ICT Integration in IPEd Schools: Challenges and Skills of Intermediate Teachers and Learners

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Abstracts: This study aimed to investigate the skills and challenges of intermediate teachers and learners in teaching and learning ICT in Indigenous Peoples Education (IPEd) schools in Butuan City Division, Philippines. A total of 63 teachers and 242 learners participated in the study, which used a descriptive survey design and questionnaires to collect data. Results showed that teachers had moderate confidence in technology operations and concepts, while learners displayed slight confidence in creativity and innovation, communication and collaboration, and critical thinking. Learners also perceived all external challenges, such as infrastructure, cost, and access to resources, as moderately challenging. The study found that teachers needed more training in device operations and understanding concepts to better teach students. The researchers recommended that teachers should model the use of technological devices, encourage students to work together and share resources, and incorporate the use of ICT in lesson planning. The study also suggested exploring low-cost technology solutions and seeking support from community organizations and non-profits. Finally, the researchers recommended providing training to teachers and students on how to effectively use technology and ensuring that classrooms have the necessary infrastructure to support its use.

Keywords: ICT integration, IPEd schools, Intermediate teachers, Intermediate learners, Challenges.

1. INTRODUCTION

Information, communication, and technology (ICT) has developed quickly in the twenty-first century, bringing about significant changes as well as affecting the needs of contemporary societies. ICT is playing a bigger role in both our daily lives and our educational system. As a result, there is a rising need for educational institutions to use ICT to impart to students the knowledge and skills they need for the twenty-first century (Buabeng-Andoh, 2012). The use of technology has become increasingly important in education because it has been proven to improve students' learning outcomes. The application of ICT in the classroom has provided teachers and students with opportunities to access and engage with information in new and innovative ways, resulting in enhanced teaching and learning experiences (Raja & Nagasubramani, 2018) However, integrating ICT in the classroom can be challenging for teachers, particularly in intermediate schools (grades 4-7). This research paper aims to investigate the challenges and skills required for intermediate teachers and learners to navigate ICT integration in IPEd schools.

One of the primary challenges faced by intermediate teachers is the lack of sufficient ICT skills and knowledge (Das, 2019). A survey conducted by revealed that many teachers struggle to integrate technology effectively due to a lack of training and support. The lack of ICT skills and knowledge can lead to teachers' low confidence in using ICT tools in their teaching, which affects the quality of their teaching.

Another challenge faced by intermediate teachers is the lack of access to ICT resources and tools (Adarkwah, 2021). This challenge is particularly common in developing countries where access to technology is limited. The availability of ICT resources and tools is essential for effective ICT integration in the classroom. Teachers need to have access to reliable and appropriate ICT tools and resources to support their teaching and learning.

Additionally, the integration of ICT in the classroom requires significant planning and preparation (Janssen et al., 2019). Intermediate teachers need to prepare adequately before implementing ICT tools in their teaching. This preparation includes selecting the appropriate ICT tools, developing relevant content, and designing effective learning activities that incorporate technology. The lack of planning and preparation can lead to ineffective use of ICT tools, which can negatively impact student learning outcomes.

To navigate ICT integration in IPEd schools, intermediate teachers and learners require specific skills. Teachers need to possess both pedagogical and technological skills to effectively integrate ICT in their teaching (Williams & Beam, 2019). Pedagogical skills include the ability to design and implement effective learning activities that incorporate ICT tools. Technological skills include the ability to use and troubleshoot ICT tools and resources.

Similarly, learners need to possess digital literacy skills to navigate ICT integration in their learning (Salmerón et al., 2018) Digital literacy skills include the ability to access, evaluate, and communicate information using ICT tools. These skills are essential for learners to engage in meaningful learning experiences that incorporate technology.

The integration of ICT in the classroom has become increasingly important in contemporary education. However, intermediate teachers face several challenges in navigating ICT integration in IPEd schools. These challenges include the lack of sufficient ICT skills and knowledge, the lack of access to ICT resources and tools, and inadequate planning and preparation. To overcome these challenges, intermediate teachers need to possess both pedagogical and technological skills. Learners also require digital literacy skills to navigate ICT integration in their learning. This research paper has highlighted the challenges and skills required for intermediate teachers and learners to navigate ICT integration in IPEd schools. Future research could investigate the impact of effective ICT integration on student learning outcomes.

2. STATEMENT OF THE PROBLEM

This study investigated the IPEd intermediate teachers' and learners' skills in teaching and learning ICT. Specifically, sought to answer the following queries:

1. What is the level of the ICT skills of the IPEd intermediate teachers in terms of being the following:

1.1. Technology Operations and Concepts;

1.2. Planning and Designing Learning Environment and Experiences;

1.3. Teaching, Learning and Curriculum;

1.4. Assessment and Evaluation;

1.5. Productivity and Professional Practice; and

1.6. Social, Ethical, Legal and Human Issues?

2. What is the extent of ICT skills of the IPEd learners in terms of:

2.1. Creativity and Innovation;

2.2. Communication and Collaboration;

2.3. Research and Information Fluency;

2.4. Critical Thinking, Problem-Solving and Decision Making;

2.5. Digital Citizenship; and

2.6. Technology Operations and Concepts?

3. What is the level of challenges of the IPEd intermediate teachers in teaching ICT in terms of:

3.1. External factors

3.1.1. Infrastructure;

3.1.2. Cost;

3.1.3. Security and privacy concerns;

3.1.4. Access to resources;

3.1.5. Technological advancement;

3.2. Internal Factors

3.2.1. Experience;

3.2.2. Appraisal?

4. Is there a significant relationship between the teachers' ICT skills and the ICT skills of learners?

5. To what extent do the teacher's ICT skills influence pupil'spils ICT skills?

3. METHODS

3.1. Research Design

This study utilized a quantitative research design. Quantitative research is a valuable approach for gaining knowledge and understanding of the social world by systematically collecting and analyzing numerical data related to situations or events that affect people. The study also utilized a descriptive-correlational method for it described the teachers' level of skills and the extent of its relationship to the learners' ICT skills. The descriptive-correlational method allowed for a comprehensive analysis of the data collected from the teachers' and students' responses.

3.2. Local of the Study

The study was conducted in the indigenous people education-implementing public elementary schools in Butuan City Division, Agusan del Norte, Caraga Region, Mindanao, Philippines.

Butuan is located at the mouth of the Agusan River (approximately 250km long) which drains almost one-third of the island (Map1). Butuan City has grown to be a highly urbanized city and the administrative center of Caraga Region (Region XIII) and its local economy is heavily dependent on agriculture and forestry-related industries with coexistence of residential, industrial, commercial, public and recreational types of service-oriented industries. From a historical viewpoint, the place is also well-known for its major archaeological discoveries from the pre-Spanish period and controversy on the first Catholic mass by Ferdinand Magellan.

The natives in Butuan ("Butuanons"), otherwise known as "Lapaknons" (swamp dwellers), have been historically regarded as one of the indigenous groups in Mindanao and the Butuanon ethnolinguistic group is well known nationally and locally for its linguistic distinctiveness and cultural traits. Historically, Butuanons seem to have been integrated as a lowland Christian constituent into a larger Philippine mainstream society. Historians believe that Butuanons come from the Manobo line in Agusan Valley and the Higaonon group.

3.3. Respondents of the Study

This study involved the intermediate teachers at the identified Indigenous People Education-implementing public elementary schools of Butuan City Division with the following number of participants:

Table 1. Teacher-Participants of the Study.

School	Number of Participants
Bugabus Elementary School	4
Bagong Silang Elementary School	5
Kauswagan Elementary School	3
Tud-ol Elementary School	2
Pianing Elementary School	7
Mahayahay Elementary School	3
Tagkiling Tribal Integrated School	3
Dugyaman Elementary School	2
Anticala Elementary School	6
Sinaka IPEd Elementary School	2
Dona Josefa Elementary School	3
La Trinidad Integrated School	13
Kinamlutan Elementary School	10
	Total: 63

Table 2. Learner-Participants of the Study.

School	Number of Participants
Bugabus Elementary School	34
Bagong Silang Elementary School	22
Kauswagan Elementary School	12
Tud-ol Elementary School	5
Pianing Elementary School	23
Mahayahay Elementary School	29
Tagkiling Tribal Integrated School	8
Dugyaman Elementary School	17
Anticala Elementary School	28
Sinaka IPEd Elementary School	13
Dona Josefa Elementary School	14
La Trinidad Integrated School	23
Kinamlutan Elementary School	14
	Total: 242

3.4. Sampling Procedure

The research study utilized a probability sampling method to select participants from the population of Indigenous intermediate public elementary school teachers and learners. Specifically, the study employed the Cochran sampling technique to determine the appropriate sample size. The resulting sample was representative of the population.

3.5. Research Instrument

In this study, the ICT skills of the teachers and learners were assessed using the National Educational Technology Standards for Teachers (NETST) and National Electronic Telecommunications System for Surveillance (NETSS) indicators developed by the International Society for Technology in Education. However, indicators for the challenges were created by the researcher to address the specific context of the locality. Each indicator statement was localized by the researcher and validated by three experts from the Division of Butuan City, Philippines.

The validity of the research instrument was secured through the scrutinized review of the experts as to the appropriateness of the content, structure, the order, and the grammar in the DepEd-Division of Butuan City. After the validity was secured, the instrument was piloted to thirty teachers and learners in the selected pilot test schools.

The responses of the participants that were gathered in the pilot testing were statistically treated to reveal whether the data collected from the instrument was reliable. Eventually, it garnered an r=.968 which signifies reliability of the instrument.

3.6. Data Gathering Procedure

The number and the identity of the schools implementing IPEd were determined through the data given by the division IPEd coordinator of Butuan City Division. A Memorandum of Agreement (MOA) between the NCIP and the DepEd Butuan was provided to the researcher to safely conduct the study. After determining the participants, a letter was sent to the Schools Division Superintendent of Butuan City to ask permission to conduct the study in its IPEd schools. Afterwards, a letter of intent to administer survey was given to the Public Schools Division Supervisors, and School heads of the IPEd Schools before conducting the survey. The survey tool was administered to the IPEd intermediate teacher and learners to assess their ICT skills and challenges in teaching and learning. The data gathered were responsibly taken from the samples in observance to Republic Act No. 10173 or the Data Privacy Act and were subjected to analysis and interpretation.

3.7. Measurement of Variable

The participants' responses to questions about their knowledge, instructional skills, and challenges in teaching ICT will be categorized using statistical measures such as mean, range, and value, along with their corresponding descriptive interpretations.

The table displays the assigned scale, range, and interpretation for each item related to knowledge and instructional skills:

Table 3. Scoring and Quantification Table for Knowledge and Instructional Skills.

