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Impact of tablets on learning and perceptions of the indigenous educational community of Amazonas

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Abstract

The objective of this research was to evaluate the impact of tablets on the learning of indigenous students in the department of Amazonas and to analyze the perceptions of educational subjects regarding the pedagogical use of these technological tools. A quantitative-descriptive approach was used employing standardized tests and perception surveys. The population consisted of 2,342 students whose learning was assessed and 180 respondents, including teachers, parents, and indigenous students. The results showed that 82% of students were at the lowest learning levels with only 4.7% achieving a satisfactory level. 54.65% of teachers had never used tablets for pedagogical purposes due to a lack of training (84.84%) and connectivity (55.10%). Regarding parents, 49.80% stated that these tools were never used for educational purposes. 59.72% of students responded that they had never used tablets at home for educational purposes. The conclusion is that connectivity limitations and a lack of training have led to a low impact on learning and negative perceptions in the educational community. Thus, the need to implement comprehensive strategies for training, connectivity and the provision of technological resources to improve the education of indigenous students is underscored.

Keywords: Indigenous education, Learning, Parent perception, Student perception, Tablets, Teacher perception, Technological resources.

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Contribution of this paper to the literature

This study is unique because it is the first time, in Peru that an evaluation has been conducted of the impact of tablets on the learning of indigenous students and the educational community's perception of their pedagogical use based on student learning outcomes and perception surveys in indigenous languages.

1. Introduction

The COVID-19 pandemic triggered a crisis in all spheres of society, deeply affecting the most vulnerable sectors such as the education sector, harming the continuity and achievement of learning for students around the world. Educational institutions suspended face-to-face educational services to guarantee educational continuity. They were forced to seek strategies to ensure the development of academic activities (López-Noguero, Gallardo-López, & García-Lázaro, 2021). According to a report prepared by the Economic Commission for Latin America and the Caribbean (ECLAC), and the United Nations Educational, Scientific and Cultural Organization (ECLAC, 2024) the interruption of face-to-face classes due to the pandemic affected almost 200 countries worldwide to protect health and mitigate the effects of the crisis. This situation resulted in more than 1.2 billion students having to abandon the face-to-face learning modality (Bloom, Reid, & Cassady, 2020).

The report highlights that educational institutions were closed, suspending face-to-face classes, and distance education models were implemented in contexts where connectivity was possible, online and in contexts where connectivity was poor, asynchronous offline education was implemented. Educational communities were given a series of technological devices such as tablets, USBs, and solar chargers to facilitate student learning to implement both forms of distance education (ECLAC, 2024).

In Peru, according to the Peruvian Institute of Economics (2021) in 2020, more than 400 thousand students dropped out of in-person education as a result of the health emergency. In addition, this pandemic deepened educational inequalities although palliative measures such as distance education were implemented, access to these solutions was unequal (Haelermans et al., 2022). For example, 30% of students from lower-income households continued their studies through the radio while those from families with better economic conditions used electronic platforms or web pages, obtaining higher academic performance. In this context, the Ministry of Education designed the strategy (I learn at home) to reduce the negative effects of the pandemic on education, ensuring the continuity of learning through the implementation of educational programs broadcast on state radio and television, and then, through the distribution of tablets to students and teachers in public educational institutions (Flores, 2024). According to Theunissen and Siebörger (2023) when citing the case of South Africa, the distribution of tablets to students was positioned as one of the main strategies adopted in many countries to respond to the health emergency.

On the other hand, in relation to the education of students belonging to indigenous peoples, Sánchez-Cruz, Masinire, and Vez-López (2021) state that during the pandemic, they were the most affected since online education requires, without exception, access to internet services and technological devices, and as these resources are non-existent in indigenous territories, the pandemic deepened the great inequalities to the detriment of the learning of these indigenous students. The abrupt change from the face-to-face model to virtual modalities, online or through telephone communication posed important challenges to guarantee relevant and effective education for indigenous peoples. The lack of digital devices and limited internet connection left a large population excluded from classes and interaction with the educational community (Gu, 2021). The limited experience and lack of knowledge in the use of technologies by students and their families which made it difficult to apply these tools in the educational process (Anaya Figueroa, Montalvo Castro, Calderón, & Arispe Alburqueque, 2021). Similarly, many teachers lacked adequate command of digital resources for teaching and learning which hindered effective teaching.

