Professional Development of Rural Teachers Based on Digital Literacy

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Abstract

This research focuses on the professional development of teachers in rural areas based on digital literacy. It aims to measure the existing digital literacy and competence of rural teachers in Indonesia, Russia, and the Middle East and to assess the extent of digital literacy training provided to rural teachers for their professional development in these regions. In pursuit of this objective, a quantitative research method was incorporated into the study. The survey was conducted specifically for the research, and SPSS was used for statistical analysis. The report reflected the challenges that digitalization faces in rural areas and the differences in the provision of digital literacy training in Indonesia, Russia, and the Middle East. Various limitations are identified as hampering the integration of digital literacy in underdeveloped areas, such as the lack of proper digital infrastructure. However, the situation was found to be somewhat better in the case of Russia, with the teachers reporting the provision of adequate hardware and infrastructure, which were lacking in the cases of Indonesia and the Middle East. The same pattern was found in the case of the provision of digital literacy training opportunities in Indonesia and the Middle East, which lag behind Russia. All in all, it is imperative to develop introductory courses for using the internet and their general application for teachers in rural areas.

1- Introduction

1-1- Background

Among the various literacy issues that underdeveloped areas are still facing; digital literacy is one of the major issues that is gaining significant importance globally. As enormous technological advancements continue to change the world, possessing digital skills has become more important than it has ever been. Rural areas globally are still unaware of these advancements. Digitalization serves as the only way in today's world to sustain growth and competitive advantages over

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adversaries in any field [1]. In the education sector as well, digitalization has made significant progress in reducing workload, managing data, and improving efficiencies. Besides, digitalization affects students and teachers. It has broadened the means and access to education sources while improving learning and understanding outcomes for both students and teachers. However, the achievement of this digitalization in education in terms of student learning depends not only on the educational institutes but also on the teachers and their digital skills. For this, it is essential to train teachers in a way that ensures they correctly incorporate digital techniques that must achieve the desired digital literacy outcomes for the economic growth of society. Nowadays, almost every educational institution in the world has integrated the use of digital tools in education; however, rural areas are still significantly behind in integrating these advancements [2].

Several governments and software companies like Microsoft have launched various schemes to provide digital literacy to teachers in rural areas so that the unprofitable population can also contribute to the country's economic growth all across the world. These programs are introduced at the national level, and they tend to provide free-of-cost training to teachers in rural areas with the desired digital resources. However, various internal and external challenges hamper these technological advancements in rural areas [3]. This research intends to identify the benefits and need for the professional development of teachers in rural areas based on digital literacy and to highlight the challenges and limitations in the digital literacy of rural teachers.

Different governments in the past have acknowledged this issue, but they failed to address the challenges properly, and no prominent efforts have been made to recover from those challenges. However, as technological integration is becoming a major source of any country's economic success, governments are considering educating an unprofitable population so that they can be aware of the needs of global markets and can notably contribute to the country's growth [4]. Most of the government's efforts indicate the introduction of various teaching programs by different organizations and institutes to provide equal educational opportunities to everyone, as well as a high emphasis on providing quality education to all. However, these advancements cannot succeed without evolving of teacher's role: a teacher is no longer confined to being the passive information converses. Teachers now act as mentors to students, helping them develop in a way that they can survive in a technology-driven and knowledge-based society [5]. For this, the teachers must be educated with the required digital skills and up-to-date digital knowledge and have a relevant understanding of using new digital techniques and methods to provide students with appropriate support in their learning. Hence, the following report will also highlight the strategies required to develop digital skills among teachers in rural areas. The initial step in building these abilities is to make teachers in rural areas aware of their digital importance. Secondly, they develop the ability to use computers and make them computer literate, and lastly, they teach them digital skills and techniques, which can not only enhance the students' learning experience but also improve teaching methods.

1-2- Research Objectives

Digitalization is highly important in every field in today's world. Also, the significant benefits that digital advancements provide in the educational sector cannot be neglected too. Despite the benefits and importance of technological integration in education, rural areas have still been dragged behind, sometimes by not even being aware of digital existence. This research is conducted to analyze digital backwardness in rural areas and to find out how teachers can be literate enough to digitalize the backcountry. The main goal of the research is to improve the digital skills of teachers in rural areas and to reflect on the challenges that hamper the digital literacy of rural area teachers.

- To measure the existing digital literacy and competence of rural teachers in Indonesia, Russia, the Middle East and other regions.

- To assess the extent to which digital literacy training is provided to rural teachers in Indonesia, Russia, the Middle East and other regions for their professional development.

- To evaluate the barriers faced by rural teachers in enhancing their professional development in Indonesia, Russia, the Middle East and other regions.

1-3- Research Significance

This research has great significance in bringing economic growth to such regions as Indonesia, Russia, and the Middle East. Digital literacy is the only prevailing skill in today's world, and it will continue to grow with its ongoing advancement. However, despite technological advancements and economic prosperity, rural areas remain at a disadvantage due to low educational status and income differences, which limit their opportunities for technological integration. Similarly, the educational sector in rural areas is different from that in urban areas because of the limited accessibility and skills of the teachers to promote technological advancement to meet the dynamic challenges of the world. Therefore, this research holds significance in assessing the level of literacy skills of teachers from three geographic regions to determine the similarities and differences based on geographical variances and to assess the impact of digital literacy and its effectiveness. This is why possessing digital skills is essential for everyone. Since not everyone

can get equal educational opportunities, especially people living in rural areas, this research highlights the importance of digitally literate rural areas for the country's growth. As a result, to which, the research provides a strategy through which the rural areas can become digitally literate by mainly emphasizing the digital development of the teachers initially. The research also highlights the challenges in the integration of these strategies in rural areas.

1-4- Research Scope

The scope of the research is limited to Indonesia, Russia, and the Middle East regions, where the government is introducing several programs to incorporate digital literacy in the backcountry. This research has covered the views and responses of several interviewers. The rationale for selecting these three regions is based on the geographical affiliation of the researchers, which added value to assessing the digital literacy of these three distinct regions to add to the existing literature. Many factors influence the digital literacy of teachers in rural areas other than the ones highlighted in the research, but the study has emphasized the few factors that highly impact the technological development in the educational sectors of the rural areas in Indonesia, Russia, and the Middle East region.

2- Literature Review

2-1- Digital Literacy

Digital literacy can be defined as a person's capacity to use technology-based information to access, interpret, and convey knowledge while requiring both intellectual and technical abilities [6]. Literacy can be divided into three divisions: finding and acquiring digital data, producing digital information, and conveying digital knowledge [1]. Technological advancements have made digital literacy the only way to survive in this era. Digital literacy has provided many advantages and opportunities for individuals, businesses, and countries to achieve success. Digital literacy has become a major source for providing companies with a competitive advantage in the enormously competitive market [7]. Digital literacy facilitated all sectors significantly. Our research mainly highlights the impacts of digital literacy in the educational sector [8].