Responses	Scale	Range	Interpretation
Very Confident	5	4.50-5.00	The participant possesses outstanding ICT skills.
Fairly Confident	4	3.50-4.49	The participant possesses evident ICT skills.
Neutral	3	2.50-3.49	The participant possesses adequate ICT skills.
Fairly Unconfident	2	1.50-2.49	The participant manifests poor ICT skills.
Very Unconfident	1	1.00-1.49	The participant has very inadequate ICT skills.

Additionally, the following table displays the responses, scale, range, and interpretation assigned for each item related to the challenges of teaching ICT:

Table 4. Scoring And Quantification Table For Challenges In Teaching ICT.

Responses	Scale	Range	Interpretation
Extremely challenging	5	4.50-5.00	The participant sees the indicator as the foremost difficult problem.
Very challenging	4	3.50-4.49	The participant sees the indicator as a difficult problem.
Moderately challenging	3	2.50-3.49	The participant sees the indicator as a reasonable problem.
Slightly challenging	2	1.50-2.49	The participant sees the indicator as a simple problem.
Not at all challenging	1	1.00-1.49	The participant sees the indicator not as a problem.

3.8. Data Analysis

The gathered data underwent several statistical treatments to derive meaningful insights. The level of ICT skills and challenges of the IPEd intermediate teachers and learners in teaching and learning ICT were determined using the weighted mean. Correlation was utilized to examine the relationship between the ICT skills of the IPEd intermediate teachers and those of the learners. Meanwhile, regression analysis was used to determine the extent to which the ICT skills of the teachers influence the ICT skills of the learners. These statistical tools provided a comprehensive understanding of the relationship between the variables and allowed for the interpretation of the data in a meaningful manner.

3.9. Ethical Considerations

Prior to commencing data collection, this study adhered to the ethical guidelines protocol of the university. The respondents were provided with information about the study and given a consent form to sign. To protect the confidentiality and safety of the participants, the researcher had exclusive access to all the surveys and ensured they could not be used in any legal actions against the respondents. These measures were implemented to ensure privacy and maintain ethical considerations that prevent any harm to the personal and academic lives of the respondents.

4. RESULTS

4.1. Level of Skills in ICT in Technology Operations and Concepts

The first objective of the study was dealt with to determine the level of ICT skills of IPEd intermediate teachers in terms of technology operations and concepts, planning and designing learning environment and experiences, teaching, learning and curriculum, assessment and evaluation, productivity and professional practice, and social, ethical, legal and human issues.

4.1.1. Technology Operations and Concepts

Table 5 shows the mean distribution of the level of skills in ICT in technology operations and concepts among the intermediate teachers of the IPEd Schools. As can be gleaned, the third item regarding troubleshooting common technology problems and errors has the least mean of 2.83, indicating moderate confidence. In contrast, the fifth item regarding the use of technology to communicate and collaborate with colleagues and students has the highest mean of 3.71, signifying very confident manifestation of the skill.

Table 5. Mean Distribution of the Level of Skills in ICT in Technology Operations and Concepts.

A. Teachers' Level of Skills in ICT in Technology operations and concepts *I can:*	**Mean**	**Description**
1. identify and understand the basic components of a computer system, such as hardware, software, and peripherals.	3.54	Very Confident
2. navigate and use various operating systems and software applications.	3.48	Moderately Confident
3. troubleshoot common technology problems and errors.	2.83	Moderately Confident
4. apply knowledge of copyright laws, fair use, and digital citizenship in their use of technology.	3.17	Moderately Confident
5. use technology to communicate and collaborate with colleagues and students.	3.71	Very Confident
6. use digital tools to create and deliver instructional materials that engage and support student learning.	3.67	Very Confident
7. understand and apply basic principles of information security and data privacy.	3.56	Very Confident
8. evaluate and select appropriate educational technology tools and resources to support teaching and learning.	3.40	Moderately Confident
9. use technology to assess student learning and progress and provide timely feedback.	3.62	Very Confident
10. continuously update their technology skills and knowledge to keep up with the latest trends and advancements.	3.44	Moderately Confident
Overall Mean	3.44	Moderately Confident

The daily use of the different social media platform has been normally done to communicate and collaborate with colleagues and students which demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies. Thus, it is no surprising that teachers are very confident to use it. On the other hand, troubleshooting requires experience and training to operate. Hence, only few can do this skill.

A homologous result in the study of (Yunus et al., 2013) concluded that online communication is prevalent among teachers, and that it plays an important role in facilitating communication and collaboration among teachers and between teachers and their students. Moreover, (Ghavifekr et al., n.d.) noted that teachers often lacked the necessary technical knowledge and skills to effectively troubleshoot common technology problems and errors they

are faced with various barriers, such as time constraints, limited access to technical support, and inadequate training, that made it difficult to effectively troubleshoot technology issues in the classroom.

4.1.2. Planning and Designing Learning Environment and Experiences

Table 6 below depicts the mean distribution of the level of teachers' ICT skills in planning and designing environments and experiences. It can be observed that the teachers are very confident in performing the specified ICT skills. In particular, item number three regarding the development of learning objectives that are aligned with curriculum standards and supported by appropriate technology tools got the highest mean of 3.73.

Table 6. Mean Distribution of the Level of Skills in ICT in Planning and Designing Environment and Experiences.

B. Teachers' Level of Skills in ICT in Planning and Designing Environment and Experiences *I can:*	**Mean**	**Description**
1.Develop learning objectives that are aligned with curriculum standards and supported by appropriate technology tools.	3.73	Very Confident
2.Create lesson plans that incorporate technology to enhance student engagement and achievement.	3.71	Very Confident
3.Use data-driven decision making to design learning experiences that meet the diverse needs of students.	3.52	Very Confident
4.Use multimedia tools and resources to create interactive and engaging learning experiences.	3.70	Very Confident
5.Design assessments that measure student learning outcomes and provide feedback for instructional improvement.	3.62	Very Confident
6.Use technology to differentiate instruction and personalize learning for individual students.	3.68	Very Confident
7.Use technology to provide access to learning resources and support for students with disabilities or special needs.	3.54	Very Confident
8.Collaborate with colleagues to design and implement technology-enhanced learning experiences.	3.65	Very Confident
9.Use design thinking principles to create innovative and effective learning environments.	3.57	Very Confident
10.Continuously reflect on and refine my instructional practices to improve student learning outcomes.	3.59	Very Confident
Overall Mean	**3.63**	**Very Confident**

Technology tools have become an integral part of modern education, providing teachers with a variety of ways to engage students and enhance their learning experiences. It enhances student engagement, increases access to learning resources, facilitates collaboration and communication, and personalizes learning experiences. Especially, it makes the teaching of the teacher more effective and efficient by carefully planning and designing lessons.

The study of (Lee & Lee, 2014) found the same results stating that found that teachers reported high levels of self-efficacy in their ICT skills related to planning and designing learning experiences. Specifically, the study found that teachers were very confident in their abilities to use ICT to design and deliver engaging and interactive learning experiences for their students that may be a result of several factors that positively associated with teachers' self-efficacy in ICT integration, including experience using ICT, ICT training, and access to technical support.

Moreover, (Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer, 2010) added that teachers who reported higher levels of ICT competence were more likely to have positive attitudes towards ICT integration in education and more willing to incorporate ICT into their teaching practices.

4.1.3. Teaching, Learning, and Curriculum

Table 7 shows the mean distribution of the level of skills in ICT in teaching, learning, and curriculum among teachers. The results indicate that the teachers are highly confident in using technology to support active and student-centered learning experiences, develop instructional materials aligned with curriculum standards, and innovate instruction based on the context of the school and learners. Additionally, the teachers are also confident in using multimedia tools and resources to create interactive and engaging learning experiences, facilitate collaborative learning and communication among students, use data to inform instruction and improve learning outcomes, provide timely and meaningful feedback to students, design and implement authentic assessments that

measure student learning outcomes, support inquiry-based learning and critical thinking skills, and improve their teaching practices based on students' level of learning.

The results suggest that the use of ICT in teaching, learning, and curriculum has become an essential component of education. Teachers need to continue to enhance their ICT skills to keep up with technological advancements and improve their teaching practices. Additionally, schools and policymakers should provide the necessary resources and support to help teachers integrate technology into their teaching practices successfully. (Decoito & Richardson, 2018) provide the same evidence that teachers' strong understanding of how to integrate technology effectively into their teaching practices and their technological, pedagogical, and content knowledge are more likely to use technology to support student-centered and active learning experiences.

Table 7. Mean Distribution of the Level of Skills in ICT In Teaching, Learning and Curriculum.

C. Teachers' Level of Skills in ICT in Teaching, Learning and Curriculum *I can:*	**Mean**	**Description**
1. Use technology to support active and student-centered learning experiences.	3.76	Very Confident
2. Develop instructional materials that align with curriculum standards and use technology to enhance student engagement and achievement.	3.67	Very Confident
3. Use technology to innovate instruction based on the context of the school and learners	3.67	Very Confident
4. Use multimedia tools and resources to create interactive and engaging learning experiences.	3.68	Very Confident
5. Use technology to facilitate collaborative learning and communication among students.	3.67	Very Confident
6. Use data to inform instruction and improve learning outcomes.	3.71	Very Confident
7. Use technology to provide timely and meaningful feedback to students.	3.62	Very Confident
8. Design and implement authentic assessments that measure student learning outcomes.	3.57	Very Confident
9. Use technology to support inquiry-based learning and critical thinking skills.	3.67	Very Confident
10.Use technology to improve my teaching practices based on students' level of learning.	3.65	Very Confident
Overall Mean	3.67	Very Confident

4.1.4. Assessment and Evaluation

Table 8 presents the mean distribution of the level of skills in ICT in assessment and evaluation among teachers. The results show that teachers are highly confident in using technology to create and administer assessments aligned with curriculum standards, monitor student progress, and adjust instruction to improve learning outcomes, support formative assessment and differentiated instruction, and use assessment data to inform instructional decision making, evaluate the effectiveness of instructional practices, and gather and analyze data to inform program evaluation and improvement. The overall mean value of 3.60 indicates that teachers have a high level of confidence in their ICT skills in assessment and evaluation.

The high mean values in all categories indicate that teachers are well-prepared and confident in using ICT tools and resources to enhance their assessment and evaluation practices. This finding is in line with the increasing emphasis on the use of technology in assessment and evaluation to improve student learning outcomes.

The implications of these results suggest that the integration of technology in assessment and evaluation practices is essential for improving teaching and learning outcomes. Teachers need to continue to develop their ICT skills and knowledge to effectively integrate technology into their assessment and evaluation practices. Schools and policymakers should also provide the necessary resources and support to help teachers integrate technology into their assessment and evaluation practices successfully. The result is consistent with the study of (Elmahdi et al., 2018) emphasized the importance of using formative assessment to improve student learning outcomes. Additionally, a study by (Ogange et al., 2018) highlighted the use of technology in supporting formative assessment and providing timely feedback to students, which is consistent with the results of this study.