Regarding the impact generated by digital resources such as tablets, laptops and cell phones, UNESCO presented the Global Education Monitoring Report for 2023 (UNESCO, 2023) which highlights that the excessive use of technology on tablets or mobile devices has a negative impact on students' learning (Gorjón & Osés, 2023). This report shows that international assessments such as the Programme for International Student Assessment (PISA) have shown a negative relationship between the excessive use of ICT and students' academic results. In certain countries, it is concluded that having a mobile device becomes a distraction for students, generating a negative impact on their learning (Kuznekoff, 2022). The report argues that very few countries have established sufficiently strict regulations to enable the appropriate use of technological devices in educational processes, so that in most countries inappropriate and excessive use of these digital resources is facilitated.

In Peru, there are not enough rigorous studies that demonstrate with empirical evidence the positive or negative effect of tablets on education. A report from the Ministry of Education (2023) study revealed that, although tablets are valuable tools to promote learning for students in rural areas who have very little access to the Internet, it reported that only about 30% of students achieved the expected learning outcomes in mathematics and reading comprehension. This same study highlighted that the preparation and capacity of parents to support their children in the use of technological devices have a significant impact on achieving positive educational outcomes. However, more studies are needed to assess the real impact of tablets (Rahali, Chikhaoui, Khattabi, & Ouzennou, 2023) particularly in indigenous communities in the country where educational dynamics and needs are different and require a more contextualized analysis.

In the department of Amazonas characterized by the presence of Awajún and Wampis indigenous communities, mainly located in the northern zone with a cultural wealth and the preservation of their indigenous worldview. However, these territories face high levels of social and economic vulnerability. Thus, a recurring problem is inadequate access to basic services such as drinking water, physical sanitation, electrification, internet and technological resources which significantly affects most families. In the educational field, this lack also affects the opportunities of Awajún and Wampis students to access better learning. This reality worsened during the COVID-19 pandemic when virtual education was the only option to guarantee the continuity of the educational process. However, this modality faced great challenges due to multiple barriers related to connectivity, technology and the lack of electrification in these communities. Although the Ministry of Education of Peru (2023) distributed

technological tools such as tablets to students and teachers as a measure to allow access to virtual education, their true effect has not yet been evaluated. Therefore, the effectiveness of these policies in these indigenous communities cannot be determined even more so when comprehensive measures have not been implemented.

In this scenario, it is relevant to analyze the impact and perception that the subjects of education (indigenous teachers, students, and parents) have regarding the use, importance, and limitations of the inclusion of tablets as digital devices in the achievement of learning in native communities.

2. Literature Review

Rahali et al. (2023) focused on assessing how tablets influence learning in primary schools in Morocco. They employed a methodology that consisted of administering surveys and conducting experiments. In the research, the academic performance of a group of 35 students who made use of tablets was compared with another group of 30 students who relied solely on traditional teaching methods. The findings showed that students who used tablets achieved significantly higher grades compared to those who worked exclusively with conventional approaches.

Casales's (2019) research concluded that digital technologies played a decisive role in the COVID-19 pandemic to allow the educational service to continue to be provided in a distance learning modality. It states that the aforementioned educational technologies became indispensable tools for teachers to communicate with their students, to provide feedback and to evaluate learning. These technologies have provided students with a series of online educational resources (Kusumaningrum & Noviyanti, 2022). Despite this, when measuring the effectiveness of these technological tools, it was possible to see that the results in terms of learning were not significantly relevant. Therefore, it raises the need to rethink educational strategies, conceiving it as a comprehensive intervention that focuses on all aspects of infrastructure, equipment, and capacity building.

Ortega, López, Sortillón, Gamiño, and Cheu (2022) analyze the impact that the transition from face-to-face teaching to virtual mode had on the academic performance of students as a result of the SARS-COV-2 pandemic. For the study, an online survey was applied to students in the commune of Hermosillo in Sonora. The findings obtained reflected that students faced significant difficulties in adapting to virtual education, which was evidenced by a decrease in the time spent on activities such as physical exercise and quality sleep as well as an increase in the time spent on work in some cases. Consequently, the study concluded that confinement, together with the conditions of virtual education generated a negative impact on both the lifestyle habits of students and their academic performance.