2-2- Technology in Education

Technology has fostered every aspect and sector in the world; it is impossible to survive in today's world, for businesses or individuals, without the integration of technology into daily operations, as technology has made work easier and more efficient [9]. The integration of technological advancement in the educational sector has provided various benefits not only to students but to teachers and educational institutes as well. Technological integration has provided convenience, efficient transfer of knowledge, and increased interactiveness. According to Raja & Nagasubramani [10], visual learning helps students learn better, which is why almost every higher education sector is opting for the use of PowerPoint Presentations (PPTs), videos, and other visual learning techniques in their institutes. However, this integration of technology is still limited in the secondary education system. Moreover, technology also assists students and teachers with access to material that helps them understand lessons better and provides them with all the available knowledge at high convenience [11]. Besides, with digitalization, the concept of online degrees has also gained much importance, which enables students to achieve online certification and degrees and improve their skills in their interest fields with much ease and cost efficiency. Hence, technological advancement and integration had variously beneficial effects on the educational sector, and with digitalization, the incorporation of technology in educational and other sectors will continue to grow [12].

2-3- Impact of Technology Adoption on Education

The impacts of technology adoption in the education sector are significant, especially in terms of the usage and absorption of information on individual and institutional levels. However, the impacts of these technological advancements have positively and negatively influenced the educational sector [10]. The positive impact that digital literacy had on the educational sector is that it provided ease for the students and teachers as well as to understand and make others understand a concept easily through digital tools, Microsoft software, informative websites, and other programs. Besides, digital literacy in the education sector has diminished the geographical barrier [13]. Several online courses, certifications, and degrees have been introduced at multiple universities and educational institutions, which help students and teachers to transfer their knowledge without being physically present in the classroom. This innovation has enabled students to take part in educational programs anywhere in the world. Moreover, digital literacy tends to boost engagement in education as students must show their creativity in different assignments through different software like Adobe, which helps them understand and communicate better through visuals [14]. As well as this software helps teachers make their lessons interesting and engaging. In contrast to this, there are several negative effects that digital literacy has on education, such as negatively impacting writing skills. Students use different software to improve their grammar and spelling in their assignments and other educational chores, which hamper their writing skills. As the students are unaware of proper grammar usage in sentences and do not know spelling, moreover, technological

advancement has increased the incidents of cheating in exams through digital devices like graphic calculators. It is very easy for students to write formulas for the exams with minimum chances of getting caught. In the bargain, it is also a challenge for teachers to maintain students' focus in online education, as being connected to digital tools makes it difficult to maintain concentration [15].

2-4- Theoretical Approach

The theoretical basis for this study is linked with the concept of the Teacher's technology acceptance model (TAM) along with the Technological Pedagogical and Content Knowledge framework (TPCK or TPACK) which are commonly used for assessing the self-efficacy of the teachers. The self-efficacy of the teachers is an assessment of the individual's self-efficacy within a specific teaching context [16]. This underpins the psychological thought process and its impact on the teaching process adopted by the individuals. Additionally, the TAM model originates from the self-efficacy theory, channel disposition model, and behavioral decision theory, which helps in determining the perceived usefulness of the technology along with perceived ease of usage. TAM uses the language pertaining to human activities in questions about perceived ease of usage. More precisely, the model of TAM is used to assess the behavior of a teacher during online education and digital literacy.

2-5- The Effect of Digital Literacy on Teachers' Proficiency in Rural Areas

The concept of digital literacy in rural areas has been nonexistent across the world. Digital literacy is a survival skill in today's world as it strengthens teachers as well as students to use digital tools to achieve their educational goals and objectives. To reduce the existing gap between people and digital literacy, educators must be digitally acknowledgeable and to teach others digital skills. In rural areas, as they are not technological advance, the teachers themselves lack the knowledge and awareness of the digital existence and the use of digital tools [17]. Some major factors are significantly impeding digital advancement in rural areas, including the unavailability of digital resources, poverty, and the unaffordability of digital devices. But one of the major barriers is that the teachers themselves in the rural areas do not possess digital literacy. According to Hassan & Mirza [18], the lack of adoption and technology in educational institutions in rural areas is because of the disinclination of digital applications by the teachers themselves, which is causing congestion in the integration of digital literacy. This is why it is essential to liberate the teachers first by introducing teacher training programs before the integration of digital resources in rural areas. As these technological advancements have changed, the responsibilities of a teacher have shifted too. Rather than just being a secondary transferor of knowledge, the teacher acts as a consultant and mentor for the students [19].

2-6- Strategies for Digital Literacy for the Professional Development of the Teachers in Rural Areas

Training teachers to be digitally literate will require initiatives by the government in the form of teacher training programs and courses. Some institutions globally are providing digital literacy courses for underdeveloped areas to take the world to the next level by educating at least one person in each family with digital skills. The Microsoft Company has introduced several digital training courses as they strongly believe that digital skills are necessary for economic growth [20]. To professionally develop teachers in digital literacy, the government and companies like Microsoft have initiated several strategies, which include providing free digital training courses with required resources to teachers living in underdeveloped areas. Several schemes have been introduced globally to invest in the non-profit population of the backcountry areas in order to educate them about the current advancements and bring them into the job market to benefit the economic growth of the country. Training of digital skills in the native language so that it is easy for people to understand and adopt. Besides, training programs have been introduced at the national level from the beginning to the advanced level of development of digital skills, which include training teachers by using video and audio conferencing and recorded lectures for their ease [2].

2-7- Limitations of Digital Literacy on Professional Development in Rural Areas

Several limitations and challenges hamper the integration of digital literacy in the educational sectors of rural areas. The first and most significant reason for the underdevelopment of dialing skills in rural areas is the unavailability of poor telecommunications infrastructure. The reason behind that the distance between the town and the villages or backcountry is large, due to which the cost of developing telecommunications infrastructure is also very high. The other limitation in professional digital development is the unavailability and unaffordability of digital devices and resources [21]. As the residents of rural areas are living hand to mouth and fulfilling their basic needs is even more difficult for them with very limited resources and poverty. People in rural areas cannot afford these devices and resources due to their high prices [18]. The government's financial support for integrating technology and digitalization in educational institutions is also at a minimum, which is why students and teachers are unable to have access to digital devices in education. Besides, people living in rural areas are still unfamiliar with the existence of digital literacy due to a lack of education. People are still using obsolete methods for education and work. This unawareness influences the lack of motivation toward the adoption of these advancements. In addition, the people in rural areas are traditional conservatives that are not ready to

adapt to any changes, especially those related to digital advancements, as they fear that these changes will bring cultural and moral damage to them and their society. Lastly, the unavailability of proper human resources and specialists able to guide and train the locals in digital literacy is also a challenge [22]. The trainers assigned to teacher training programs in many rural areas by the government are themselves not properly trained and possess very poor digital skills. Hence, for any sought digital advancement or digital development in rural areas, these fundamentals should be considered to make digital literacy possible.

3- Research Methods and Methodology

The following section comprises the research and data collection methods used in analyzing the results of the professional development of rural teachers based on digital literacy.