Table 8. Mean Distribution of the Level of Skills in ICT in Assessment and Evaluation.

D. Teachers' Level of Skills in ICT in Assessment and Evaluation *I can:*	**Mean**	**Description**
1. Use technology to create and administer assessments that align with curriculum standards.	3.63	Very Confident
2. Use data to monitor student progress and adjust instruction to improve learning outcomes.	3.60	Very Confident
3. Use technology to provide timely and meaningful feedback to students.	3.52	Very Confident
4. Use technology to support formative assessment and differentiated instruction.	3.70	Very Confident
5. Use assessment data to inform instructional decision making.	3.57	Very Confident
6. Design and implement authentic assessments that measure student learning outcomes.	3.56	Very Confident
7. Use technology to support self-assessment and reflection.	3.59	Very Confident
8. Use assessment data to evaluate the effectiveness of instructional practices.	3.60	Very Confident
9. Use technology to gather and analyze data to inform program evaluation and improvement.	3.60	Very Confident
10. Continuously update my assessment and evaluation practices to reflect the latest technology tools and trends.	3.63	Very Confident
Overall Mean	3.60	Very Confident

4.1.5. Productivity and Professional Practice

Table 9 displays the mean distribution of the level of skills in ICT in productivity and professional practice. The teachers have very high confidence in all the indicators of the mentioned ICT skill. Specifically, item number two regarding the use of technology tools to provide timely and specific feedback to students that supports their learning and growth got the highest mean of 3.75.

When teachers have strong ICT skills and can use technology tools effectively to provide feedback, they can provide students with more detailed and specific feedback than might be possible through traditional methods. This can help to ensure that students receive feedback in a timely manner, which can help to keep them motivated and engaged in their learning.

The result is in congruence to the study of Alqurashi and Vogel (2021) in which they found that teachers' ICT competence was positively related to their use of technology tools to provide timely and specific feedback to students. Teachers with higher ICT competence were more likely to use technology tools, such as learning management systems and online feedback forms, to provide feedback to students in a timely manner. Hence, providing training and support to teachers to develop their ICT skills can help to enhance their feedback practices and improve student learning outcomes.

Table 9. Mean Distribution of the Level of Skills in ICT in Productivity and Professional Practice.

E. Teachers' Level of Skills in ICT in Productivity and Professional Practice *I can:*	**Mean**	**Description**
1. Use technology tools to design and implement engaging and personalized learning experiences that align with the needs, interests, and abilities of all learners.	3.70	Very Confident
2. Use technology tools to provide timely and specific feedback to students that supports their learning and growth.	3.75	Very Confident
3. Use technology tools to develop and share resources with colleagues, including lesson plans, assessments, and other instructional materials.	3.71	Very Confident
4. Participate in professional development opportunities that focus on technology integration and related best practices.	3.70	Very Confident
5. Use technology tools to collect and analyze data to inform instructional decisions and improve student learning outcomes.	3.68	Very Confident
6. Use technology tools to facilitate and support student-centered learning, including project-based learning, collaborative learning, and inquiry-based learning.	3.67	Very Confident
7. Use technology tools to provide access to authentic learning experiences that connect students to real-world issues and problems.	3.67	Very Confident
8. Use technology tools to support flipped and blended learning models that promote student agency and ownership of learning.	3.67	Very Confident
9. Use technology tools to support formative and summative assessments that measure student progress and inform instructional decisions.	3.71	Very Confident
10. Use technology tools to provide students with opportunities for self-reflection, self-assessment, and goal setting.	3.62	Very Confident
Overall Mean	3.69	Very Confident

The high level of confidence in these skills suggests that teachers recognize the value of using technology tools to support their own productivity and professional practice, as well as to enhance student learning experiences. This is in line with the growing body of literature that supports the use of technology tools in education. For example, a study by Kay and Greenhill (2018) found that teachers who used technology tools reported increased engagement and motivation among their students, as well as improved learning outcomes.

4.1.6. Social, Ethical, Legal and Human Issues

The mean distribution of the level of skills in ICT in social, ethical, legal, and human issues is presented in Table 10. The results show that the teachers are very confident in their skills related to these areas. Among the indicators, item number three, which pertains to teaching students to respect and protect intellectual property rights and practice ethical use of digital resources, received the highest mean score of 3.76.

Table 10. Mean Distribution of the Level of Skills in ICT in Social, Ethical, Legal and Human Issues.

F. Teachers' Level of Skills in ICT in Social, Ethical, Legal and Human Issues *I can:*	**Mean**	**Description**
1. Teach students to use technology tools to communicate and collaborate respectfully and responsibly with peers, teachers, and other members of the community.	3.62	Very Confident
2. Teach students to recognize and address cyberbullying, online harassment, and other digital dangers and to seek help when needed.	3.73	Very Confident
3. Teach students to respect and protect intellectual property rights and to practice ethical use of digital resources.	3.76	Very Confident
4. Teach students to be aware of their digital footprints and to manage their online identity responsibly.	3.67	Very Confident
5. Teach students to recognize and report incidents of digital fraud, hacking, and other cybercrimes.	3.62	Very Confident
6. Teach students to evaluate the credibility and reliability of digital resources and to use critical thinking skills to evaluate online information.	3.67	Very Confident
7. Teach students to use technology tools to promote cultural awareness, diversity, and inclusion.	3.63	Very Confident
8. Teach students to protect their privacy and personal information online and to be responsible digital citizens.	3.68	Very Confident
9. Teach students to use technology tools to promote social and environmental sustainability.	3.59	Very Confident
10. Use technology tools to create a safe, healthy, and positive learning environment that promote well-being and personal growth.	3.59	Very Confident
Overall Mean	3.66	Very Confident

The ability to recognize and address cyberbullying, online harassment, and other digital dangers is also an important skill that teachers are very confident in, with a mean score of 3.73. This is particularly relevant in today's digital age where students may be vulnerable to various online threats. And the ability to evaluate the credibility and reliability of digital resources and to use critical thinking skills to evaluate online information is also an important skill that teachers are confident in. This is particularly relevant as students may be exposed to fake news and other misleading information online.

The high level of confidence that teachers have in their ICT skills in social, ethical, legal, and human issues is a positive finding. It suggests that they are able to effectively integrate digital citizenship into their teaching and are able to prepare their students for the challenges of the digital age. In line with this, in the study of Aslam and Qureshi (2021) supported the notion by stating that teachers were more likely to incorporate digital citizenship education into their classroom instruction, use ICT tools to teach students about digital citizenship, and provide opportunities for students to practice ethical use of digital resources.

4.2. Extent of ICT Skills of the IPEd Learners

The second objective was to identify the extent of ICT skills of IPEd learners in terms of creativity and innovation, communication and collaboration, research and information fluency, critical thinking, problem-solving and decision making, digital citizenship, and technology operations and concepts.

4.2.1. Creativity and Innovation

Table 11 shows the mean distribution of the extent of ICT skills of IPEd learners in terms of creativity and innovation. The results suggest that the learners are slightly confident in their ICT skills for creativity and innovation, with an overall mean of 2.19.

The learners' mean scores on each item ranged from 1.77 to 2.76, indicating that they were slightly confident in their ICT skills related to creativity and innovation. The highest mean score was for expressing creativity and originality in a variety of media (item 2), followed by designing and developing innovative products, services, and solutions (item 3). The lowest mean score was for promoting and showcasing creative work to authentic audiences (item 10).

The results imply that IPEd learners need further support and training to enhance their ICT skills for creativity and innovation. Educational institutions and policymakers should consider incorporating more ICT-related activities that promote creativity and innovation in the curriculum. Additionally, educators should provide learners with opportunities to develop their ICT skills in real-world contexts, such as internships and project-based learning.

In recent years, there has been a growing interest in the use of ICT to promote creativity and innovation in education (Craft, Jeffrey, & Leibling, 2018). Studies have shown that ICT tools can enhance learners' creativity by providing opportunities for collaboration, exploration, and experimentation (Burke, Crowley, & O'Sullivan, 2018). However, learners' confidence in their ICT skills may affect their ability to use technology for creative purposes (Lai, Law, & Wong, 2018). Therefore, it is essential to provide learners with appropriate support and training to develop their ICT skills for creativity and innovation.

Table 11. Mean Distribution of the Extent of ICT Skills of the IPED Learners in Terms of Creativity and Innovation.

A. Learners' ICT Skills in Creativity and Innovation I use technology tools to… Ako naggamit sa mga gamit sa teknolohiya aron sa…	**Mean**	**Description**
1. Generate new ideas and approaches to problem-solving. (paghimo og bag-ong mga ideya ug pamaagi sa pagsulbad sa problema.)	2.14	Slightly Confident
2. Express creativity and originality in a variety of media, including text, graphics, audio, and video. (pagpahayag sa pagkamamugnaon ug pagka-orihinal sa lainlaing media, lakip ang teksto, mga graphic, audio, ug video.)	2.76	Slightly Confident
3. Design and develop innovative products, services, and solutions that address real-world problems. (pagdesinyo ug paghimo og mga bag-ong produkto, serbisyo, ug solusyon nga nagtubag sa mga problema sa tinuod nga kalibutan.	2.49	Slightly Confident
4. Experiment, test, and refine ideas and prototypes. (pageksperimento, pagsulay, ug pagpino sa mga ideya ug mga prototype.)	2.08	Slightly Confident
5. Collaborate with peers and experts to explore new ideas and approaches. (pakigtambayayong sa mga kaedad ug mga eksperto sa pagsuhid sa bag-ong mga ideya ug mga pamaagi.)	2.28	Slightly Confident
6. Create and share original digital content that reflects personal interests and passions. (paghimo ug pagpaambit sa orihinal nga digital nga sulud nga nagpakita sa personal nga mga interes ug mga hilig.)	2.02	Slightly Confident
7. Develop and pursue creative projects and goals, both independently and as part of a team. (pagpalambo ug pagpadayon sa mamugnaon nga mga proyekto ug mga tumong, nga independente ug isip kabahin sa usa ka team..)	2.37	Slightly Confident
8. Explore and integrate multiple perspectives, experiences, and cultures into creative work. (pagexplore ug paghiusa sa daghang mga panan-aw, kasinatian, ug kultura sa mamugnaon nga buhat.	2.00	Slightly Confident
9. Evaluate and reflect on personal creative processes and products. (pagtimbang-timbang ug pagpamalandong sa personal nga mga proseso sa paglalang ug mga produkto.)	2.02	Slightly Confident
10. Promote and showcase creative work to authentic audiences. (i-promote ug mapakita ang mamugnaong buhat ngadto sa tinuod nga mga tumatan-aw.)	1.77	Slightly Confident
Overall Mean	2.19	Slightly Confident

4.2.2. Communication and Collaboration

The results presented in Table 12 indicate the extent of ICT skills possessed by IPEd learners in terms of communication and collaboration. The mean distribution shows that the learners are slightly confident in their ability to use technology tools for communication and collaboration purposes.