On the other hand, analyzed teachers' perceptions regarding the pedagogical use of Google tools and found that teachers use these tools very little in their pedagogical practice, basically due to a lack of knowledge. Along the same lines, identified that the elements that contribute to the development of digital competencies are the incorporation of technologies in teaching, teaching conditions, and the ability to create digital resources. Torrano, Fuentes, and Albertos (2022) conducted research focused on the perceptions of Spanish families regarding the use of tablets in primary education institutions. The study was conducted with a sample of 396 parents from 31 educational centers distributed across six autonomous communities in Spain. The findings revealed that 70% of families reported having received training on the use of tablets. However, this training was mostly brief, lasting less than five hours. Regarding acceptance, 68% of parents agreed with the incorporation of tablets in the classroom although they highlighted that they do not perceive significant changes in teaching methodologies (54%). Regarding the impact on academic performance, 56% believed that tablets have not generated substantial improvements. Similarly, in Saudi Arabia, investigated the satisfaction of 307 parents with the virtual education their children were receiving at the time of the pandemic and found that respondents' satisfaction was moderate. Regarding student perceptions, in Indonesia analyzed the attitudes of 342 students towards e-learning at the time of the pandemic and found that students on average had neutral attitudes.

In contrast, the study by Mushtaque, Rizwan, Dasti, Ahmad, and Mushtaq (2021) found that students showed favorable attitudes towards online teaching during the pandemic but deficiencies in connectivity and electricity negatively affected it.

In the Peruvian context, Gómez-Arteta and Escobar-Mamani (2021) conducted a study focused on social inequalities related to virtual education in Peru during the 2020 pandemic. The results obtained were very similar to a study in China where it was shown that insufficient resources and the digital divide become an obstacle to learning and harm students' opportunities (Song, 2023) but also intensified the digital and educational gaps, impacting mainly the most vulnerable sectors which are predominantly found in rural areas and indigenous communities. These findings showed that a significant number of students were excluded from the educational system, which aggravated pre-existing inequalities due to the lack of technological and economic resources. According to Orbegoso, Rafael, and Moreno (2021) that education in Peru, during the pandemic, stopped fulfilling its role as a universal and accessible right for all, becoming a privilege reserved for those who had the necessary economic conditions to access it.

Chuco (2021) points out that the digital divide in the country has represented a highly relevant educational and social challenge, especially in the mid of COVID-19. In response to this problem, the Ministry of Education began a process of acquiring tablets for teachers and students as a component of a broad strategy to enable students to continue their studies remotely. However, the major barriers related to internet connection, access to electricity and the availability of technological equipment highlight the need to focus on closing the large digital gaps to guarantee equitable education that is accessible to all Peruvian students.

Similarly, Anaya Figueroa et al. (2021) in a study on the situation of rural educational institutions in Peru state that the COVID-19 pandemic has exposed the deep structural gaps facing Peruvian education, particularly in rural areas. For this reason, the study emphasizes the urgency of implementing educational policies aimed at equipping students with technological resources that enable their digital inclusion. This includes not only the provision of equipment and the improvement of connectivity but also teacher training in the use of ICT tools and the promotion of intercultural dialogue as a learning option.

In general terms, studies regarding the impact of tablets on education have shown varied results (Liu, 2022). On the one hand, some research has shown that tablets have improved curricular learning achievements and have

raised the level of motivation of students (Ministry of Education, 2023) but other research has also shown that these technological devices have not had a positive and significant impact on student learning and may even be counterproductive if not used properly (Chaturvedi, Vishwakarma, & Singh, 2021).

In 2023, the Ministry of Education (2023) published a study that analyzed the impact of tablets on learning during the COVID-19 pandemic concluding that the impact was positive. In response to the health crisis, the education sector carried out the strategy called " closing the digital gap" throughout the country. This initiative consisted of distributing tablets to students and teachers at public educational institutions in rural and marginal urban areas with low incomes to allow students to continue studying. The tablets, duly equipped with a series of applications and educational content and internet access in some cases contributed to students taking their classes remotely. However, the effectiveness of this measure was largely conditioned by the support, guidance and supervision that could be provided by adults within the family. Those parents who showed greater knowledge and mastery of digital technologies played a decisive role in ensuring that their children used tablets appropriately and efficiently, thereby ensuring that they were useful tools to improve student learning. However, the use of tablets was not without several challenges, such as appropriate use, rational use and control to avoid adverse effects. The report also revealed that gender inequalities in the domestic sphere influenced learning outcomes; girls, by taking on a greater burden of household chores faced additional barriers that hindered their academic performance which in turn deepened pre-existing inequalities.