3-1- Research Philosophy and Approach

The research approach is one of the significant elements in the research, which enables researchers to gather, examine and evaluate data [23]. The research approach comprises three basic methods including qualitative, quantitative, and pragmatic methods. Researchers select the research approaches based on the data needed for the research. Quantitative data collection methods comprise the techniques that are used to interpret and evaluate data that is either in the form of numbers or statistics or graphs or any other quantitative form Mishra & Alok [24]. Besides, the qualitative methods of research enable the researchers to collect and interpret the data that are in the form of theories based on the relevant experiences, views, and opinions of the respondents. Lastly, the pragmatic approach enables researchers to apply both qualitative and quantitative methods techniques to gather, interpret and analyze the data relevant to the research issue [25]. To research the professional development of rural teachers based on digital literacy, the study has used the qualitative approach comprehensively specifically in the context of Indonesia, Russia, and the Middle East region. In this research, to explore the significance of digital literacy in the professional development of teachers living in rural areas, interpretive research philosophy has been used. As the research will use the primary form of the data by using the quantitative data collection method hence positivist philosophy will be appropriate for the research. The positivist approach emphasizes the objectivity as well as investigative aspects of the research approach [26]. Hence, the positivist approach will allow having an in-depth analysis containing the questions like why, what, when, how, etc. in the context of the digital literacy application in rural educational institutes.

3-2- Research Design

The framework of the steps and procedures to conduct research is referred to as the research design in the research methodology [27]. The research design comprises three techniques, including data collection methods, methods for measuring data, and techniques incorporated to analyze the data gathered for the research issue. In the bargain, research designs are classified into four types: experimental research, descriptive research, exploratory research, and explanatory research [28]. To study the factors that impact the rural teacher being digitally literate the research design that is used is descriptive research so that first-hand or primary information covering all the aspects or issues of the research problem can be obtained from the teachers in the rural areas. The descriptive form of research provides insights on existing topics like population, etc. [29], which is why it will be relevant to the research conducted. However, the descriptive form of the research will be described through the survey conducted to determine and analyze different aspects and the lack of digital literacy in rural areas, especially in terms of Russia, Indonesia, and the Middle East regions.

3-3- Data Collection

The data collection process revolves around the concept of collecting information from all relevant and accessible sources to jot down a solution to the identified research issue [30]. The data collection method also allowed the researchers to interpret the outcomes of the research too. Data collection methods are generally categorized into two categories: primary data collection methods and secondary data collection methods. The primary data collection method involves gathering data from first-hand or initial sources, which include interviews, questionnaire surveys, or experiments. The collection of primary data is convenient and cost-efficient; however, it is difficult to ensure authenticity and unbiased in this form of data collection method, which may affect the results of the research too [31]. The second data collection method is known as secondary data collection, in which the researcher opts for information that is available through auxiliary sources, including journals or books [32]. For this study, primary data collection methods have been opted because the research emphasizes the importance of the development of digital literacy for rural teachers, since the rural areas can become digitally literate and contributing significantly to the country's growth concerning Indonesia, Russia, and Middle East regions.

3-4- Research Instrument

Research instruments can be generally defined as the techniques and tools through which the research is going to be conducted [33]. These research instruments depend upon the data that needs to be collected in the form of primary and secondary data. Some of the most common research instruments through which primary and secondary data can be gathered include interviews, questionnaire surveys, focus group discussions, journals, websites, books, experiments, and

many more, etc. [34]. To study the ways through which professional development of digital literacy in rural teachers can build the research instruments the close-ended questionnaire survey method has opted for. As for the research, the focus has been laid on primary data collection hence collecting data through surveys is deemed appropriate. A Survey of teachers living in rural areas will enable them to have in-depth knowledge of the current situation in Russia, Indonesia, and the Middle East region. This will also help get authentic knowledge of the challenges and limitations that rural areas face in integrating digital literacy. Moreover, choosing a survey will also help to maintain cost efficiency during the research. Lastly, surveys highly rely based on numeric data, which is why they are selected as it promotes the generalizability of the data findings to a wider population.

3-5- Data Analysis

Data analysis methods in research methodologies comprise the techniques and tools to analyze and interpret the data in the form of logic and statics [35]. The research conducted as highlighted above aims to find the importance of the professional development of rural teachers based on digital literacy in the context of Russia, Indonesia, and China. To find the relevant data for the research and to analyze it efficiently, the statistical analysis method has been opted for as it complies with the selected research approach, data collection methods, and data sources. The statistical analysis focuses on the numeric testing of the data conducted using SPSS software to ensure data accuracy and validity of the findings of the study. For the following research, a close-ended survey of rural teachers was conducted to master the challenges in the integration of digital literacy in rural areas. This is why statistical analysis is appropriate for structured questions.

3-6- Ethical Consideration

Ethical considerations reflect the moral and ethical practices maintained during the research [36]. While conducting our research, the researcher maintained the practice of these ethical considerations by obtaining consent before final recruitment. Besides, the respondents were not compelled or forced to reveal information that is private to them or did not wish to share during the interviews. The questions the survey were shared with the teachers who were the respondents, to maintain transparency and communication. The rights of the respondents were protected and confidentiality and voluntary participation were also ensured. Besides, the respondents were properly informed of the niche and specific area of the research and the value of their responses contributes to the study. The study highly relied on the data analysis based on demographic or physiographic factors in the context of Russia, Indonesia, and the Middle East region without personal identity revelation.

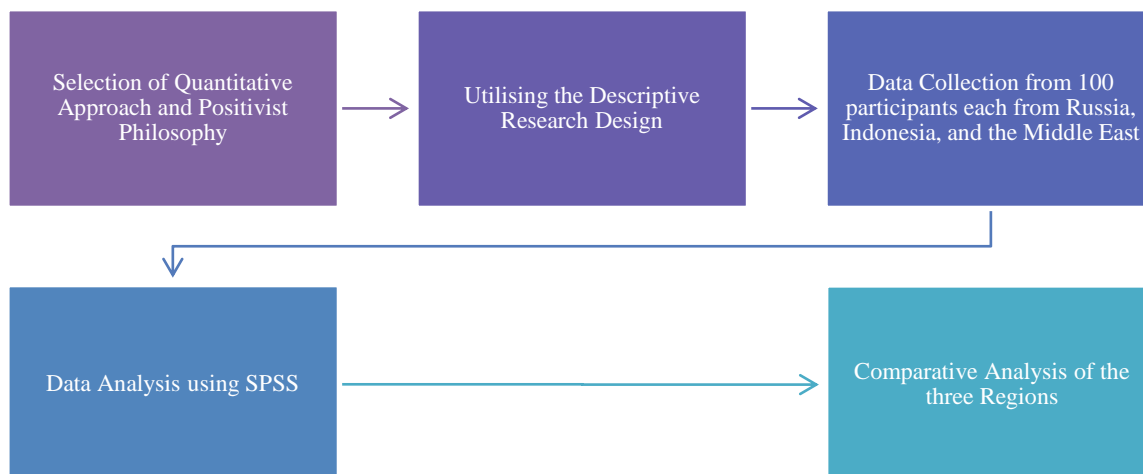The workflow of the research process is the following (Figure 1):

Figure 1. The flowchart of the research methodology

4- Results

This section discusses the results of the survey. The survey received 100 responses from each of the three countries.

