Abstract

Global education systems are undergoing a revolution due to the swift progress of technology. In order to improve student learning, this new educational environment dubbed Education 4.0 combines cutting-edge teaching strategies with digital technologies. Few research studies have been done on Education 4.0 despite its potential, especially in Mindanao, Philippines. This study sought to ascertain faculty members' awareness, readiness, and digital competence in relation to Education 4.0 at higher education institutions (HEIs) in Region XII. The variables and their relationships were investigated using a descriptive-correlational research design in this study. Three hundred forty-six (346) faculty members who were chosen at random took part in the study by answering a questionnaire. ANOVA, Spearman's rho, and mean scores were used in the quantitative analysis. According to the results, faculty members at HEIs demonstrate a high level of awareness (M=3.94; SD=0.85), readiness (M=3.67; SD=0.93), and digital competence (M=3.79; SD=0.90) with respect to Education 4.0. Digital competence and awareness showed a significant strong positive correlation (rs=0.6539; p-value = 0.0000), while readiness and awareness showed a significant moderate positive correlation (rs=0.5670; p-value = 0.0000). There are significant differences in higher education institutions' awareness (F=1.8219; p-value=0.0130), readiness (F=3.2062; p-value=0.0000), and digital competence (F=1.8025; p-value=0.0144). These results imply that the Commission on Higher Education (CHED) might identify the importance of Education 4.0 and give it top priority when integrating it into local HEI initiatives. CHED acknowledges and supports this revolutionary change by recognizing the need for strategic direction, allocating required funds, and establishing policies that encourage the successful implementation of Education 4.0.

Keywords: *education 4.0, awareness, readiness, digital competence, higher education institutions faculty*

Introduction

In this era, rapid technological advancement is changing education systems all over the world. The goal of Education 4. 0 is to enhance student learning outcomes engagement and collaboration through the use of cutting-edge digital technologies such as artificial intelligence robotics big data analytics virtual reality and the Internet of Things. Education 4. 0 uses these technologies to give learners individualized flexible and learner-centered learning experiences. These technological advancements extend beyond education and influence various aspects of society, the economy, and people's lifestyles. Consequently, individuals' lifestyles, work patterns, interactions, and relationships have undergone significant transformations. In fact, the Future of Jobs Report (2023) by the World Economic Forum identifies several in-demand jobs of the future, such as Data Analysts and Scientists, AI and Machine Learning Specialists, Big Data Specialists, Digital Marketing and Strategy Specialists, and Information Security Specialists.

Recognizing the need to prepare students for the future workforce, higher education institutions (HEIs) face the challenge of equipping learners with analytical, creative, self-directed, and reflective skills (Fisk, 2017). To achieve this, institutions must stay abreast of emerging trends and develop innovative strategies to enhance the teaching and learning process. However, the awareness, readiness, and digital competence of HEI faculty members, particularly in Region XII, regarding Education 4.0, need to be explored.

Despite the existing global literature on the subject, limited published studies have been conducted that look into the Education 4.0 paradigm, and none in Region XII. On this premise, this study aims to determine the awareness, readiness, and digital competence levels of HEI faculty in Region XII towards Education 4.0, with the goal of giving recommendations to align HEIs in the region with the principles and characteristics of Education 4.0.

Research Questions

This study aimed to determine the awareness, readiness, and digital competence levels toward Education 4.0 of Higher Education Institutions (HEIs) faculty in Region XII. Specifically, it sought to answer the following questions:

1. What is the awareness level towards Education 4.0 of higher education institutions (HEIs) faculty in Region XII in terms of:
    1.1. personal awareness;
    1.2. teaching and learning practices; and
    1.3. infrastructure requirement?
2. What is the readiness level towards Education 4.0 of higher education institutions (HEIs) faculty in Region XII in terms of:
    2.1. process;
    2.2. infrastructure; and
    2.3. organization?