Table 12. Mean Distribution of the Extent of ICT Skills of the IPED Learners in Terms of Communication and Collaboration.

B. Learners' ICT Skills in Communication and Collaboration: I use technology tools to… Ako naggamit sa mga gamit sa teknolohiya aron sa…	**Mean**	**Description**
1. Communicate effectively and respectfully with peers, teachers, and other members of the community. (pakigkomunikar sa epektibo ug matinahuron nga paagi sa mga kaedad, magtutudlo, ug ubang mga miyembro sa komunidad.)	2.95	Slightly Confident
2. Collaborate with peers and experts to develop and produce high-quality products and solutions. (pakigtambayayong sa mga kaedad ug mga eksperto aron sa pagpalambo ug pagprodyus og taas nga kalidad nga mga produkto ug solusyon.)	1.92	Slightly Confident
3. Share and receive feedback on work in progress and final products. (pagpaambit ug pagdawat og feedback sa trabaho nga nagpadayon ug sa katapusan nga mga produkto.)	1.95	Slightly Confident
4. Engage in online discussions, debates, and other forms of collaborative learning. (pag-apil sa online nga mga diskusyon, mga debate, ug uban pang mga porma sa kolaborasyon nga pagkat-on.)	2.41	Slightly Confident
5. Build and maintain positive relationships with others, including those from diverse backgrounds and cultures. (pagtukod ug pagmentinar sa positibong relasyon sa uban, lakip niadtong gikan sa lain-laing kagikan ug kultura.)	1.53	Slightly Confident
6. Promote teamwork, leadership, and problem-solving skills. (pagpalambo sa teamwork, pagpangulo, ug mga kahanas sa pagsulbad sa problema.)	2.20	Slightly Confident
7. Support effective and efficient project management and task coordination. (pagsuporta sa epektibo ug episyente nga pagdumala sa proyekto ug koordinasyon sa buluhaton.)	2.30	Slightly Confident
8. Facilitate remote and asynchronous communication and collaboration. (mapadali ang layo ug asynchronous nga komunikasyon ug kolaborasyon..)	2.41	Slightly Confident
9. Develop and maintain a positive online presence that reflects personal values and aspirations. (pagpalambo ug pagpadayon sa usa ka positibo nga presensya sa online nga nagpakita sa personal nga mga mithi ug mga pangandoy.)	3.21	Slightly Confident
10. Promote social and environmental sustainability through communication and collaboration with others. (pagpalambo sa sosyal ug kinaiyahan nga pagpadayon pinaagi sa komunikasyon ug kolaborasyon sa uban.)	2.10	Slightly Confident
Overall Mean	2.30	Slightly Confident

In terms of specific skills, the learners are most confident in developing and maintaining a positive online presence (mean score of 3.21), followed by effective and respectful communication with peers, teachers, and other community members (mean score of 2.95). On the other hand, the learners are least confident in collaborating with peers and experts to develop and produce high-quality products and solutions (mean score of 1.92) and building and maintaining positive relationships with others from diverse backgrounds and cultures (mean score of 1.53).

These results have several implications for both learners and educators. Firstly, it is important for learners to develop their ICT skills to effectively communicate and collaborate in today's digital world. Secondly, educators should provide opportunities for learners to develop their ICT skills through various activities and assignments. Thirdly, educators need to identify and address any gaps in learners' ICT skills to ensure that they are well-equipped to navigate the digital landscape.

The findings of this study are consistent with previous research that highlights the importance of ICT skills for effective communication and collaboration (Yi & Hwang, 2003). The study also highlights the need for further research to explore the factors that contribute to learners' ICT skills in communication and collaboration.

4.2.3. Research and Information Fluency

Table 13 shows the mean distribution of the extent of ICT skills of IPEd learners in terms of research and information fluency. The results suggest that the learners have a moderate level of confidence in evaluating the credibility, reliability, and relevance of information sources and selecting the most appropriate ones for a given task or problem. On the other hand, the learners have a slightly confident level of skills in defining research questions and hypotheses, organizing, analyzing, and synthesizing information from multiple sources, creating and sharing annotated bibliographies, research summaries, and other forms of research output, using appropriate citation and referencing styles, collaborating with peers and experts to conduct research and develop shared knowledge and understanding, exploring and evaluating different research methodologies and selecting the most appropriate ones, creating and conducting surveys, interviews, and other forms of data collection, analyzing and visualizing data to identify patterns and trends, and promoting ethical and responsible use of information.

The findings have important implications for the design and delivery of ICT skills training programs for IPEd learners. Specifically, the programs should focus on enhancing learners' skills in defining research questions and hypotheses, organizing, analyzing, and synthesizing information from multiple sources, creating and sharing annotated bibliographies, research summaries, and other forms of research output, using appropriate citation and referencing styles, collaborating with peers and experts to conduct research and develop shared knowledge and understanding, exploring and evaluating different research methodologies and selecting the most appropriate ones, creating and conducting surveys, interviews, and other forms of data collection, analyzing and visualizing data to identify patterns and trends, and promoting ethical and responsible use of information.

Table 13. Mean Distribution of the Extent of ICT Skills of the IPED Learners in Terms of Research and Information Fluency.

C. Learners' ICT Skills in Research and Information Fluency I use technology tools to… Ako naggamit sa mga gamit sa teknolohiya aron sa…	**Mean**	**Description**
1. Define research questions and hypotheses and to identify and access relevant information sources. (pag-ila sa research questions ug ug hypotheses ug 494ap ag-ila ug pag-access sa may kalabutan nga mga tinubdan sa impormasyon.)	1.96	Slightly Confident
2. Evaluate the credibility, reliability, and relevance of information sources and to select the most appropriate ones for a given task or problem. (pagtimbang-timbang sa kredibilidad, kasaligan, ug kalambigitan sa mga tinubdan sa impormasyon ug sa pagpili sa labing tukma nga alang sa usa ka gihatag nga buluhaton o problema.	2.59	Moderately Confident
3. Organize, analyze, and synthesize information from multiple sources to develop new insights and perspectives. (pag-organisar, pag-analisar, ug pag-synthesize sa kasayuran gikan sa daghang mga gigikanan aron mapalambo ang bag-ong mga panabut ug panan-aw.)	2.24	Slightly Confident
4. Create and share annotated bibliographies, research summaries, and other forms of research output. (paghimo ug pagpaambit sa mga annotated nga bibliograpiya, mga summary sa panukiduki, ug uban pang mga porma sa output sa research.)	1.93	Slightly Confident
5. Use appropriate citation and referencing styles to attribute sources and avoid plagiarism. (paggamit sa ang angay nga mga estilo sa pagkutlo ug paghisgot sa pagpasidungog sa mga tinubdan ug paglikay sa plagiarism.)	1.85	Slightly Confident
6. Collaborate with peers and experts to conduct research and develop shared knowledge and understanding. (pakigtambayayong sa mga kaedad ug mga eksperto sa pagpahigayon sa panukiduki ug pagpalambo sa gipaambit nga kahibalo ug pagsabot.)	1.79	Slightly Confident
7. Explore and evaluate different research methodologies and to select the most appropriate ones for a given task or problem.(pagexplore ug pagtimbang-timbang sa lain-laing mga pamaagi sa panukiduki ug pagpili sa labing angay alang sa usa ka buluhaton o problema.)	2.36	Slightly Confident
8. Create and conduct surveys, interviews, and other forms of data collection. (paghimo ug pagpahigayon og mga survey, mga interbyu, ug uban pang mga porma sa pagkolekta sa datos.)	1.90	Slightly Confident
9. Analyze and visualize data to identify patterns and trends and to develop new insights and perspectives. (pag-analisar ug paghanduraw sa mga datos aron mahibal-an ang mga sumbanan ug uso ug aron mapalambo ang bag-ong mga panabut ug panan-aw.)	2.33	Slightly Confident
10. Promote ethical and responsible use of information and to respect intellectual property rights. (pagpalambo sa etikal ug I nga paggamit sa impormasyon ug sa pagtahod sa mga katungod sa intelektwal nga kabtangan.)	1.64	Slightly Confident
Overall Mean	2.06	Slightly Confident

The literature suggests that the development of ICT skills is crucial for learners' academic success and future employability (Fajaryati et al., 2020) However, there is a need for more research to explore the most effective ways of delivering ICT skills training programs (Abu-Tineh & Sadiq, 2018). Furthermore, there is a need to consider learners' individual differences, such as their prior knowledge, motivation, and learning styles, in the design and delivery of ICT skills training programs (Bikowski & Casal, 2018). Finally, there is a need to promote the ethical and responsible use of information among learners, given the increasing concerns about plagiarism and academic integrity (Cotton et al., 2023)

4.2.4. Critical Thinking, Problem-Solving and Decision Making

Table 14 presents the mean distribution of the extent of ICT skills of the IPEd learners in terms of critical thinking, problem-solving, and decision-making. The learners were asked to rate their confidence levels in using technology tools for various tasks related to these skills.

The learners reported a slightly confident level of ICT skills in critical thinking, problem-solving, and decision-making, with a mean score of 1.96. Among the specific skills, the learners reported the highest level of confidence in anticipating and addressing potential obstacles and challenges to problem-solving and decision-making, with a mean score of 2.35. On the other hand, they reported the lowest level of confidence in reflecting on personal problem-solving and decision-making processes and identifying areas for improvement, with a mean score of 2.04.

These findings have several implications for the teaching and learning of ICT skills in the context of critical thinking, problem-solving, and decision-making. For instance, the results suggest that learners may need more guidance and support in reflecting on their personal processes and identifying areas for improvement. Furthermore, the findings suggest that teaching strategies should emphasize the use of technology tools for anticipating and addressing potential obstacles and challenges to problem-solving and decision-making.

Several studies in the literature support the importance of ICT skills in critical thinking, problem-solving, and decision-making(Turan et al., 2019). For instance,(Suardana et al., 2018) found that integrating ICT tools in the teaching and learning of critical thinking skills improved students' performance and engagement. Similarly, (Parrot & Leong, 2018) found that using ICT tools in problem-solving activities improved students' problem-solving skills and attitudes. Moreover, (Schnoes et al., 2018) found that the use of ICT tools in decision-making activities improved students' decision-making skills and confidence.