4-1- Indonesia

4-1-1- Demographic Characteristics

After analysing the demographic characteristics of the participants from Indonesia, it is found that most participants were male 67 percent presence while only 33% of the participants were female (Figure 2). Figure 3 represents the age of the participants and shows that majority of the participants were aged between 31 and 35 years (32 per cent) and 36 to 40 years (29%). Furthermore, in terms of education and experience level, most of the participants had a master's degree with 53% presence (Figure 4) and 5 to 10 years of professional experience with 37 per cent presence (Figure 5).
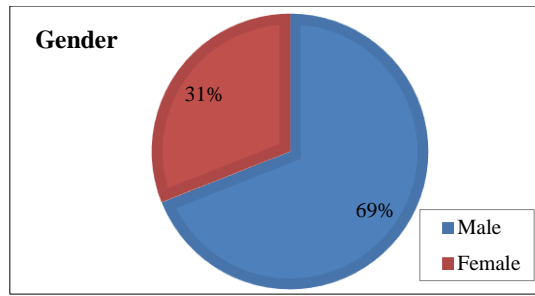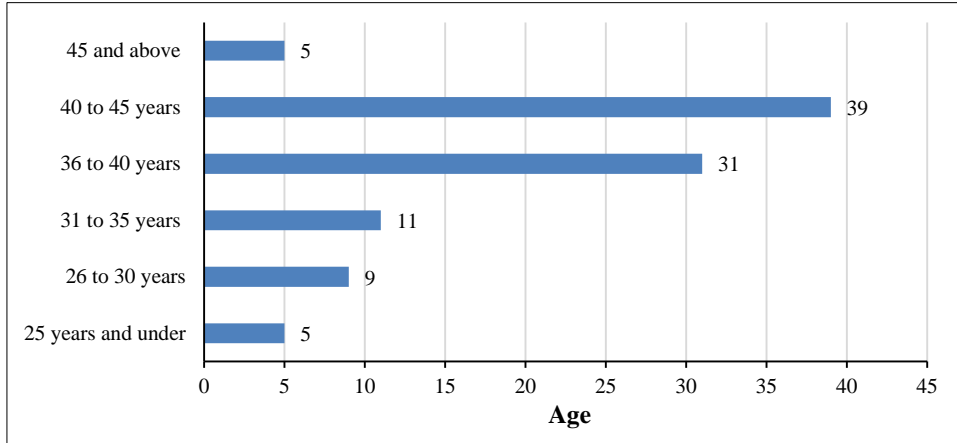
Figure 2. Gender of the participants
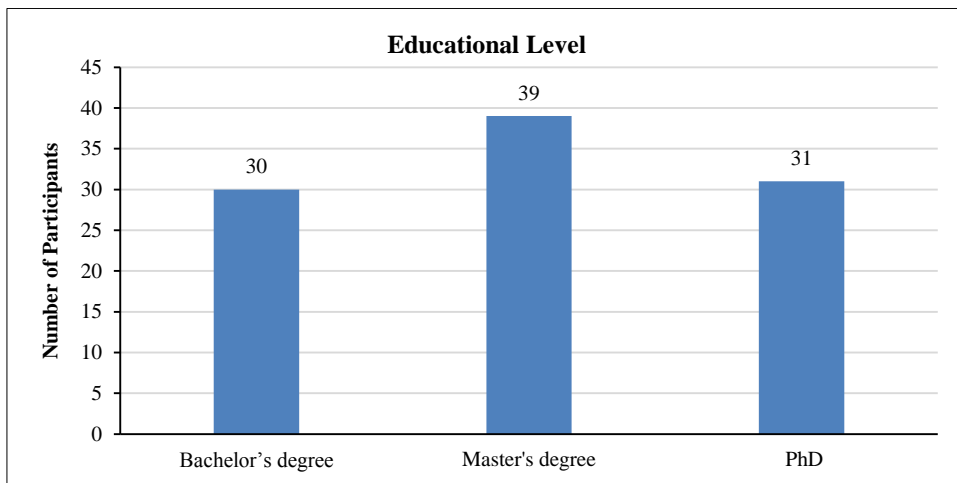

Figure 3. Age of the participants

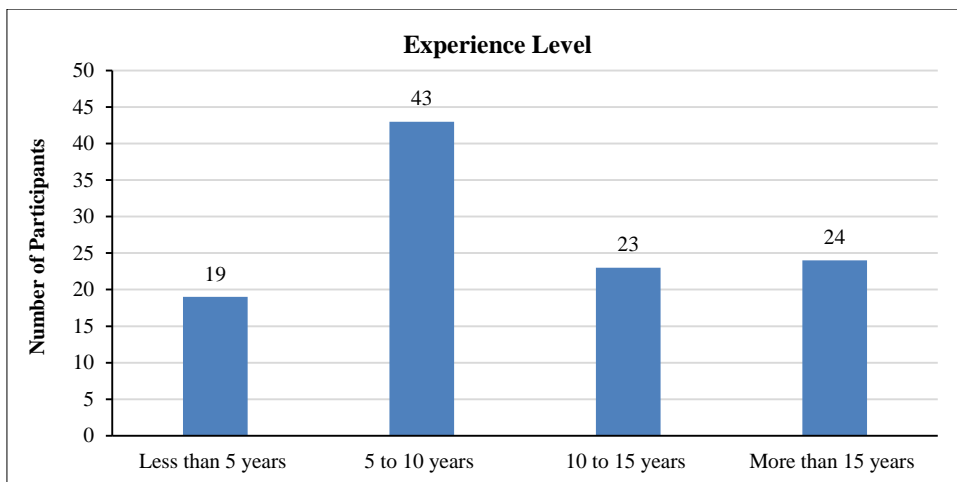

Figure 4. Educational level

Figure 5. Experience level

4-1-2- Survey Findings

Table 1 presents the results of the descriptive statistics for a survey conducted to measure the existing digital literacy and competence of rural teachers in Indonesia. The results show that the mean values of all items are greater than the standard deviation. This implies that all data points (responses) are located near the mean of the data. The standard deviation value implies that there is no significant variation in the responses to all items. Thus, consistent responses were obtained from all participants. The mean value of most of the items was found to be between 2.5 and 3.3, which shows that the data is skewed on the left side of the scale. This implies that most rural teachers from Indonesia who participated in the study disagreed with the survey propositions, indicating that, currently, the digital literacy and competence of the rural teachers are considerably low. This is aligned with the findings of the extant literature that suggested that in rural regions, teachers lack the knowledge and awareness of digital tools and technologies [17], which would result in low digital literacy and competence among the teachers.

Table 1. Digital Literacy and Competence of Teachers

Items	N	Min	Max	Mean	SD
I actively use ICT tools and resources for managing student learning	100	1.00	5.00	2.002	1.1.28872
I have adequate digital equipment in my classroom	100	1.00	5.00	2.9407	1.24989
I feel I am competent in using ICTs to communicate to the student about learning and course material	100	2.00	5.00	2.5000	1.06462
At our university/school, teachers actively incorporate ICT tools and resources into teaching	100	1.00	5.00	2.8898	1.20948
I create a lesson plan using digital tools (such as the internet, search engines, digital programs etc.)	100	1.00	5.00	3.2831	0.997621
I feel competent enough for developing teaching material using digital tools and resources in my subject area	100	1.00	5.00	2.2373	0.89712
I feel confident in using a digital tool to enhance my mastery in my subject area	100	1.00	5.00	2.1017	0.97226
I feel confident in using digital tools and resources to manage the learning environment	100	1.00	5.00	3.3763	0.58872
I like to use digital technology in teaching	100	1.00	5.00	3.2418	1.20831

Table 2 presents the results of the descriptive statistics for measuring the extent to which digital literacy training is provided to rural teachers in Indonesia for their professional development. Responses were found to be free from significant variations. Analysing the mean values of all items, it is worth noting that only 2 items received relatively higher rating responses (agree or strongly agree) while the rest of the items received low rating responses having mean values between 2.0 and 3.4. The results of table 2 show that the teachers are not really provided with sufficient training for digital literacy professional development. The findings of Wilson et al. [22] support the current survey, suggesting that people living in rural areas are still unfamiliar with the existence of digital literacy due to a lack of relevant education. Hence, they use old methods of education and teaching. This demonstrates the absence of relevant education and training facilities for teachers in rural areas. Despite that, they try to participate in online courses and webinars for professional development. A smaller proportion of the teachers also receive formal job-related training using various digital tools and programs as the mean value of this item is 3.9, showing that responses are skewed a little on the right side (neutral, agree and strongly agree).