3. What is the digital competence level towards Education 4.0 of higher education institutions (HEIs) faculty in Region XII in terms of:
    3.1. information and data literacy;
    3.2. communication and collaboration; and
    3.3. digital content creation?
4. Is there a significant relationship between the awareness and readiness levels towards Education 4.0 of higher education institutions (HEIs) faculty in Region XII?
5. Is there a significant relationship between the awareness and digital competence levels towards Education 4.0 of higher education institutions (HEIs) faculty in Region XII?
6. Is there a significant relationship between the readiness and digital competence levels toward Education 4.0 of higher education institutions (HEIs) faculty in Region XII?
7. Is there a significant difference in the awareness level towards Education 4.0 of higher education institutions (HEIs) faculty across institutions in Region XII?
8. Is there a significant difference in the readiness level toward Education 4.0 of higher education institutions (HEIs) faculty across institutions Region XII?
9. Is there a significant difference in the digital competence level towards Education 4.0 of higher education institutions (HEIs) faculty across institutions Region XII?
10. Based on the findings of the study, what recommendations could be given to enable higher education institutions (HEIs) in Region XII to be on par with the standard characteristics of Education 4.0?

Methodology

Research Design

This study investigated faculty members awareness, readiness, and digital competence at Higher Education Institutions (HEIs) in Region XII with regard to Education 4. 0 using a quantitative descriptive-correlational methodology. The descriptive-correlational design offers a thorough explanation as well as an assessment of the relationships between variables within the context under study by combining descriptive and correlational research methods (Creswell & Creswell, 2017).

Respondents

Three hundred forty six (346) faculty members were chosen from a total of 3,432 to participate in the study using the Cochran formula and proportionate allocation stratified random sampling. The respondents came from twenty-four higher education institutions (HEIs) in Region XII: seventeen private institutions, five State Universities and Colleges (SUCs), and two Local Universities and Colleges (LUCs).

Instrument

The research instrument was a modified and adapted questionnaire that was validated by experts from different stakeholders such as DepEd, TESDA, and CHED. The validity of the questionnaire was assessed using a validation tool created by Robles (2019). With a mean score of 4.97, the questionnaire was found to be very highly valid. Before data was collected, the questionnaire was then based on the expert validators' advice, comments, and suggestions. To evaluate its internal consistency, the questionnaire was also subjected to reliability testing. The reliability coefficient for the questionnaire as determined by Cronbach's alpha was 0. 967 indicating an excellent level of internal consistency.

The first part of the questionnaire focused on the awareness level, which comprised 24 items that were modified and adapted from the Alda et al. (2020) on Teacher Education Institutions: Towards Education 4.0. Indicators including personal awareness, teaching and learning practices, and infrastructure requirements were all included in the questionnaire.

Twenty-four questions taken from Paryono (2019) study on institutions readiness for the Industrial Revolution 4. 0 comprised Part II of the questionnaire which evaluated the readiness level. Process, infrastructure, and organization were the topics of the indicators in this section of the questionnaire. A 5-point Likert scale was used just like in Part I.

Part III of the questionnaire centered on the digital competence level of the respondents, which consisted of 24 questions, was modified and adapted from the study of Touron et al. (2018) on Digital Competency Measuring. Information and data literacy, communication and collaboration, and digital content creation were the indicators in this section of the survey. A 5-point Likert scale was also applied.

Procedure

Before conducting the data-gathering process, the researcher obtained the necessary ethical clearance. This involved seeking approval from the MSU-GSC Institutional Ethics Review Committee, which required the researcher to fulfill certain requirements. These requirements included securing a certification from the dissertation adviser confirming that all revisions suggested by the panel members during the proposal defense had been addressed. Additionally, a notice to proceed certification, signed by the dean of the Graduate School, was obtained.

Furthermore, through a letter request, the researcher sought permission from the Regional Director of the Commission on Higher Education (CHED) Region XII. This request aimed to conduct the study in twenty-four selected higher education institutions in Region XII. Once the request was granted, the researcher presented the same letter to the presidents and administrators of the selected institutions to formally ask permission to conduct the study within their respective institutions.