Finally, Chira and Rodríguez (2024) analyzed the impact of tablets on the learning process during the COVID-19 pandemic. In their research, they state that tablets became a key tool to guarantee remote or distance education, allowing students to have continuity in the educational service in a context where educational institutions closed their doors and restricted face-to-face classes because it was unfeasible given the risks they represented for health. However, they say that the effectiveness of this resource was deeply conditioned by factors associated with internet connectivity, the permanence of electricity, the educational level and the preparation of parents and guardians to provide adequate support in the use of technology. In the specific case of Peru where access to technological resources is limited and presents marked inequalities, tablets contributed to attenuating the loss of learning, although they were not able to completely replace the interaction and benefits of face-to-face teaching. The lack of connectivity and the lack of familiarity with the use of digital technology compromised the efficiency of these tools, exacerbating the inequalities already existing in the Peruvian educational system itself (López, 2024).

At a theoretical level, Lev Vygotsky argues that learning is a product of social interaction and is developed in collaboration with others (Roth and Lee). In this logic, knowledge is assumed to be a historical and social product constructed through social relations. Therefore, in the context of indigenous students belonging to the Awajún communities, the use of electronic devices is not enough to promote learning; in addition, the figure of a teacher competent in the use of these technological tools becomes essential, thus ensuring a positive impact on learning. The mere incorporation of digital and portable devices in educational institutions does not guarantee the achievement of effective learning because learning, being a social process requires that teachers and students integrate strategies adjusted to significant sociocultural contexts (Caldwell & Bird, 2024).

On the other hand, Vygotsky's approach is also based on the fact that the cognitive development of individuals is not predetermined solely by their internal capacities but emerges through social interaction and the intervention of cultural aspects as well as dialogue with other people (Zavershneva & Veer, 2019). In this context, tablets are considered cultural tools that can facilitate learning as long as their implementation contemplates the use of culturally relevant educational resources and is adjusted to the specific characteristics of Awajún students as highlighted above. These statements are consistent with Vygotskian approaches which affirm that human development, particularly cognitive development, constitutes a process prolonged over time based on historical and cultural foundations and mediated in a social way (Smagorinsky, 2018).

3. Methods

This research is based on a quantitative approach whose main objective is to analyze the impact that tablets have had on the learning of indigenous students in the department of Amazonas as well as the perceptions of the subjects of education in these contexts in relation to the pedagogical use of tablets. The methodology allowed describing the perceptions of teachers, students and parents in relation to the use of these technological tools as well as the level of learning achieved by indigenous students. The quantitative approach makes it possible to measure academic performance in reading comprehension through standardized tests.

The population considered for this research was made up of Awajún students in the fourth grade of primary education who during the context of the pandemic were studying in the first grade and received tablets as a technological tool for educational support. Similarly, this population includes the parents of these students and the teachers belonging to the educational institutions that offer the bilingual intercultural education service which is an education model for indigenous peoples where students first learn in their native language and then, gradually, incorporate Spanish as a second language. For the collection of information, a sample of 180 educational subjects was chosen distributed among 60 students who are in the fourth grade of primary education, 60 parents of these students and 60 teachers who work in educational institutions of bilingual intercultural education located in the districts of Imaza, El Cenepa and Río Santiago in the department of Amazonas where there are indigenous populations whose mother tongue is Awajún.

A standardized test was used to measure learning in reading comprehension in Spanish as a second language which was administered by the Quality Measurement Unit (UMC) of the Ministry of Education of Peru to collect data for this research. From this test, the results of the level of achievement reached by students in Spanish as a second language were obtained. Finally, teachers and students regarding the use of tablets in bilingual intercultural education institutions, three structured surveys were designed and applied, each one specifically addressed to one of these groups to collect the perception of parents. The surveys were constructed in the Awajún language to ensure their cultural and linguistic relevance and contained 10 items focused on collecting their opinions on the perception of the use of tablets, their usefulness in learning and the difficulties they faced when using them.