Table 2. Digital literacy training for professional development

Items	N	Min	Max	Mean	SD
Digital technology was a part of my induction training at my university/school	100	1.00	5.00	2.5467	1.11257
I tend to participate in online courses and webinars for professional development	100	2.00	5.00	3.8971	0.89764
I received an introduction course on using the internet and general application	100	1.00	5.00	2.12435	1.90876
I received training on the pedagogical use of digital tools and resources in teaching	100	1.00	5.00	2.0021	1.09435
Teachers at my university/school, are provided with formal job-related training using various digital tools and programs (multimedia, audio/video aid etc.)	100	1.00	5.00	3.9121	1.67542
I actively participate and engage with other teachers in online communities for professional discussions	100	1.00	5.00	2.3456	1.23876
Teachers at my university/school, are provided with training to use various ICT tools and resources (Equipment-specific training)	100	1.00	5.00	2.6754	1.32678
Teachers at my university/school have to complete e-learning sessions	100	1.00	5.00	3.3362	1.08567

Lastly, Table 3 presents the barriers faced by rural teachers in Indonesia in enhancing their professional development via digital literacy. Responses were found to be free from significant variations. All the items have a mean value between 3.9 and 4.8 showing high agreement of the participants with the following survey proposition. This implies that the teachers in the rural areas of Indonesia are not provided with adequate training and equipment use of digital tools hinders their professional development in relation to digital literacy. The major barrier to the provision of digital literacy is the lack of adequate telecommunication infrastructure in rural areas. This is further exacerbated by tunavailability of digital devices and resources [21]. Thus, these factors impede the digital literacy of the teachers, contributing to their low level of experience, awareness and knowledge of digital technology and tools.

Table 3. Barriers to professional development based on digital literacy

Items	N	Min	Max	Mean	SD
The lack of adequate hardware and equipment (computer, internet, interactive boards) etc. prevents us from using digital tools in teaching	100	1.00	5.00	4.1212	1.77894
The lack of training and development opportunities for teachers to develop digital literacy and competence	100	1.00	5.00	3.9695	1.90865
The lack of proper digital literacy training for the teachers	100	1.00	5.00	4.0847	1.11235
The use of digital tools in job-related training is low or negligible	100	1.00	5.00	4.788	1.67832

4-2- Russia

4-2-1- Demographic Characteristics

In the case of Russia, more balanced participation of male and female rural teachers was received with 53 and 47 per cent presence respectively (Figure 6) while most participants were found to be aged between 36 to 40 years(44 per cent) (Figure 7). Furthermore, in terms of education level, most of the participants had a master's degree and PhD with 43 per cent and 33 per cent presence respectively (Figure 8). Lastly, most participants possessed 5 to 10 years of professional experience with a 41 per cent presence (Figure 9).
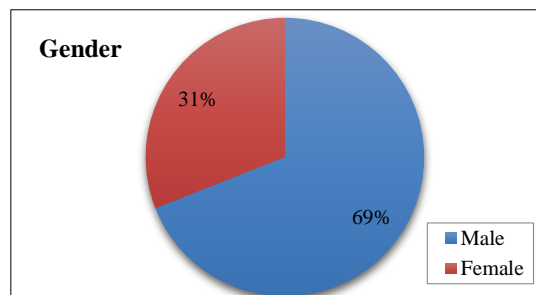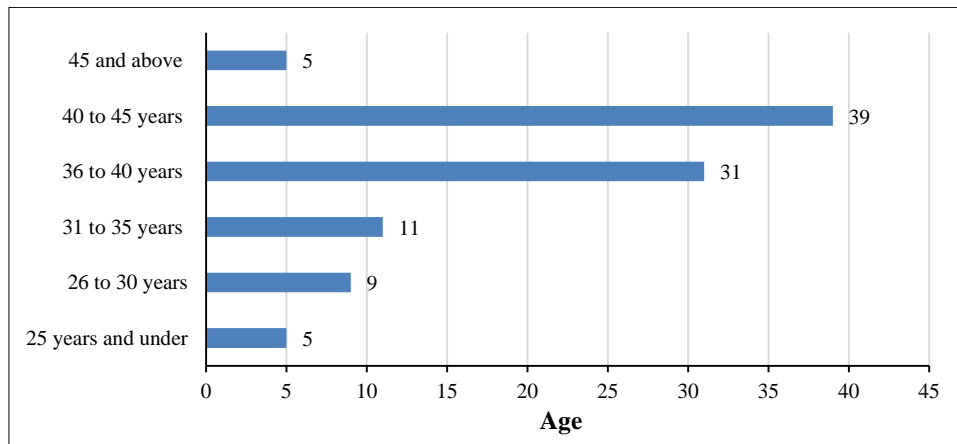