The researcher conducted a brief orientation session to explain the study's objectives to the respondents currently employed in their respective institutions during the Academic Year 2022-2023. The respondents were informed that their participation was voluntary, and they were free to choose not to participate without any negative consequences. To maintain confidentiality, pseudonyms or coding were used when reporting the findings.

Following the orientation, data collection began. The researcher distributed the questionnaires to the respondents and provided instructions on answering the provided materials. The respondents were given sufficient time, at least 30 minutes, to complete the questionnaires. Afterward, the questionnaires were collected for further analysis. All the gathered data underwent statistical analysis using a significance level of $\alpha = 0.05$.

Ethical Considerations

This study was carried out ethically and received the required approvals from Mindanao State University - General Santos City Institutional Ethics Review Committee (IERC). Crucial ethical principles were scrupulously adhered to including voluntary participation, anonymity, confidentiality, and preventing injury or discomfort. The researcher worked in conjunction with pertinent parties prior to starting data collection such as the Commission on Higher Education Office HEI presidents and administrators, validators, and respondents. These parties received comprehensive letters outlining the goals and methods of the investigation. The research followed the guidelines set forth by the Republic of the Philippines Data Privacy Act of 2012 (Republic Act No. [10173]. The investigator implemented supplementary measures to guarantee confidentiality and foster confidence specifically by addressing participants apprehensions regarding information sharing.

Results and Discussion

The data gathered to answer the research questions is presented in this chapter along with its analysis and interpretations. The following tables present the findings along with in-depth analyses and justifications.

Table 1. *The Awareness Level of the Higher Education Institutions (HEIs) Faculty Towards Education 4.0*

Indicators	*Weighted Mean*	*Standard Deviation*	*Description*
Personal Awareness	4.04	0.77	Highly Aware
Teaching and Learning Practices	4.00	0.81	Highly Aware
Infrastructure Requirement	3.79	0.97	Highly Aware
Overall Mean	3.94	0.85	Highly Aware

Legend: 4.50 – 5.00 Very Highly Aware, 3.50 – 4.49 Highly Aware, 2.50 – 3.49 Moderately Aware, 1.50 – 2.49 Less Aware, 1.00 – 1.49 Least Aware

The faculty of Higher Education Institutions (HEIs) is highly aware of Education 4. 0 as shown in Table 1.

The Personal Awareness category has the highest mean score of 4.04 which denotes a high level of awareness. This suggests that faculty members are well-versed in the applications of digital technology to education and the critical role that technology plays in the 21st century and beyond.

The Teaching and Learning Practices category has the second-highest mean score of 4.00 which is denotes the high level of awareness among respondents. The aforementioned suggests that faculty members possess a high level of awareness regarding their role in fostering the development of 21st-century competencies in students offering interactive educational opportunities fostering creativity via technological means and employing technology-driven evaluation instruments.

The category of Infrastructure Requirement has the lowest mean score of 3.79. The information indicates that faculty members are highly aware of the infrastructure needed for Education 4.0 such as the availability of internet-connected computer labs and the office responsible for handling ICT requirements.

Overall, faculty members in HEIs appear to have a high level of awareness towards Education 4.0 as indicated by the mean score of 3.94. This suggests that faculty members are highly aware of the significance of teaching and learning methodologies infrastructure needs in higher education and technology integration. These findings also suggest that faculty members are in a good position to help higher education institutions successfully implement Education 4. 0 initiatives. It appears that they are ready to accept and integrate technological advancements in their teaching practices given their high level of awareness on personal. Teaching and learning practices, and infrastructure requirement.

Romero-Garcia et al.(2020) studies provide credence and authority to the findings, which emphasized how crucial faculty members digital competency is to successfully integrating technology into teaching and learning procedures. Smith et al. (2020) also highlights

the importance of educators gaining a thorough understanding of the digital learning environment and taking the initiative to incorporate technology into their teaching methods. On the same lines Tondeur et al. (2016) highlights how important it is for faculty members to participate in professional development programs that improve their digital competencies and help them develop a positive attitude toward technology integration.