Table XIV provides valuable insights into the extent of ICT skills of IPEd learners in critical thinking, problem-solving, and decision-making. The findings suggest that learners need more guidance and support in reflecting on their personal processes and identifying areas for improvement. Furthermore, the results highlight the importance of using technology tools for anticipating and addressing potential obstacles and challenges to problem-solving and decision-making. These findings have implications for the teaching and learning of ICT skills in the context of critical thinking, problem-solving, and decision-making.

Table 14. Mean Distribution of the Extent of ICT Skills of the IPED Learners in Terms of Critical Thinking, Problem-Solving and Decision Making.

D. Learners' ICT Skills in Critical Thinking, Problem solving and Decision-Making I use technology tools to… Ako naggamit sa mga gamit sa teknolohiya aron sa…	**Mean**	**Description**
1. Analyze complex problems and to identify and evaluate different possible solutions. (pagsabot sa komplikadong problema ug 495ap ag-ila ug pagtimbang-timbang sa lain-laing mga 495ap ag495495 nga mga solusyon.)	1.96	Slightly Confident
2. Develop and apply logical reasoning, critical thinking, and problem-solving skills to real-world situations. (pagpalambo ug paggamit sa lohikal nga pangatarungan, kritikal nga panghunahuna, ug mga kahanas sa pagsulbad sa problema sa tinuod nga kalibutan nga mga sitwasyon.)	1.77	Slightly Confident
3. Create and use models, simulations, and other forms of representations to explore and test ideas and solutions. (paghimo ug paggamit sa mga modelo, simulation, ug uban pang mga porma sa representasyon aron masusi ug masulayan ang mga ideya ug solusyon.)	1.81	Slightly Confident

4. Collaborate with peers and experts to develop and refine solutions and to evaluate their effectiveness and feasibility. (pakigtambayayong sa mga kaedad ug mga eksperto aron sa pagpalambo ug pagpino sa mga solusyon ug sa pagtimbang-timbang sa ilang pagkaepektibo ug posibilidad.)	1.90	Slightly Confident
5. Anticipate and address potential obstacles and challenges to problem-solving and decision-making. (pagpaabut ug pagsulbad sa mga potensyal nga babag ug mga hagit sa pagsulbad sa problema ug paghimog desisyon.)	2.35	Slightly Confident
6. Promote creative and innovative approaches to problem-solving and decision-making. (pagpasiugda og mamugnaon ug bag-ong mga pamaagi sa pagsulbad sa problema ug paghimog desisyon.)	1.91	Slightly Confident
7. Develop and apply quantitative and qualitative analysis skills to solve complex problems. (pagpalambo ug paggamit sa quantitative ug qualitative analysis kahanas sa pagsulbad sa komplikado nga mga problema.)	1.86	Slightly Confident
8. Evaluate the effectiveness and efficiency of different problem-solving and decision-making strategies. (pagtimbang-timbang sa pagka-epektibo ug kaepektibo sa lain-laing mga problema-pagsulbad ug desisyon-making estratehiya.)	2.07	Slightly Confident
9. Identify and address biases, assumptions, and limitations in problem-solving and decision-making processes. (pag-ila ug pagsulbad sa mga pagpihig, mga pangagpas, ug mga limitasyon sa pagsulbad sa problema ug mga proseso sa paghimog desisyon.)	1.93	Slightly Confident
10. Reflect on personal problem-solving and decision-making processes and to identify areas for improvement. (pagpamalandong sa personal nga pagsulbad sa problema ug mga proseso sa paghimog desisyon ug 496ap ag-ila sa mga dapit alang sa kalamboan..)	2.04	Slightly Confident
Overall Mean	1.96	Slightly Confident

4.2.5. Digital Citizenship

Table 15 presents the mean distribution of the extent of ICT skills of IPEd learners in terms of digital citizenship. The mean values range from 1.57 to 3.12, with an overall mean of 2.41, indicating that the learners have a slight level of confidence in their ICT skills related to digital citizenship.

Table 15. Mean Distribution of the Extent of ICT Skills of the IPED Learners in Terms of Digital Citizenship.

E. Learners' ICT Skills in Digital Citizenship I use technology tools to… Ako naggamit sa mga gamit sa teknolohiya aron sa…	**Mean**	**Description**
1. Communicate respectfully and responsibly with peers, teachers, and other members of the community. (pagpakigsulti nga matinahuron ug I sa mga kaedad, magtutudlo, ug uban pang mga miyembro sa komunidad.)	3.12	Moderately Confident
2. Protect personal privacy and security online and to avoid cyberbullying and other forms of online harassment. (pagpanalipod sa personal nga pribasiya ug seguridad online ug sa paglikay sa cyberbullying ug uban pang matang sa online nga 496ap ag496496nt.)	1.88	Slightly Confident
3. Evaluate the credibility and reliability of online information and to avoid spreading misinformation and disinformation. (pagtimbang-timbang sa kredibilidad ug kasaligan sa online nga impormasyon ug aron malikayan ang pagkaylap sa sayop nga impormasyon ug disinformation.)	2.46	Slightly Confident
4. Respect intellectual property rights and to avoid plagiarism and other forms of academic dishonesty. (pagtahod sa mga katungod sa intellectual property ug sa paglikay sa plagiarism ug uban pang matang sa academic dishonesty.)	1.80	Slightly Confident
5. Understand and comply with local and international laws and regulations related to online behavior and digital rights and responsibilities. (pagsabut ug pagsunod sa 496ap a ug internasyonal nga mga balaod ug regulasyon nga may kalabutan sa online nga pamatasan ug digital nga mga katungod ug responsibilidad.)	2.25	Slightly Confident
6. Develop and maintain a positive online presence that reflects personal values and aspirations. (pagpalambo ug pagpadayon sa usa ka positibo nga presensya sa online nga nagpakita sa personal nga mga mithi ug mga pangandoy..)	2.90	Moderately Confident
7. Promote cultural awareness and understanding through online communication and collaboration with peers from diverse backgrounds and cultures. (pagpalambo sa kahibalo ug pagsabot sa kultura pinaagi sa online nga komunikasyon ug kolaborasyon sa mga kaedad gikan sa lain-laing mga kagikan ug kultura.)	2.76	Moderately Confident
8. Participate in online civic engagement and advocacy for social and environmental causes. (pag-apil sa online civic engagement ug adbokasiya alang sa sosyal ug environmental nga mga hinungdan.)	1.57	Slightly Confident
9. Develop and practice ethical decision-making skills in online and offline contexts. (pagpalambo ug pagpraktis sa etikal nga mga kahanas sa paghimog desisyon sa online ug offline nga	2.82	Moderately Confident

konteksto.)		
10. Promote empathy and compassion in online interactions and to avoid online conflicts and arguments. (pagpalambo sa empatiya ug kaluoy sa mga interaksyon sa online ug aron malikayan ang mga panagbangi ug panaglalis sa online..)	2.56	Moderately Confident
Overall Mean	2.41	**Slightly Confident**

One interesting finding is that learners are moderately confident in communicating respectfully and responsibly with peers, teachers, and other members of the community, with a mean value of 3.12. This suggests that learners have some level of awareness and understanding of digital etiquette and appropriate behavior online. However, learners are less confident in protecting personal privacy and security online, as well as understanding and complying with laws and regulations related to online behavior and digital rights and responsibilities, with mean values of 1.88 and 2.25, respectively.

These results have important implications for educators and policymakers in terms of developing and implementing effective strategies and interventions to enhance learners' ICT skills related to digital citizenship. For example, educators may need to focus more on teaching learners about online privacy and security and ethical decision-making skills in both online and offline contexts. Policymakers may need to develop and implement laws and regulations that promote responsible and ethical behavior online and protect digital rights and privacy.

There is limited literature specifically discussing the ICT skills of IPEd learners related to digital citizenship. However, several studies have explored the role of ICT in promoting digital citizenship skills among students in general. For example, (Tapingkae et al., 2020) found that integrating digital citizenship education into ICT courses can effectively enhance students' knowledge, skills, and attitudes related to digital citizenship. Similarly, (Lauricella et al., 2020) found that using online learning environments can improve students' digital citizenship skills, such as online safety and responsible online behavior.

4.2.6. Technology Operations and Concepts

Table 16 presents the mean distribution of the extent of ICT skills of IPEd learners in terms of technology operations and concepts. The overall mean value of 2.01 indicates that learners have a slight level of confidence in their ICT skills related to technology operations and concepts.

One finding is that learners are very confident in communicating and collaborating online using different types of communication tools and platforms, with a mean value of 2.53. This suggests that learners have a good understanding of how to use communication tools effectively. However, learners are less confident in navigating and operating different hardware and software systems and troubleshooting technical issues, as well as understanding and applying basic coding and programming concepts, with mean values of 1.24 and 1.36, respectively.

These results imply that educators may need to focus more on teaching learners how to navigate and operate different hardware and software systems effectively, troubleshoot common technical issues, and apply basic coding and programming concepts. Policymakers may need to develop and implement policies that promote the integration of ICT skills related to technology operations and concepts into the curriculum of IPEd.

Several studies have explored the role of ICT in enhancing learners' technology operations and concepts skills. For example, (Lin et al., 2022) found that using online collaborative tools can enhance students' problem-solving skills and knowledge related to technology operations and concepts. Similarly, (Subhash & Cudney, 2018) found that using gamification in ICT courses can enhance students' motivation and engagement and improve their understanding of technology operations and concepts.

Table 16. Mean Distribution of the Extent of ICT Skills of the IPED Learners in Terms of Technology Operations and Concepts.