Finally, regarding ethical considerations, the study adhered to ethical research standards, ensuring informed consent from all participating subjects. Confidentiality and anonymity were maintained throughout the data

collection and analysis process. In addition, the research team worked closely with local communities to ensure cultural sensitivity and respect for indigenous perspectives.

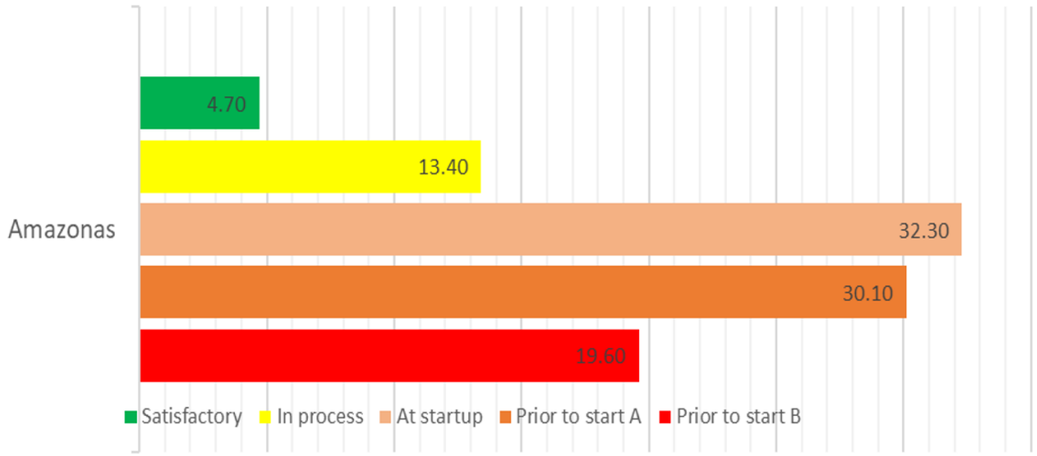

Figure 1. Achievement level in Spanish as a second language in percent.

4. Results

The impact of tablets on the learning of indigenous students assessed through the reading proficiency in Spanish as a second language in indigenous students in the fourth grade of primary education registered as EIB shows critical results. Only 4.7% of students are at the satisfactory level. They read and understand adequately. More than 80% are at the beginning and below this level which reflects that education in these indigenous contexts is going through a serious crisis. When the COVID -19 pandemic arose, these students were studying the first grade of primary education and due to health measures; they took their classes using tablets overcoming a series of structural barriers in terms of connectivity to ensure that learning was not affected. However, since students did not have adequate guidance and advice in the institution and within their families, they were unable to give pedagogical use to these technological tools which led to their failure to appropriate the written code in an appropriate and timely manner because these low learning achievements continue to drag on and deepen.