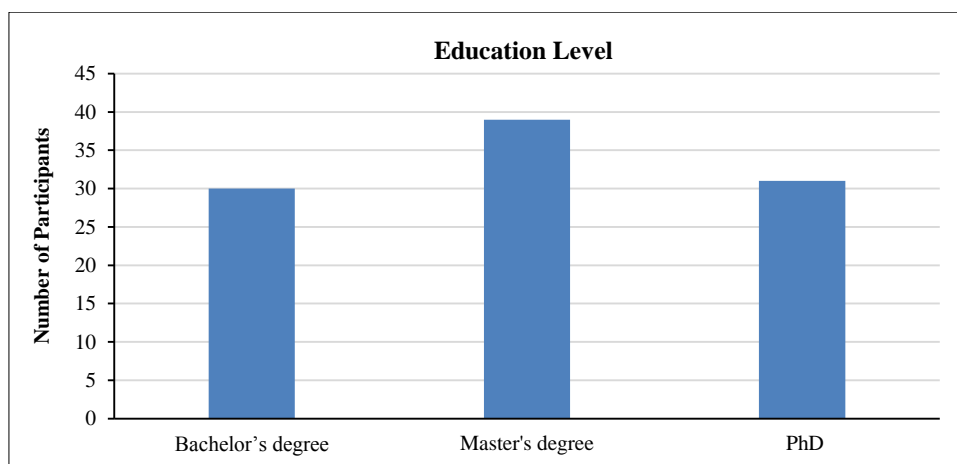**Figure 6. Gender of the participants**

Figure 7. Age of the participants
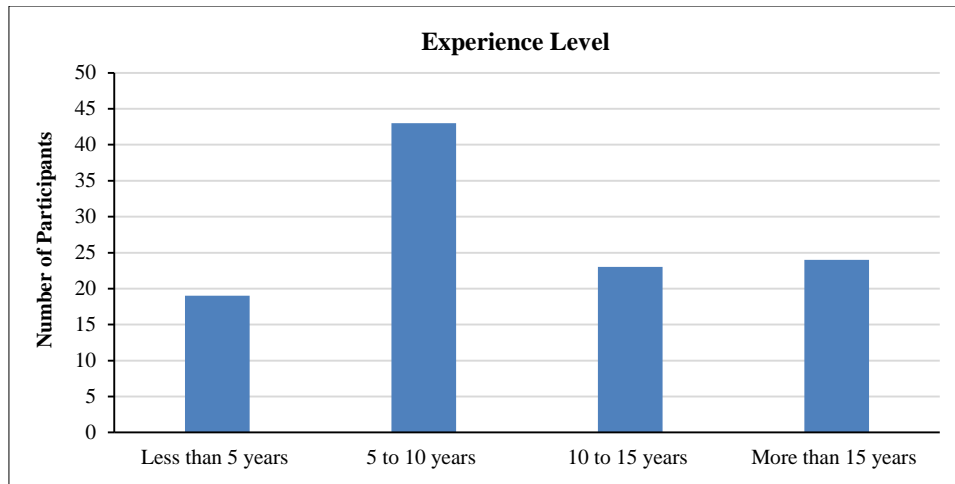

Figure 8. Educational level

Figure 9. Experience level

4-2-2- Survey Findings

Table 4 presents the results of the descriptive statistics for the existing digital literacy and competence of rural teachers in Russia. The results show that most items have a mean value between 3.1 to 4.2 showing that the data is skewed on the right side of the scale (neutral, agree and strongly agree). This implies that a considerable number of participants agreed with the survey propositions and thus, they possess some level of digital literacy and competence. Table 5 presents the results of the descriptive statistics for measuring the extent to which digital literacy training is provided to rural teachers in Russia for their professional development. Analyzing the mean values of all items, it is worth noting that except for the third and the last item, the rest of the items have mean values above 3.3 showing that participants marked options on the right side of the scale (neutral, agree and strongly agree). This implies that teachers in the rural areas of Russia are provided with some level of training and access to digital tools that contribute to their professional development. These findings support the extant literature that presented the idea that digital training is imperative to make teachers digitally literate and competent. The provision of training is the major means for improving the knowledge and awareness of the people pertinent to digital technology [2, 20]. Thus, it can be deduced that the developed digital literacy and competence of the teachers in the rural regions of Russia can be attributed to the provision of training to them. Nonetheless, teachers do not receive any kind of introductory course on using the internet and general application and do not have to complete e-learning sessions.

Table 4. Digital literacy and competence of the teachers

Items	N	Min	Max	Mean	SD
I actively use ICT tools and resources for managing student learning	100	1.00	5.00	3.0424	1.45732
I have adequate digital equipment in my classroom	100	1.00	5.00	4.1456	1.89754
I feel I am competent in using ICTs to communicate to the student about learning and course material	100	2.00	5.00	4.0071	0.23895
At our university/school, teachers actively incorporate ICT tools and resources into teaching	100	1.00	5.00	3.1123	1.23095
I create a lesson plan using digital tools (such as the internet, search engines, digital programs etc.)	100	1.00	5.00	3.9876	1.16387
I feel competent enough for developing teaching material using digital tools and resources in my subject area	100	1.00	5.00	4..0098	0.95432
I feel confident in using digital tools to enhance my mastery in my subject area	100	1.00	5.00	4.1017	1.27846
I feel confident in using digital tools and resources to manage the learning environment	100	1.00	5.00	3.5763	1.10542
I like to use digital technology in teaching	100	1.00	5.00	3.7712	1.27845

Table 5. Digital literacy training for professional development

Items	N	Min	Max	Mean	SD
Digital technology was a part of my induction training at my university/school	100	1.00	5.00	3.5815	1.67432
I tend to participate in online courses and webinars for professional development	100	2.00	5.00	4.1145	0.27693
I received an introduction course on using the internet and general application	100	1.00	5.00	3.0010	1.24568
I received training on the pedagogical use of digital tools and resources in teaching	100	1.00	5.00	3.9831	1.24901
Teachers at my university/school, are provided with formal job-related training using various digital tools and programs (multimedia, audio/video aid etc.)	100	1.00	5.00	4.1610	1.87259
I actively participate and engage with other teachers in online communities for professional discussions	100	1.00	5.00	4.8220	1.27476
Teachers at my university/school, are provided with training to use various ICT tools and resources (Equipment-specific training)	100	1.00	5.00	3.7781	1.28943
Teachers at my university/school have to complete e-learning sessions	100	1.00	5.00	2.0012	1.29041

Lastly, Table 6 presents the barriers faced by rural teachers in Russia in enhancing their professional development via digital literacy. All the items have a mean value below 3 indicating disagreement except for the last item which is slightly higher than 3.1 showing a small level of agreement. This implies that rural teachers in Russia perceive very few barriers to their professional development via digital literacy. Based on these results, the high competence and the provision of digital literacy training of the teachers in rural Russia can be attributed to the developed digital infrastructure and the provision of adequate hardware and equipment as lack of these were identified as the major barriers to the development of digital literacy in the rural regions in the review of the extant literature [18, 21, 22].

Table 6. Barriers to professional development based on digital literacy

Items	N	Min	Max	Mean	SD
The lack of adequate hardware and equipment (computer, internet, interactive boards) etc. prevents us from using digital tools in teaching	100	1.00	5.00	2.0012	1.67983
The lack of training and development opportunities for teachers to develop digital literacy and competence	100	1.00	5.00	2.1695	1.09564
The lack of proper digital literacy training for the teachers	100	1.00	5.00	2.8976	1.23896
The use of digital tools in job-related training is low or negligible	100	1.00	5.00	3.1123	1.11349

4-3- Case Study: Middle East

4-3-1- Demographic Statistics

Lastly, in the case of the Middle East, the majority of the participants were male with 69 per cent presence while only 31 per cent were female (Figure 10). In terms of age, the highest participation was from the age group 40 to 45 years (39%) followed by 31% of those aged between 36 and 40 years (Figure 11). In terms of education and experience level, most of the participants had a master's degree (39%) (Figure 12) and 5 to 10 years of professional experience (43%) (Figure 13).
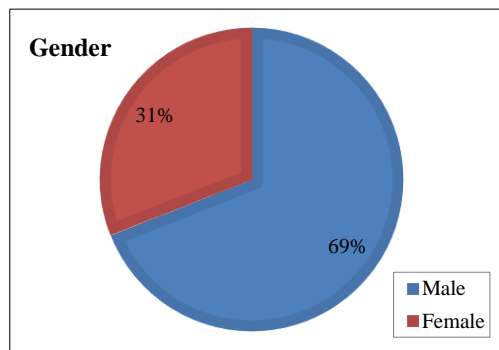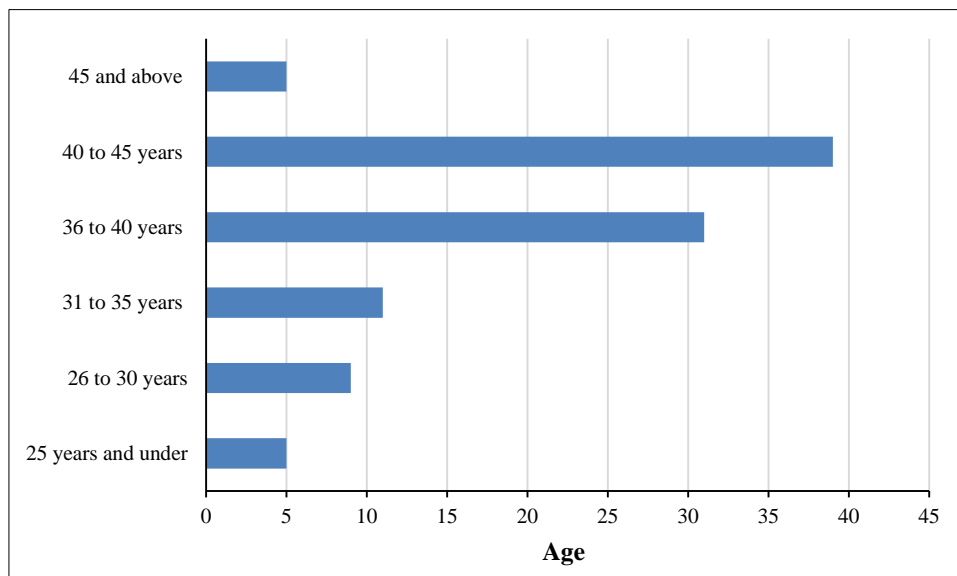