F. Learners' ICT Skills in Technology Operations and Concepts I use technology tools to… Ako naggamit sa mga gamit sa teknolohiya aron sa…	**Mean**	**Description**
1. Navigate and operate different hardware and software systems and to troubleshoot common technical issues. (navigate ug operate lain-laing mga hardware ug software 498ap ag498 ug sa troubleshoot komon nga teknikal nga mga isyu.)	1.24	Not at all Confident
2. Manage and organize digital files and folders and to backup and recover data. (pagdumala ug pag-organisar sa mga digital nga file ug mga folder ug 498ap ag-backup ug pagbawi sa datos.)	2.21	Slightly Confident
3. Communicate and collaborate online using different types of communication tools and platforms. (pakigkomunikar ug pakigtinabangay online gamit ang lain-laing matang sa mga himan ug plataporma sa komunikasyon..)	2.53	Very Confident
4. Create and edit different types of digital media, including text, graphics, audio, and video. (paghimo ug pag-edit sa lain-laing mga matang sa digital media, lakip ang text, graphics, audio, ug video.)	1.97	Slightly Confident
5. Conduct online research and to access and evaluate different types of digital information sources. (pagpahigayon og online research ug 498ap ag-access ug pagtimbang-timbang sa lain-laing mga matang sa digital nga mga tinubdan sa impormasyon.)	2.32	Slightly Confident
6. Protect personal privacy and security online and to avoid cyber threats and attacks. (pagpanalipod sa personal nga pribasiya ug seguridad online ug aron malikayan ang mga hulga ug pag-atake sa cyber.)	2.05	Slightly Confident
7. Understand and apply basic coding and programming concepts to create and modify digital products and solutions. (pagsabot ug pag apply sa basic nga coding ug mga konsepto sa programming sa paghimo ug pag-usab sa digital nga mga produkto ug solusyon..)	1.36	Not at all Confident
8. Evaluate and compare different technology tools and platforms for specific tasks and purposes. (pagtimbang-timbang ug pagtandi sa lain-laing teknolohiya himan ug mga plataporma alang sa piho nga mga buluhaton ug mga katuyoan.)	1.64	Slightly Confident
9. Stay up-to-date with emerging technologies and to understand their potential impact on society and the environment. (pagpabilin nga up-to-date sa mga nag-uswag nga mga teknolohiya ug aron masabtan ang ilang potensyal nga epekto sa katilingban ug sa kinaiyahan.)	2.21	Slightly Confident
10. Develop and apply critical thinking and problem-solving skills to solve technical problems and challenges. (pagpalambo ug paggamit sa kritikal nga panghunahuna ug mga kahanas sa pagsulbad sa problema aron masulbad ang teknikal.)	2.53	Slightly Confident
Overall Mean	2.01	Slightly Confident

4.3. Level of Challenges of the IPEd Intermediate Teachers in Teaching ICT

The third objective of the study was o assess the level of challenges that IPEd intermediate teachers face when teaching ICT, including external factors (such as infrastructure, cost, security and privacy concerns, access to resources, and technological advancement) and internal factors (such as experience and appraisal).

4.3.1. External Factors

Table 17 shows that intermediate teachers face moderate challenges in teaching ICT due to external factors such as infrastructure, cost, and security and privacy concerns. These challenges are consistent with previous research, such as (Cheng et al., 2020), who found that teachers' knowledge, goals, and beliefs are critical factors in the integration of technology in the classroom. Teachers need access to appropriate hardware and software, technical support, and training to effectively integrate ICT in the classroom, which are also reflected in the infrastructure and cost indicators in the table.

Furthermore, the table highlights the importance of addressing security and privacy concerns when integrating ICT in education. Cybersecurity threats and data breaches can compromise student data and result in legal or ethical consequences for schools. To address these concerns, schools need to ensure the security of ICT systems, provide cybersecurity training to teachers and staff, and comply with data protection regulations. These findings align with previous research that emphasizes the importance of addressing security and privacy concerns when integrating technology in education (Alammary et al., 2019)

The findings underscore the need for collaborative efforts between schools, policymakers, and other stakeholders to address the challenges of integrating ICT in education. This requires allocating adequate resources,

providing technical assistance and training, and developing policies that prioritize the integration of ICT in education while ensuring the security and privacy of student data.

Table 17. Mean Distribution of the Level of Challenges of the IPED Intermediate Teachers in Teaching ICT in Terms of External Factors: Infrastructure, Cost, Security and Privacy Concerns.

Indicators	Mean	Description
External challenges in teaching ICT (Infrastructure) I have…		
1. Access to reliable and stable internet connection inside the classroom.	3.16	Moderately challenging
2. Computer, laptop, and other devices to use in teaching.	3.37	Moderately challenging
3. Access to appropriate software and applications to fully integrate ICT into the classroom.	3.30	Moderately challenging
4. Known trained professionals in schools whom I can easily ask for help with hardware and software issues, troubleshoot problems, and maintain the ICT infrastructure.	3.38	Moderately challenging
5. Access to stable electricity supply in the classroom.	3.11	Moderately challenging
6. Adequate space, power outlets, and other physical resources to integrate ICT effectively.	3.21	Moderately challenging
External challenges in teaching ICT (Cost) Our school…		
1. Allocates or provides with funds to purchase and maintain hardware and software, provide training for teachers, and upgrade the ICT infrastructure.	3.08	Moderately challenging
2. Allocates or provides with funds for regular maintenance and repair of my hardware and software to ensure that they are functioning properly.	3.05	Moderately challenging
3. Allocates or provides with funds for training my teachers and staff on how to use ICT effectively in the classroom.	3.02	Moderately challenging
4. Allocates or provides with funds for replacement costs to ensure that my ICT infrastructure remains up-to-date and functioning properly.	3.05	Moderately challenging
5. Allocates or provides with funds for the purchase of chords and wires needed for teaching using technology.	2.95	Moderately challenging
External challenges in teaching ICT (Security and Privacy Concerns) Our school…		
1. Ensures that the ICT systems are secured, and that student data is protected from cyber threats and breaches.	3.11	Moderately challenging
2. Ensures that only authorized users have access to sensitive information.	3.10	Moderately challenging
3. Uses data encryption to protect sensitive information to help prevent unauthorized access to data.	3.05	Moderately challenging
4. Provides cybersecurity training to my teachers and staff to help them recognize and prevent cyber threats.	3.19	Moderately challenging
5. Complies with data protection regulations to ensure that student data is protected.	3.17	Moderately challenging
Overall Mean	3.14	Moderately challenging

4.3.2. Internal Factors

Table 18 depicts the mean distribution of the level of challenges faced by IPEd intermediate teachers in teaching ICT in terms of internal factors, specifically experience. The overall mean is 3.26, which suggests that the challenges faced by teachers in this regard are moderately challenging.

One finding is that teachers face challenges in having sufficient training in using ICT devices, software, and applications (mean=3.32). This highlights the need for ongoing professional development programs that provide teachers with the necessary skills to effectively integrate technology into their teaching practices. Furthermore, teachers report a need for time to experiment with new technologies (mean=3.25), which suggests the importance of providing them with the necessary time and resources to explore innovative teaching practices.

Table 18. Mean Distribution of the Level of Challenges of the IPED Intermediate Teachers in Teaching ICT in Terms of Internal Factors: Experience.

Indicators	Mean	Description
Internal challenges in teaching ICT (Experience) *I have…*		
1. Sufficient training in using ICT devices, software, and applications.	3.32	Moderately challenging
2. Familiarity with how to design effective learning activities that incorporate technology or how to leverage digital resources to enhance student learning.	3.33	Moderately challenging
3. Regularly access ICT resources in school.	3.30	Moderately challenging
4. Practiced the creation of digital content, such as videos, podcasts, or interactive simulations.	3.21	Moderately challenging
5. The ability to troubleshoot technical problems.	3.27	Moderately challenging
6. Familiarity with the range of available ICT resources, such as educational software or online platforms.	3.22	Moderately challenging
6. Sufficient time to experiment with new technologies.	3.25	Moderately challenging
7. Collaborated with others to develop my ICT skills and share best practices for integrating technology in the classroom.	3.27	Moderately challenging
8. Attended periodic training in developing ICT-based instructional material	3.13	Moderately challenging
9. Taught learners who can clearly understand instructions and know how to use computer and other devices.	3.22	Moderately challenging
10. Sufficient training in using ICT devices, software, and applications.	3.32	Moderately challenging
Overall Mean	3.26	Moderately challenging

Another finding is that teachers face challenges in developing effective learning activities that incorporate technology or leveraging digital resources to enhance student learning (mean=3.33). This suggests that there may be a need for additional support and training in instructional design and pedagogical strategies that effectively integrate technology.

Additionally, teachers reported challenges in collaborating with others to develop their ICT skills and share best practices for integrating technology in the classroom (mean=3.27). This highlights the importance of fostering a culture of collaboration and professional learning communities among teachers to promote the sharing of knowledge and skills.

The findings suggest that while teachers possess some level of experience with using ICT in the classroom, there are still areas where they require further training and support to effectively integrate technology into their teaching practices. Providing ongoing professional development programs, time and resources for experimentation, and opportunities for collaboration and sharing of best practices could help address these challenges and improve the use of technology in teaching and learning.

Table 19 shows the mean distribution of the level of challenges faced by intermediate teachers in teaching ICT in terms of internal factors: appraisal. The table includes ten indicators of internal challenges that teachers face while teaching ICT, such as integrating technology into their teaching practice effectively, ensuring the safety and privacy of students, and enhancing personal connections between teachers and students.

Table 19. Mean Distribution of the Level of Challenges of the IPED Intermediate Teachers in Teaching ICT in Terms of Internal Factors: Appraisal.

Indicators	Mean	Description
Internal challenges in teaching ICT (Appraisal) *ICT can…*		
1. Help me in the teaching and learning process.		
2. Give me aid in my role as primary source of knowledge in the classroom.	3.33	Moderately challenging
3. Provide assistance to enhance my teaching practice and augment human interaction in the classroom, leading to improved learning outcomes for my students.	3.29	Moderately challenging
4. Make me feel empowered and confident as I use technology for effective teaching.	3.35	Moderately challenging
5. Effectively integrate technology into my teaching practice in a way that is purposeful, intentional, and directly supports the learning outcomes I am striving to achieve.	3.33	Moderately challenging

6. Allow me to effectively integrate technology into my teaching practice without concerns over cost or maintenance	3.35	Moderately challenging
7. Enhance learners' learning across a variety of subject areas and are motivated to continuously learn and innovate with technology in my teaching practice.	3.35	Moderately challenging
8. Enhance the personal connection between teachers and students, promoting increased engagement and motivation in the learning process.	3.40	Moderately challenging
9. Efficiently and effectively integrate technology into my teaching practice, supported by accessible tools and resources that streamline the process and save valuable time.	3.29	Moderately challenging
10. Prioritize the safety and privacy of my students when integrating technology in the classroom and have access to the necessary tools and resources to ensure secure and responsible use of technology.	3.29	Moderately challenging
Overall Mean	3.33	Moderately challenging

The overall mean of the table indicates that intermediate teachers find teaching ICT moderately challenging. The table shows that intermediate teachers face challenges in integrating technology into their teaching practice effectively and purposefully to support their learning outcomes. Furthermore, teachers face challenges in ensuring the safety and privacy of their students while using technology.

The findings are consistent with previous studies that have identified various challenges faced by teachers in integrating technology into their teaching practice. For example, a study by (Brevik et al., 2019) found that teachers face challenges in using technology to support their pedagogical practices and that they require professional development to improve their skills and knowledge of ICT.

4.4. Correlation Analysis Between the Teachers' ICT Skills and the ICT Skills of Learners

The fourth objective was to examine the relationship between the ICT skills of IPEd intermediate teachers and the ICT skills of learners. Table 20 shows the correlation analysis between the teachers ICT skills and the ICT skills of the learners. It can be gleaned that, the negative r – value (-.337) suggests that there is a negative correlation between the ICT skills of the teachers and the ICT learners' skills. In other words, as the ICT skills of the teachers increase, the ICT skills of the learners tend to decrease. However, it is important to note that this correlation is relatively weak, with a p-value of .007 indicating that the result is statistically significant but not very strong.