Table 2. *The Readiness Level of the Higher Education Institutions (HEIs) Faculty Towards Education 4.0*

Indicators	*Weighted Mean*	*Standard Deviation*	*Description*
Process	3.90	0.86	Highly Ready
Infrastructure	3.57	0.98	Highly Ready
Organization	3.54	0.95	Highly Ready
Overall Mean	3.67	0.93	Highly Ready

Legend: 4.50 – 5.00 Very Highly Ready, 3.50 – 4.49 Highly Ready, 2.50 – 3.49 Moderately Ready, 1.50 – 2.49 Less Ready 1.00 – 1.49 Least Ready

Table 2 shows the readiness level of the higher education institution faculty towards Education 4.0. Process dimension has the highest mean score out of the three indicators with a mean of 3.90. This suggests that faculty members at HEIs are highly ready to comprehend and identify how education is changing. It implies that faculty members are actively involved in procedures that support creativity flexibility and the use of technology in their methods of instruction. A strong understanding of the need to adopt new pedagogical approaches and stay up to date with the evolving educational landscape is evident from the high mean score among faculty members.

On the other hand, the Organization dimension has the lowest mean score among the three indicators with a mean of 3.54. Although this mean score is still in the highly ready range it shows a somewhat lower level of readiness than the other indicators. This shows that Education 4.0 organizational features might use some work. To promote the integration of Education 4. 0 initiatives, HEIs could intensify their efforts in identifying qualified candidates offering sufficient training forming alliances and forming specialized task forces or committees.

Although faculty members have demonstrated a high level of process and infrastructure readiness there may be a need for additional attention and development in the organizational aspects as indicated by the difference between the highest and lowest mean scores. This suggests that higher education institutions (HEIs) should fortify their organizational frameworks and cultivate an environment that encourages creativity teamwork and the efficient application of Education 4. 0 tactics.

Research by Caliskan and Zhu (2021) who discovered that organizational culture is essential for promoting innovation capacity in higher education institutions corroborates the study's findings. The importance of creating organizational structures and procedures that facilitate the successful integration of Education 4. 0 initiatives is highlighted by their findings.

Table 3. *The Digital Competence Level of the Higher Education Institutions (HEIs) Faculty Towards Education 4.0*

Indicators	*Weighted Mean*	*Standard Deviation*	*Description*
Information and Data Literacy	3.89	0.86	Highly Competent
Communication and Collaboration	3.93	0.88	Highly Competent
Digital Content Creation	3.54	0.96	Highly Competent
Overall Mean	3.79	0.90	Highly Competent

Legend: 4.50 – 5.00 Very Highly Competent, 3.50 – 4.49 Highly Competent, 2.50 – 3.49 Moderately Competent, 1.50 – 2.49 Less Competent, 1.00 – 1.49 Least Competent

Table 3 shows the summary of the digital competence level of HEI faculty members in terms of information and data literacy, communication and collaboration, and digital content creation.

Communication and Collaboration has the highest mean score indicating a highly competent level with a mean of 3.93. This indicates that faculty members are highly competent in using social networks software that is available in their school online communication tools and collaborative learning tools to promote productive communication and teamwork between students and colleagues. It suggests that faculty members are adept at using a range of digital tools and platforms to improve collaboration communication and the creation of a positive learning atmosphere.

The Information and Data Literacy has the second-highest mean score 3. 89 indicating a high level of competence. This suggests that faculty members are highly proficient in techniques for using the internet finding information in various media or formats file recovery tools and information management techniques. It suggests that faculty members are skilled at using digital information sources carrying out efficient searches and organizing information in a digital setting.

Digital Content Creation has the lowest mean among the three indicators with a mean of 3.54. This still shows a high level of competency in using interactive whiteboard software tools for facilitating learning reworking or enriching content in different formats understanding programming logic and basic device modification. To improve their skills in creating digital content faculty members might need more training and assistance in these areas.