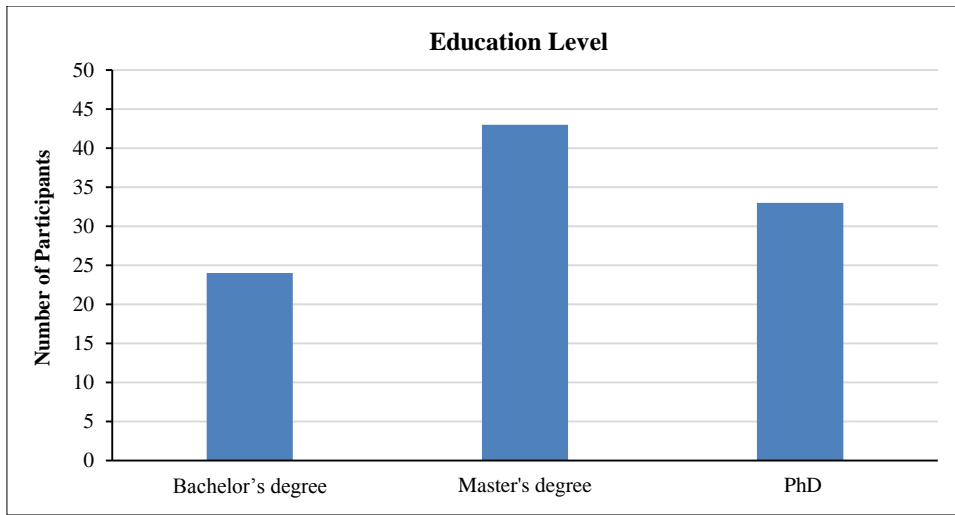**Figure 10. Gender of the participants**

Figure 11. Age of the participants
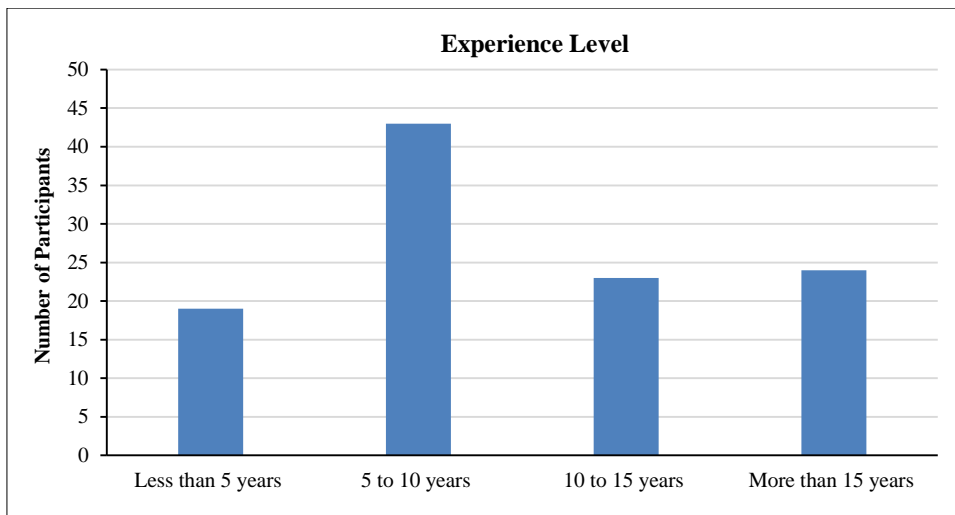
Figure 12. Educational level

Figure 13. Experience level

4-3-2- Survey Findings

Table 7 presents the results of the descriptive statistics for the existing digital literacy and competence of rural teachers in the Middle East. The results are found to be similar to that of Indonesian teachers, with lower mean values indicating that the majority of the participants disagreed with the survey propositions. Thus, rural teachers in the Middle East possess poor digital literacy and competence. These findings are found to be similar to the survey results of Indonesian teachers supporting the findings of the literature. It is asserted that in rural regions, the teachers lack the knowledge and awareness of digital technology because to which they are not really digitally literate and competent [17]. Due to this lack of knowledge, teachers are not really inclined towards the application of digital technology [18]. Due to such lack of experience with digital technology owing to their disinclination, they remain incompetent.

Table 7. Digital literacy and the competence of the teachers

Items	N	Min	Max	Mean	SD
I actively use ICT tools and resources for managing student learning	100	1.00	5.00	2.2234	1.78542
I have adequate digital equipment in my classroom	100	1.00	5.00	2.8965	1.26890
I feel I am competent in using ICTs to communicate to the student about learning and course material	100	2.00	5.00	3.0001	0.23526
At our university/school, teachers actively incorporate ICT tools and resources into teaching	100	1.00	5.00	3.000	1.45723
I create a lesson plan using digital tools (such as the internet, search engines, digital programs etc.)	100	1.00	5.00	2.9831	1.26578
I feel competent enough for developing teaching material using digital tools and resources in my subject area	100	1.00	5.00	2.2373	0.23484
I feel confident in using digital tools to enhance my mastery in my subject area	100	1.00	5.00	2.1017	1.43567
I feel confident in using digital tools and resources to manage the learning environment	100	1.00	5.00	2.2267	1.89433
I like to use digital technology in teaching	100	1.00	5.00	2.8865	1.22376

Table 8 presents the results of the descriptive statistics for measuring the extent to which digital literacy training is provided to rural teachers in the Middle East for their professional development. Again, the results are somewhat similar to the results in Indonesia. A considerable proportion of participants agreed with the statement that digital technology was a part of their induction training at my university/school as the mean value of this item was 4.2. Nonetheless, the rest of the items received low-rating responses with a mean value between 2.3 and 3.2. Thus, there is a lack of proper digital literacy training for the professional development of rural teachers in the Middle East. This is again in line with the findings of the previous studies that have emphasized the need for digital literacy training for the professional development of teachers [2, 20]. In this regard, the low competence and lack of digital literacy of Indonesian teachers can be attributed to the lack of training opportunities.