Table 20. Correlation Analysis between the Teachers' ICT Skills and the ICT Skills of Learners.

Variables	r-value	p-value	Interpretation	Decision
Teachers' ICT skills and ICT skills of learners	-0.337	0.007	Significant	Reject Ho

Note: Level of significance at 0.05.

These results suggest that teachers who are more skilled in ICT may be relying too heavily on technology in their teaching, to the point where learners are not developing their own ICT skills as much as they could be. This could be particularly relevant in areas such as productivity and professional practice, where teachers may be using technology to complete tasks that learners could be doing themselves.

Alternatively, it is possible that teachers with higher ICT skills may be using more advanced or complex technology tools that are not accessible or appropriate for learners with lower levels of ICT skills. This could be particularly relevant in areas such as planning and designing learning environments and experiences, where teachers may be using technology to create interactive or multimedia resources that require a certain level of technical proficiency.

Moreover, teachers with higher ICT skills may be more focused on technical aspects of ICT use, such as software and hardware operations, rather than on pedagogical aspects such as designing effective learning experiences that incorporate technology. This could be particularly relevant in areas such as teaching, learning, and curriculum, where teachers may need to balance the use of technology with other instructional strategies.

Similarly, several recent studies have explored the relationship between the ICT skills of teachers and learners, and several have found a negative correlation between the two. In the study by (Hu et al., 2018) they found that there was a negative correlation between teacher ICT skills and student ICT skills.

It is notable that the negative correlation between teacher and student ICT skills is due to several factors. Especially that the the six areas in which the ICT skills of the teachers were assessed cover a broad range of skills, from technical skills to pedagogical skills and ethical considerations.

Despite these findings, it should be noted that not all studies have found a negative correlation between teacher and student ICT skills (Bergdahl et al., 2020). For instance, in a study by (Arrosagaray et al., 2019) wherein they did not find evidence to support the claim that an increase in teacher ICT skills leads to a decrease in student ICT skills.

4.5. Multiple Regression Analysis Summary Influencing the Pupils ICT Skills

The fifth objective was to determine the extent to which the ICT skills of IPEd intermediate teachers influence the ICT skills of learners. Based on the multiple regression analysis summary Table 21, the results show that several variables significantly influence pupils' ICT skills. The variables are Technology Operations and Concepts, Teaching, Learning and Curriculum, Assessment and Evaluation, Productivity and Professional Practice, and Social, Ethical, Legal and Human Issues. Technology Operations and Concepts have a negative coefficient (-.434) and a significant effect (p=.032), indicating that pupils who have a better understanding of technology operations and concepts tend to have higher ICT skills. This finding is consistent with previous research that highlights the importance of technology literacy in developing ICT skills among pupils (Jalil et al., 2021)

Table 21. Multiple Regression Analysis Summary Influencing the Pupils ICT Skills.

Variables	B	SE	β	t	p
(Constant)	7.343	0.234		7.003	0.000
• Technology Operations and Concepts	-0.772	0.134	-0.434	-3.217	0.032*
• Planning and Designing Learning Environment and Experiences	-0.027	0.037	-0.067	-0.723	0.471
• Teaching, Learning and Curriculum	0.067	0.039	0.153	1.986	0.035*
• Assessment and Evaluation	0.459	0.034	0.278	3.561	0.000*
• Productivity and Professional Practice	0.765	0.092	-0.478	-3.425	0.015*
• Social, Ethical, Legal and Human Issues	-0.187	0.287	-0.348	-3.712	0.016*

Teaching, Learning, and Curriculum have a positive coefficient (.153) and a significant effect (p=.035), suggesting that pupils who receive effective instruction and learning experiences in ICT tend to have higher ICT skills. This finding is consistent with previous research that highlights the importance of pedagogical strategies in developing ICT skills among pupils (Lawrence & Tar, 2018)

Assessment and Evaluation have a positive coefficient (.278) and a significant effect (p=.000), indicating that effective assessment and evaluation of pupils' ICT skills can contribute to the development of these skills. This finding is consistent with previous research that emphasizes the importance of assessment and evaluation in improving ICT education (Martin et al., 2019)

Productivity and Professional Practice have a negative coefficient (-.478) and a significant effect (p=.015), suggesting that pupils who use ICT tools to increase productivity and improve professional practice tend to have higher ICT skills. This finding is consistent with previous research that highlights the importance of integrating technology into work and productivity practices (Fernando et al., 2019)

Social, Ethical, Legal, and Human Issues have a negative coefficient (-.348) and a significant effect (p=.016), indicating that pupils who have a better understanding of social, ethical, legal, and human issues related to ICT tend to have higher ICT skills. This finding is consistent with previous research that highlights the importance of ethical and social considerations in ICT education (Porat et al., 2018)

Planning and Designing Learning Environment and Experiences do not have a significant effect on pupils' ICT skills, as shown by its non-significant coefficient (p=.471).

In addition, consistent findings across multiple studies supports the notion that effective technology integration in Indigenous education is positively related to teachers' technology skills and their ability to design and implement curriculum and assessments that incorporate technology (Margot & Kettler, 2019). In a multiple regression analysis conducted by one of these studies, Teaching, Learning and Curriculum and Assessment and Evaluation were found to have a significant positive relationship with technology, while Technology Operations and Concepts, Productivity and Professional Practice, and Social, Ethical, Legal and Human Issues had significant negative relationships with technology (Alqurashi, 2019). These results suggest that targeted training and support should be provided to educators who need help with technology operations, productivity, and ethical considerations to integrate technology more effectively into their teaching practice.

Executive Summary	
Project Title: Localized Teaching ICT Strategic Framework	**Proponent**: Alvic A. Arnado; Glenn M. Aviles
Beneficiary: DepEd Butuan City Division, Philippines	**Target Area**: Butuan City, Caraga, Mindanao, Philippiones

Rationale:

The use of Information and Communication Technology (ICT) has become an essential part of education in the 21st century, providing educators with tools to improve student learning outcomes and engage students in the learning process. However, the effective use of ICT in teaching and learning can be challenging, especially in the context of Indigenous Peoples Education. The Butuan City Division has a significant population of Indigenous Peoples, and the education system must consider their unique cultural and linguistic contexts in implementing ICT tools.

The development of a localized teaching ICT strategic framework for Indigenous Peoples Education teachers in Butuan City Division will help provide a guide that aligns with the local context and addresses the specific needs of Indigenous learners. The framework aims to support teachers in integrating ICT tools effectively into their teaching practices and improving students' ICT competencies while acknowledging the cultural diversity of the Indigenous Peoples.

Several studies have emphasized the importance of integrating ICT tools in teaching and learning to enhance learning outcomes and engage students (Jorre de St Jorre & Oliver, 2018) Moreover, research has highlighted the need to consider the cultural contexts of Indigenous learners in implementing ICT tools in education (Lakhan & Laxman, n.d.) Thus, a localized teaching ICT strategic framework for Indigenous Peoples Education teachers in Butuan City Division can provide a foundation for effective integration of ICT tools in the classroom that aligns with the local context and addresses the specific needs of Indigenous learners.

Objectives

The following objectives aim to address the challenges identified, specifically the need to improve the ICT skills of teachers while also considering the cultural and contextual factors of the indigenous peoples in Butuan City Division:

1. To improve the ICT skills of indigenous people's education teachers in Butuan City Division to enable them to effectively integrate technology in their teaching practices.
2. To enhance the learners' ICT competencies through the use of appropriate and culturally relevant technology in the teaching and learning process.
3. To promote equitable access to quality education and technology for all learners, particularly those from indigenous communities.
4. To foster cultural sensitivity and inclusion in the use of technology in the classroom, recognizing the diversity of indigenous cultures and knowledge systems.
5. To ensure sustainable and contextually appropriate implementation of technology in indigenous peoples education in Butuan City Division.

The framework aims to promote equitable access to quality education and technology while also preserving and promoting indigenous cultures and knowledge systems.

It was found out that among Technology Operations and Concepts, Teaching, Learning and Curriculum, Assessment and Evaluation, Productivity and Professional Practice, and Social, Ethical, Legal and Human Issues indicators, only Teaching, Learning and Curriculum, Assessment and Evaluation positively influence the ICT skills of the learners as they can see their teacher model the usage of the technological devices which they can familiarize and be acquainted with. The rest of the indicators are focused on how the teachers personally use the technology. It can be implied that learners can improve their ICT skills if they are engaged in the process of using the technology. (Shyr & Chen, 2018) found that students' ICT skills improved significantly when they were actively involved in the process of using technology in the classroom. The study involved 85 Malaysian undergraduate students who participated in a project-based learning activity using ICT tools. The results showed that the students' ICT skills improved in areas such as digital content creation, information literacy, and critical thinking. The researchers attributed the improvement to the students' active engagement with the technology, as they 'ere required to collaborate, experiment, and solve problems using ICT tools. The study suggests that integrating technology into classroom activities can be an effective way to enhance students' ICT skills.

This framework is dedicated to making the teaching and learning process more inclusive amidst the inadequacy of infrastructure, provision, training, and experience.

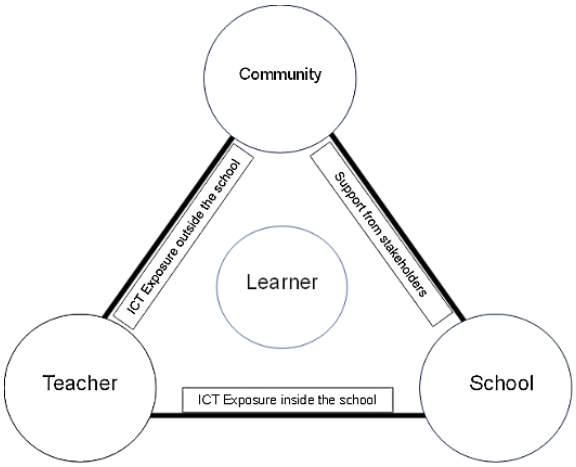

Figure 1. The Localized Teaching ICT Framework.

Concept:

The ICT skills of the learner in the middle are nurtured and supported by the teacher as the facilitator of learning, the school as the vessel of his learning, and the community as his home. Yet, aside from the teaching and the support, the learner must also be exposed to technological experiences wherein he will be able to explore and navigate his own knowledge through the use of ICT and consequently be able to develop his digital skills that he might use in the digital world. Ideally, it is best if there is bigger support for the establishment of infrastructure and provision of devices especially in the IPEd community.

Salient factors:

1. **Teachers**. They are the facilitators of learning, guiding the students in developing their technological proficiency and ICT skills.