Overall, a mean score of 3.79 indicates that all faculty members at HEIs exhibit a high level of digital competence in the areas of

information and data literacy, communication and collaboration, and digital content creation. This suggests that they possess the abilities and know-how needed to properly communicate and work together using a variety of digital tools navigate digital information and produce digital content to enhance student learning.

Prior studies carried out by Alieto et al.(2024) corroborate the results of this study. In order to successfully integrate technology into teaching and learning practices faculty members must possess digital competency.

Table 4. *Relationship between the Awareness and Readiness Level Towards Education 4.0 of Higher Education Institutions (HEIs) Faculty*

Variables Correlated	*Mean*	*rs*	*Degree of Relationship*	*p-value*	*Remark*
Level of Awareness	3.94	0.5670	Moderate Correlation	0.0000	Significant
Level of Readiness	3.67				

**Tested at 0.05 level of significance.*

Table 4 illustrates the significant correlation between the awareness and readiness of HEI faculty members regarding Education 4. 0. The awareness level has a mean score of 3.94 while the readiness level is 3.67. There is a moderately positive correlation (r = 0. 5670) between these two variables. There is a significant correlation between awareness and readiness levels as indicated by the correlation coefficients p-value of 0000.

This findings supports the idea that faculty members awareness significantly influences their readiness to adopt Education 4.0 practices. The moderate positive correlation indicates that faculty members at HEIs tend to be more prepared as their awareness of Education 4. 0 rises.

This suggests that educators are more likely to be equipped and ready to incorporate Education 4. 0 techniques into their teaching and learning activities if they have a greater understanding of the concepts principles and practices of the program. The present study's outcomes corroborate those of earlier research conducted by Ishak and Mansor (2020) which emphasized the significance of increasing faculty members awareness in order to facilitate their preparedness and successful implementation of Education 4. 0 strategies.

Table 5. *Relationship between the Awareness and Digital Competence Level Towards Education 4.0 of Higher Education Institutions (HEIs) Faculty*

Variables Correlated	*Mean*	*rs*	*Degree of Relationship*	*p-value*	*Remark*
Level of Awareness	3.94	0.6539	Strong Correlation	0.0000	Significant
Level of Digital Competence	3.79				

**Tested at 0.05 level of significance.*

Table shows the significant correlation between the faculty members of Higher Education Institutions (HEIs) awareness and digital competency levels with regard to Education 4.0. The digital competence level has a mean score of 3. 79 while the awareness level has a mean score of 3.94. With a correlation value of 0. 6539, these two variables have a strong positive correlation. There is a significant correlation between awareness and digital competence as indicated by the correlation coefficients p-value of 0000.

The result supports the idea that the level of awareness among faculty members has a positive impact on their level of digital competence for Education 4. 0. The strong positive correlation indicates that faculty members at HEIs tend to be more digitally competent as their awareness of Education 4. 0 rises.

This suggests that educators who are more aware of the ideas values and practices of Education 4. 0 are more likely to be proficient in digital competency. Using digital tools technologies and resources related to Education 4. 0 they will probably be adept at it. The outcomes of this study are consistent with the studies conducted by Moltudal et al. (2019) which highlighted the favorable correlation in the framework of Education 4. 0 between awareness classroom management skills and professional digital competence.

Table 6. *Relationship between the Readiness and Digital Competence Level towards Education 4.0 of Higher Education Institutions (HEIs) Faculty*

Variables Correlated	*Mean*	*rs*	*Degree of Relationship*	*p-value*	*Remark*
Level of Readiness	3.67	0.6795	Strong Correlation	0.0000	Significant
Level of Digital Competence	3.79				

**Tested at 0.05 level of significance.*

Table 6 shows the significant relationship between the readiness and digital competence levels of faculty members at Higher Education Institutions (HEIs) with regard to Education 4. 0.