Table 8. Digital literacy training for professional development

Items	N	Min	Max	Mean	SD
Digital technology was a part of my induction training at my university/school	100	1.00	5.00	4.2113	1.67443
I tend to participate in online courses and webinars for professional development	100	2.00	5.00	2.3559	0.67894
I received an introduction course on using the internet and general application	100	1.00	5.00	3.1125	1.99821
I received training on the pedagogical use of digital tools and resources in teaching	100	1.00	5.00	2.9831	1.00765
Teachers at my university/school, are provided with formal job-related training using various digital tools and programs (multimedia, audio/video aid etc.)	100	1.00	5.00	2.1610	1.89432
I actively participate and engage with other teachers in online communities for professional discussions	100	1.00	5.00	2.8220	1.42596
Teachers at my university/school, are provided with training to use various ICT tools and resources (Equipment-specific training)	100	1.00	5.00	2.8644	1.24637
Teachers at my university/school have to complete e-learning sessions	100	1.00	5.00	3.1271	1.37591

Lastly, Table 9 presents the barriers faced by the rural teachers in Middle East to enhance their professional development via digital literacy. All the items have a mean value between 3.5 and 4.7 showing high agreement of the participants with the following survey proposition. Thus, rural teachers in the Middle East perceive high barriers to their professional development via digital literacy. It is found from the review of the extant literature that the unavailability of digital resources, lack of proper digital infrastructure, and the unaffordability of digital devices are the major barriers impeding digital advancement in rural areas [17, 18, 21]. Furthermore, the integration of technology and digitalization in educational institutions is very low due to which teachers do not have access to digital devices while the lack of specialists who can guide and train teachers also exacerbates this issue [22].

Table 9. Barriers to professional development based on digital literacy

Items	N	Min	Max	Mean	SD
The lack of adequate hardware and equipment (computer, internet, interactive boards) etc. prevents us from using digital tools in teaching	100	1.00	5.00	3.8983	1.19375
The lack of training and development opportunities for teachers to develop digital literacy and competence	100	1.00	5.00	4.1378	1.46289
The lack of proper digital literacy training for the teachers	100	1.00	5.00	4.6745	1.28913
The use of digital tools in job-related training is low or negligible	100	1.00	5.00	3.4757	1.28893

5- Discussions

5-1- Main Findings of the Present Study

This study highlights the current status of the professional development of rural teachers in Russia, Indonesia, and the Middle East. It was found that digital literacy remained low among rural teachers in both Indonesia and the Middle East. The teachers who participated in the survey demonstrated low confidence in their extant digital competence, and thus, they do not actively use ICT tools and resources in designing teaching material or supporting the students' learning. There are many perceived barriers that impede the professional development of teachers in the context of digital literacy. The teachers in Indonesia and the Middle East were found to face major barriers in terms of digital competence and infrastructure, while the situation appears to be slightly better in Russia, as the teachers there reported the existence of adequate hardware and infrastructure. The use of ICT is more common among rural teachers in Russia compared to the teachers in the rural regions of Indonesia and the Middle East. Thus, disparities were found in the professional development of rural teachers based on digital literacy across the three geographic regions. Furthermore, the lack of digital literacy training opportunities was found to be a major issue, while again, the situation was somewhat better in the case of Russia, where the teachers in the rural areas receive somewhat better training for digital literacy. Thus, this boosts their confidence in the level of their digital competence.

5-2- Comparison with Other Studies

The findings of the current investigation are supported by the findings of the existing literature. A review of the literature revealed that the poor availability of the telecommunications infrastructure, as well as the lack of digital devices and resources, hinder the development of digital literacy [21]. This was found to be true in the cases of both Indonesia and the Middle East. Rural teachers from both geographic regions appear to have high perceived barriers to their professional development in relation to digital literacy. Alternatively, the situation appears to be slightly different in Russia, as the survey received somewhat better results from the rural teachers of Russia. The lack of adequate hardware contributed to the barriers to digital literacy impeding the professional development of rural teachers, while the absence of such an issue paved the way for the professional development of teachers in Russian rural areas. The rural teachers from Russia demonstrated better confidence in their digital literacy. They tend to use ICT tools and resources in designing teaching material and managing the learning environment. Their digital literacy is well supported by the digital literacy training that contributes to their professional development. Thus, there are disparities across countries in terms of the professional development of rural teachers based on digital literacy.

Furthermore, their low level of digital literacy and competence is found to stem from the lack of digital literacy training opportunities for them, which hinders their professional development in this area. The literature review also revealed that the lack of proper training to guide teachers with digital literacy is also one of the major challenges [22]. Furthermore, it is asserted that, due to the advancements in the technological era, digital literacy has emerged as the major means for surviving and thriving in the digital era. It has become the major source of a competitive advantage in the enormously competitive market [7]. It is of particularly crucial importance for the educational sector and teachers [8]. The issue of a lack of training was also found to be true in the cases of Indonesia and Russia, where teachers perceive a lack of training and development opportunities as a major barrier hindering their professional development. The analysis of the literature reviews also showed that digital literacy professional development can be supported by the training programs introduced from the beginning for developing digital skills via various digital tools and resources [2]. This finding was found to be true in the case of the Russian rural teachers. The teachers in the rural areas of Russia receive somewhat better training than those in the other two countries. Thus, the higher confidence level of the rural teachers in Russia can be attributed to the provision of training and development opportunities for them. Nonetheless, there exists a need to incorporate introducing courses for using the internet and general application for the locals that lack digital competence. Overall, there is a need to work on the professional development of rural teachers based on their digital literacy.

6- Conclusion and Implications

The study conducted a comparative measurement of the professional development of rural teachers based on digital literacy across three regions: Russia, Indonesia, and the Middle East. The comparative analysis showed that Russia is doing somewhat better in terms of supporting the professional development of teachers in relation to their digital literacy compared to the other two countries. The results and findings of the present survey-based study offer useful implications for the education sectors of Russia, Indonesia, and the Middle East. In particular, this paper presents important practical implications for the policymakers of the Indonesian and Middle Eastern education sectors. The findings of the study have highlighted the gap in the digital literacy of the teachers in the rural areas of Indonesia and the Middle East that has been hindering their professional development. Policymakers must introduce adequate strategies and programs to fill these gaps given the rapidly evolving world and the increasingly technological and digital-driven era. According to survey results, the teachers in the rural areas of Indonesia and the Middle East perceive high barriers to their professional development due to the lack of availability of adequate hardware (infrastructure) and proper training and development. In this regard, policymakers would have to work on the development of adequate training programs for the teachers as well as the development of digital infrastructure to support the professional development of the teachers and ultimately the digital literacy of the rural population.

7- Declarations

7-1- Author Contributions

Conceptualization, H.S.; methodology, H.S. and N.L.; software, E.K.; validation, A.Y. and N.N.; formal analysis, N.N.; investigation, M.K.; resources, A.A.A.A.; data curation, N.K.; writing—original draft preparation, D.G.; writing—review and editing, N.L.; visualization, I.N.; supervision, N.N.; project administration, A.Y. All authors have read and agreed to the published version of the manuscript.

7-2- Data Availability Statement

The data presented in this study are available on request from the corresponding author.

7-3- Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

7-4- Institutional Review Board Statement

Not applicable.

7-5- Informed Consent Statement

The participants provided their written informed consent to participate in this study.

7-6- Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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