   Roles:

   a. Facilitator of learning: The IPEd teacher should guide the learners in their exploration of various ICT tools and applications. They should provide a safe and inclusive learning environment that fosters curiosity and

creativity.

b. Promoter of digital literacy: The IPEd teacher should promote digital literacy by helping learners to become competent and confident in using various digital technologies.
c. Model of responsible digital behavior: The IPEd teacher should model responsible digital behavior by using technology appropriately and demonstrating how to use technology safely and ethically.
D. Designer of learning experiences: The IPEd teacher should design engaging and relevant learning experiences that integrate ICT tools and applications to enhance learning outcomes.
e. Evaluator of learning: The IPEd teacher should evaluate the effectiveness of ICT integration in the classroom and adjust their teaching methods accordingly to ensure that all learners are benefiting from the technology.
f. Collaborator with community and other educators: The IPEd teacher should collaborate with community members and other educators to identify resources and opportunities that can support the learners' ICT skill development.

Procedure:

a. Identify the learners' current ICT skills and needs – Conduct a pre-assessment to determine the level of proficiency of the learners in using different ICT tools and identify the areas that need improvement.
b. Incorporate ICT in lesson planning – Develop lesson plans that incorporate the use of ICT tools to facilitate learning. Use different multimedia resources such as videos, interactive activities, and online simulations to engage learners and enhance their understanding of the topics.
c. Provide hands-on experience – Allow learners to use different ICT tools and encourage them to explore the features and functions of the tools. Provide opportunities for them to practice using the tools until they become comfortable and confident in using them.
D. Encourage collaboration – Use ICT tools to facilitate collaboration among learners. For instance, create online discussion forums or virtual study groups where learners can share their ideas, insights, and feedback.
e. Model responsible use of technology – Teach learners about responsible use of technology, such as online safety, ethical behavior, and digital citizenship. Model these behaviors by setting guidelines for online interactions and ensuring that learners follow them.
f. Provide feedback and support – Provide timely and constructive feedback to learners to help them improve their ICT skills. Provide support and resources, such as online tutorials and guides, to help learners further develop their skills.
g. Continuously evaluate and improve – Regularly evaluate the effectiveness of the ICT integration in teaching and learning. Make adjustments and improvements based on feedback from learners and the outcomes of the evaluation.

2. **Schools** – They are the learning centers which creates an avenue where ICT skills acquisition has become possible.

Roles:

a. Providing access to necessary ICT resources: Schools should ensure that learners have access to necessary ICT resources, such as computers, tablets, internet connectivity, and software applications. This may require seeking funding or partnerships with organizations that provide these resources to schools in low-resource settings.
b. Offering ICT courses and training: Schools can offer ICT courses and training to learners to help them develop essential ICT skills. These courses can cover basic computer literacy, software applications, coding, and digital citizenship. Teachers can also provide professional development opportunities to improve their own ICT skills and teaching methods.
c. Integrating ICT into the curriculum: Schools can integrate ICT into the curriculum across all subjects, to promote active and engaged learning. For example, teachers can use digital tools and platforms to enhance collaboration, research, and creativity. They can also use online resources to supplement traditional teaching methods.
D. Fostering a positive digital culture: Schools can promote a positive digital culture by setting clear expectations for responsible digital behavior, such as ethical use of technology and safe online practices. They can also encourage learners to be active creators and contributors in the digital world, rather than

passive consumers.

e. Encouraging partnerships with the community: Schools can leverage partnerships with community organizations, such as libraries, museums, and local businesses, to provide additional ICT resources and learning opportunities for learners. These partnerships can also help to promote the use of ICT in real-world contexts and connect learners to relevant career pathways.

Procedures:

a. Conduct a needs assessment: Assess the ICT skills of the learners, the availability of ICT resources, and the training needs of the teachers. This will help in designing appropriate ICT interventions.
b. Provide ICT infrastructure and resources: Ensure that there is adequate ICT infrastructure and resources available to the learners, including hardware, software, and internet connectivity.
c. Offer ICT training to teachers: Provide training to teachers on how to use ICT tools and resources effectively in the classroom. This will help them integrate ICT into their teaching practices.
d. Integrate ICT into the curriculum: Integrate ICT into the curriculum and ensure that it is aligned with the learning objectives. This will help learners develop ICT skills while also achieving their learning goals.
e. Promote experiential learning: Encourage learners to use ICT tools to explore and discover new things. This will help them develop their problem-solving, critical thinking, and decision-making skills.
f. Encourage collaboration and communication: Foster a collaborative and communicative learning environment by using ICT tools that enable learners to work together on projects and share their ideas.
g. Evaluate the effectiveness of ICT interventions: Regularly assess the impact of ICT interventions on the learning outcomes of the learners. This will help in refining the interventions to make them more effective.

3. **Community** – an extension of the classroom for learning purposes. It involves engaging community members, resources, and institutions to provide students with real-world experiences that complement and enhance their academic learning. The idea is that the community can serve as a rich source of knowledge, skills, and values that students can apply to their academic and personal development.

Roles:

a. Support the use of technology in education – The community can support the integration of ICT in the classroom by providing access to technology and resources such as computers, internet, and software. They can also provide financial support to the school to acquire necessary technological equipment.
b. Encourage collaboration and knowledge-sharing – The community can create a platform for educators and learners to collaborate and share knowledge about ICT. They can organize workshops, training sessions, and seminars to improve the ICT skills of the learners.
c. Incorporate indigenous knowledge and culture – The community can help in incorporating indigenous knowledge and culture into the use of technology. They can provide examples of how technology can be used to preserve and promote their culture and values.
d. Advocate for policies and programs – The community can advocate for policies and programs that support the use of technology in indigenous education. They can lobby for government funding and resources to support the integration of ICT in the classroom.
e. Foster a culture of digital citizenship – The community can promote responsible and ethical use of technology among learners by fostering a culture of digital citizenship. This includes teaching learners about online safety, privacy, and security.

Procedure:

a. Establish community-led programs or initiatives that promote ICT literacy and use among community members, including learners. This can include workshops, training programs, and community events that showcase the benefits of ICT and how it can be used in everyday life.
b. Encourage the development of ICT-related skills among community members, such as coding, digital content creation, and data analysis. This can be done through partnerships with local organizations and experts who can provide training and mentorship to interested individuals.
c. Advocate for the availability of ICT resources and infrastructure in the community, such as access to computers, high-speed internet, and software programs. This can be done through community-led campaigns and lobbying efforts to local government and other relevant organizations.
D. Promote the integration of ICT in traditional indigenous knowledge and practices, such as language

preservation, storytelling, and cultural arts. This can be done through the development of digital content and tools that incorporate indigenous knowledge and values.

e. Foster a culture of collaboration and knowledge sharing among community members, particularly between elders and youth. This can be done using ICT platforms and tools that facilitate communication and information sharing.

Sub-Factors:

V. ICT exposure inside the school.

Ways:

a. Establish computer labs or ICT centers: Create a dedicated space in the school for computer use and technology education. This can be a room or area equipped with computers, internet access, and software programs that support learning objectives.
b. Integrate technology into curriculum: Encourage teachers to incorporate technology into their lesson plans and teaching strategies. This can include using multimedia presentations, interactive online resources, and digital tools to enhance the learning experience.
c. Offer ICT-related courses or workshops: Organize workshops or courses focused on ICT skills development. This can include training sessions on computer basics, software applications, coding, and other related skills.
D. Provide access to online resources: Allow learners access to online resources that support their learning objectives. This can include access to e-books, digital libraries, and educational apps.
e. Use mobile devices for learning: Utilize mobile devices like tablets and smartphones to support learning activities. This can include using educational apps, accessing online resources, and conducting research.
f. Involve parents and the community: Encourage parents and community members to participate in school ICT-related activities. This can include organizing ICT-related events, inviting guest speakers to talk about technology, and promoting ICT-related programs in the community.

2. ICT exposure outside the school.

Ways:

a. Encourage learners to participate in online communities related to their interests. Online communities, such as forums, social media groups, and online clubs, offer opportunities for learners to interact with others who share the same interests, learn from each other, and develop their digital citizenship skills.
b. Provide learners with access to educational apps and software. There are many educational apps and software available online that can help learners develop their ICT skills while also learning new concepts and skills.
c. Encourage learners to use technology to pursue their hobbies and interests. Whether it's creating videos, writing blogs, or designing games, using technology to pursue hobbies and interests can help learners develop their ICT skills in a fun and engaging way.
D. Provide learners with opportunities to participate in technology-related events and competitions. There are many technology-related events and competitions, such as hackathons and coding competitions, that can provide learners with opportunities to apply their ICT skills in real-world settings and gain exposure to potential careers in technology.
e. Encourage learners to volunteer or intern with organizations that use technology. Volunteering or interning with organizations that use technology, such as non-profit organizations or tech companies, can provide learners with hands-on experience and exposure to different aspects of the technology industry.

3. Support from stakeholders.

Ways:

a. Partnership with Technology Companies: Schools can collaborate with technology companies to provide learners with access to modern technology and relevant software tools.
b. Community Outreach Programs: Collaborating with local businesses, organizations, and community centers can provide students with access to technology resources outside of the school environment.
c. Parent and Family Engagement: Educating parents and family members about the importance of technology and encouraging them to support their children's use of technology at home can increase learners' ICT

exposure.

D. Grants and Funding: Schools can seek grants and funding from government agencies, non-profit organizations, and private foundations to provide learners with access to technology resources.
e. Teacher Professional Development: Providing teachers with professional development opportunities to enhance their own ICT skills can lead to more effective integration of technology into the curriculum.
f. Advocacy and Policy: Educators can advocate for policies and initiatives that support technology education and access for all learners, including those from underserved communities.

It is hoped that these processes will effectively aid the challenges faced by the indigenous people's education school in Butuan City Division.

5. CONCLUSIONS

Based on the results of the study, the teachers in the IPEd program have moderate confidence in their technology skills, particularly in troubleshooting common technology problems and errors, but are very confident in other areas such as planning and designing environments and experiences, teaching, learning and curriculum, assessment and evaluation, productivity, and professional practice, and in social, ethical, legal and human issues.

On the other hand, the learners in the IPEd program show slight confidence in creativity and innovation, communication and collaboration, critical thinking, problem-solving, and decision-making. However, they are moderately confident in evaluating the credibility, reliability, and relevance of information sources, being respectful and responsible in communication, and collaborating online using different communication tools and platforms. They also learn better when they are exposed or modeled about using technological devices.

Furthermore, both the teachers and learners perceive external challenges such as infrastructure, cost, security, and privacy, access to resources, and technological advancement as moderately challenging, and perceive internal challenges regarding their experience and appraisal as moderately challenging as well.

The findings suggest that there is room for improvement in enhancing the ICT skills of both teachers and learners in the IPEd program, particularly in areas where they showed lower levels of confidence.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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