The digital competence level has a mean score of 3. 79 while the readiness level has a mean score of 3. 67. These two variables have a strong positive correlation as indicated by the correlation value of 0. 6795. There is a significant correlation between awareness and digital competence as indicated by the correlation coefficients p-value of 0. 0000.

This result supports the idea that the readiness of faculty members influences their digital competence for Education 4. 0 in a positive way. The strong positive correlation indicates that faculty members at HEIs tend to be more digitally competent as their readiness for Education 4. 0 rises.

This suggests that educators who are more equipped and willing to adopt the ideas and methods of Education 4. 0 are also more likely to have higher levels of digital competency. They will likely proficiently utilize digital tools technologies and resources relevant to Education 4. 0.

These results are consistent with the study by Layco (2022) which examined the preparedness and digital competency of more than 500 math teachers across a range of Philippine educational institutions in Luzon. Ultimately they revealed that there is a positive correlation between the skill readiness and competence of the teachers. This suggests that in order to directly increase the digital competency of their faculty HEIs must give priority to investing in infrastructure or facilities that are ready for Education 4. 0.

Table 7. *Difference in the Awareness Level towards Education 4.0 of Higher Education Institutions (HEIs) Faculty across Institutions*

Indicators	*Mean*	*F-value*	*p-value*	*Remark*
Personal Awareness	4.04			
Teaching and Learning Practices	4.00	1.8219	0.0130	Significant
Infrastructure Requirement	3.79			
Overall Mean	3.94			

**Tested at 0.05 level of significance.*

Table 7 presents the differences in the awareness level towards Education 4.0 of Higher Education Institutions (HEIs) faculty across different institutions. The awareness level is measured based on three indicators: personal awareness, teaching and learning practices, and infrastructure requirement.

The mean score for personal awareness is 4.04, indicating a relatively high awareness among faculty members regarding the concepts and implications of Education 4.0 in their capacity. The mean score for teaching and learning practices is 4.00, suggesting that faculty members understand how to integrate Education 4.0 principles into their instructional strategies. The mean score for infrastructure requirement is 3.79, indicating a slightly lower level of awareness regarding the specific infrastructure needs and technological requirements for implementing Education 4.0 effectively.

The F-value associated with the analysis of variance (ANOVA) is 1.8219, and the p-value is 0.0130. This indicates a significant difference in the awareness level towards Education 4.0 across the different institutions. The significant p-value suggests that the observed differences in awareness levels are unlikely to occur by chance alone.

This implies that the institutions differ in terms of the faculty members' awareness of Education 4.0. Some institutions may have implemented more comprehensive awareness programs or provided greater support and resources to enhance faculty members' understanding of Education 4.0 concepts. On the other hand, institutions with lower awareness levels may benefit from initiatives such as professional development programs, workshops, and awareness campaigns to bridge the gap and promote a deeper understanding of Education 4.0 among their faculty members.

The study's results are supported by previous research conducted by Goh & Abdul-Wahab (2020), which discuss the paradigms necessary to drive Higher Education 4.0, focusing on the need for institutions to adapt their curricula to include more digital and technological skills, which aligns with the importance of infrastructure and faculty awareness. The findings highlight the need for institutional-level interventions to foster a higher level of awareness towards Education 4.0 among faculty members.

Table 8. *Difference in the Readiness Level towards Education 4.0 of Higher Education Institutions (HEIs) Faculty across Institutions*

Indicators	*Mean*	*F-value*	*p-value*	*Remark*
Process	3.90			
Infrastructure	3.57	3.2062	0.0000	Significant
Organization	3.54			
Overall Mean	3.67			

**Tested at 0.05 level of significance.*

Table 8 presents the differences in the readiness level toward Education 4.0 of Higher Education Institutions (HEIs) faculty across different institutions. The readiness level is assessed based on three indicators: Process, infrastructure, and organization.

The mean score for the process is 3.90, indicating a relatively high level of readiness among faculty members regarding the processes and procedures required to implement Education 4.0 effectively. The mean score for infrastructure is 3.57, suggesting a slightly lower level of readiness regarding the technological infrastructure and resources needed to support Education 4.0 initiatives. The mean score for the organization is 3.54, indicating a similar level of readiness regarding the organizational structures and support mechanisms in place to facilitate Education 4.0 adoption.

The F-value associated with the analysis of variance (ANOVA) for the process is 3.2062, and the p-value is 0.0000. This indicates a significant difference in the readiness level for processes across the different institutions.

This implies that institutions vary in readiness to implement the necessary processes and procedures for Education 4.0. Some institutions may have well-defined strategies, guidelines, and frameworks to support the integration of Education 4.0 principles into

their academic practices. On the other hand, institutions with lower readiness levels for the process may need to focus on developing and implementing clear processes and protocols to enhance their readiness and ensure a smooth transition to Education 4.0.

The study's results are supported by previous research conducted by Jamaludin et al. (2020), explores the perception, readiness, and changes involved in implementing Education 4.0 within ASEAN higher education institutions. This study provides insights into the readiness levels of faculty and institutions, highlighting the importance of financial and managerial readiness alongside high personal readiness among respondents.

Table 9. *Difference in the Digital Competence Level towards Education 4.0 of Higher Education Institutions (HEIs) Faculty across Institutions*

Indicators	*Mean*	*F-value*	*p-value*	*Remark*
Information and Data Literacy	3.89			
Communication and Collaboration	3.93	1.8025	0.0144	Significant
Digital Content Creation	3.54			
Overall Mean	3.79			

**Tested at 0.05 level of significance.*

Table 9 presents the differences in the digital competence level towards Education 4.0 of Higher Education Institutions (HEIs) faculty across different institutions. The digital competence level is assessed based on three indicators: information and data literacy, communication and collaboration, and digital content creation.

The mean score for information and data literacy is 3.89, indicating a relatively high level of digital competence among faculty members regarding the skills and knowledge related to information and data literacy in the context of Education 4.0. The mean score for communication and collaboration is 3.93, suggesting a similar level of digital competence in utilizing online communication tools, software, and social networks for educational purposes. The mean score for digital content creation is 3.54, indicating a slightly lower level of digital competence in creating and reworking digital content using various tools and formats.

The F-value associated with the analysis of variance (ANOVA) for information and data literacy is 1.8025, and the p-value is 0.0144. This indicates a significant difference in the digital competence level for information and data literacy across the different institutions. The significant p-value suggests that the observed differences in digital competence levels for information and data literacy are unlikely to occur by chance alone.

This implies that institutions vary in digital competence in information and data literacy. Some institutions may have effectively developed their faculty members' skills and knowledge in searching, evaluating, and managing information, which is crucial in the Education 4.0 landscape. On the other hand, institutions with lower digital competence levels in information and data literacy may need to focus on enhancing their faculty members' abilities in effectively utilizing digital resources and critically evaluating information.

The study's results are supported by the research of Vuorikari et al. (2016) and Zhao et al. (2021) focused on the development and validation of a framework for digital competencies specifically tailored for Higher Education. It highlights the need for a comprehensive framework to support digital literacy, professional identity, and teaching with technology to enhance the overall digital competencies of faculty members. Fernández-Batanero et al. (2021) conducted a systematic review to identify the key digital competencies needed by university teachers. Their findings underscore the low level of digital competence among faculty and the necessity for ongoing training in both technological and pedagogical areas to improve teaching effectiveness in the digital age. This suggests that institutions should prioritize initiatives that promote information and data literacy skills development among faculty members, such as training programs, workshops, and collaborative projects. By improving digital competence in information and data literacy, institutions can ensure that faculty members are well-equipped to navigate the digital landscape and utilize information effectively in their teaching and research practices.

Conclusions

Based on the findings of the study, the following conclusions were drawn:

HEI faculty members in Region XII show high level of awareness, particularly in personal awareness and teaching practices, but infrastructure improvements are necessary. Investing in infrastructure will better support Education 4.0 initiatives, allowing faculty to fully utilize digital tools and resources in their teaching.

Faculty demonstrate high readiness, especially in process and infrastructure, though organizational improvements are needed. Addressing organizational gaps through clear policies and leadership support will help ensure sustained and effective implementation of Education 4.0.

Faculty excel in communication, collaboration, and information literacy but need improvement in digital content creation. Providing targeted professional development on digital content creation will enhance faculty's ability to create more engaging, technology-driven learning experiences.

There is a moderate positive relationship was found between the faculty's awareness and readiness for Education 4.0. Greater awareness is linked to higher readiness for adopting Education 4.0 practices. Increasing faculty awareness through workshops and training will likely boost their preparedness for implementing Education 4.0, fostering smoother transitions.

A strong positive relationship existed between the faculty's awareness and digital competence. Faculty with higher awareness also exhibit stronger digital skills. Raising awareness of Education 4.0 can significantly enhance digital competence, ensuring faculty are more adept at integrating technology into their teaching methods.

A strong positive relationship was observed between readiness and digital competence. Increased readiness is associated with higher digital proficiency. Enhancing readiness for Education 4.0 through organizational and process improvements will naturally boost faculty digital skills, further strengthening teaching practices.

Awareness levels vary across institutions in Region XII, indicating institution-specific factors at play. Customized awareness-raising efforts tailored to the unique needs of each institution can promote more uniform understanding and adoption of Education 4.0.

Readiness also varies significantly across institutions. Implementing targeted interventions, such as region-wide collaborations or resource sharing, can address readiness disparities and ensure more consistent implementation of Education 4.0.

Digital competence differs across institutions, reflecting varying levels of proficiency. Offering region-specific professional development and support in digital tools will address these differences and promote more equitable and effective use of technology in education.

Based on the findings and conclusions of the study, the following recommendations are proposed to enhance and facilitate the adoption of Education 4.0 in higher education institutions (HEIs):

Education 4. 0 principles can be successfully incorporated into HEIs curricula by giving priority to improving organizational management and infrastructure. This entails making investments in technological resources, modernizing facilities, and streamlining administrative procedures to facilitate the integration of digital technologies and innovative teaching techniques.

HEIs may provide free professional development courses that address the varied backgrounds of their faculty members. The knowledge and abilities these programs give teachers enable them to successfully incorporate Education 4. 0 methods into their lesson plans. Higher education institutions may support their faculty members ongoing education and professional development by providing easy access to these programs.

Commission on Higher Education (CHED) may recognize and give priority to the adoption of Education 4. 0 practices policies and innovations in order to facilitate the effective implementation of Education 4. 0. CHED may provide guidance, allot resources, and create policies by acknowledging and assisting with this shift.

Education 4. 0 practices might be included in the curricula of upskilling programs currently in place for pre-service teachers. Future teachers will be able to gain the skills and competencies needed to adjust to the changing educational landscape by having these programs in line with the principles of Education 4. 0.

In Education 4. 0, HEIs have the option to create extensive professional development plans that prioritize implementing efficient classroom management techniques. These programs might offer a range of educational opportunities including seminars, training sessions, and workshops led by experienced educators or external experts. This will enable faculty members to stay updated with the latest teaching methodologies and enhance their instructional practices.

HEI administrators in Region XII may establish a comprehensive incentive program to encourage staff and faculty to actively participate in the full implementation of Education 4. 0. HEIs may encourage an innovative and continuous improvement culture by praising and rewarding efforts to adopt Education 4. 0.

HEI administrators may collaborate to create clear guidelines and criteria for faculty members to follow when putting Education 4. 0 characteristics into practice. These guidelines will ensure uniformity of actions and consistency among educators, promoting a cohesive and standardized approach to Education 4.0 adoption.

HEIs may utilize the phases and stages outlined in the proposed implementation framework for Education 4.0. Helping HEIs navigate the complexities of the transition and ensuring a comprehensive and systematic approach to implementation, the framework provides a structured roadmap for the full integration of Education 4.0 principles

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