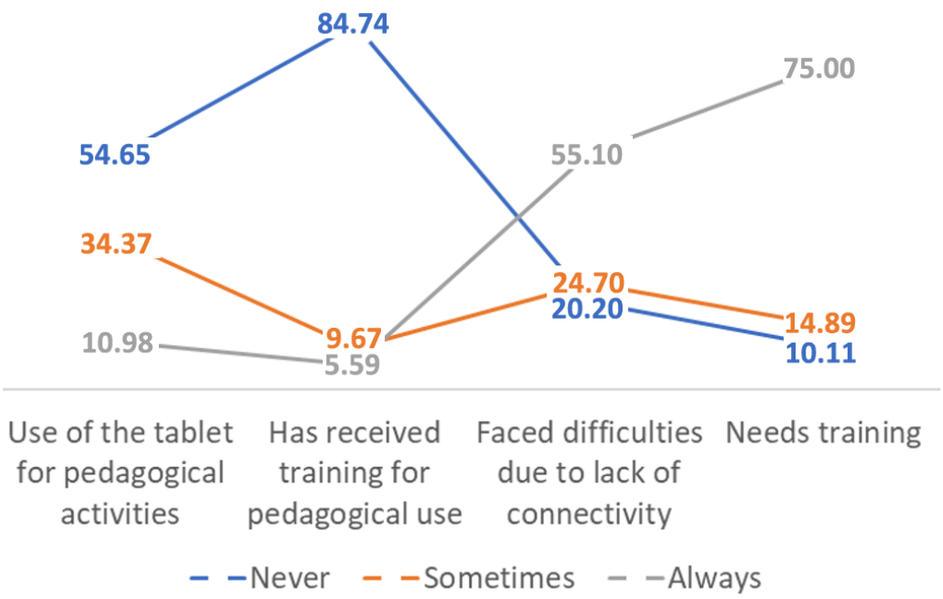

Figure 2. Perception of bilingual teachers regarding the use of tablets.

Bilingual teachers have different perceptions regarding the use of tablets for pedagogical activities. It is evident that 54.65% consider that they have never used tablets, 34.37% sometimes, and 10.98% always. Another relevant fact is that 84.74% of teachers report never having received training to use tablets pedagogically compared to only 5.59% who have always received training. In addition, 55.10% of teachers have always faced difficulties due to a lack of connectivity, and finally, 75% of teachers always require training to use tablets pedagogically. These figures reflect that the low frequency of pedagogical use of tablets is strongly linked to a lack of training and frequent connectivity problems. However, beyond pedagogical use or teacher training, the root of the educational problem in these indigenous contexts lies in the precarious educational infrastructure at the level of connectivity, electrification and training that limits the adequate use of these digital tools. This situation, during the pandemic and afterwards, caused those who were most affected to be the students, by not able to achieve the minimum learning expected in basic education as reflected in Figure 1. Similarly, the digital divide prevailing in these areas harms the professional development of teachers, limiting innovation and the incorporation of appropriate methodologies for education and reassigning them to continue with educational models that no longer respond to current educational demands. This described situation leads to affirming that interventions aimed at solving the educational problem must be addressed in a comprehensive manner, focusing on closing the existing gaps at the level of educational infrastructure but complemented with measures aimed at improving teacher training.

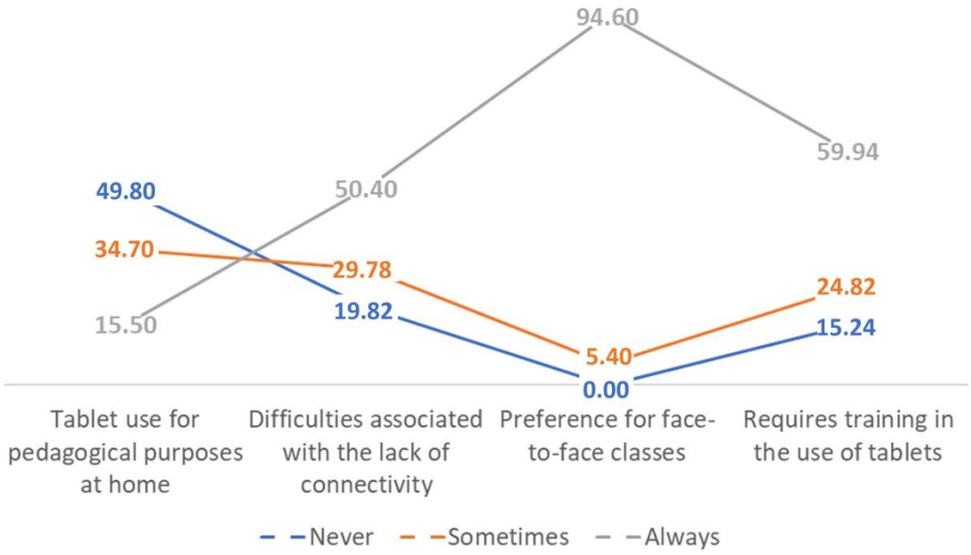

Figure 3. Parents' perception of the use of tablets.

The perception of indigenous parents reflects a rather worrying reality. 49.80% say that tablets are never used for educational purposes by their children compared to only 15.50% who claim the constant use of these tools. These figures indicate that technological devices are not conceived as an important tool that contributes to the education of their children at home. This perception is due to the lack of infrastructure and connectivity given that 50.40% of parents claim to always have these difficulties, which becomes a barrier to access educational platforms and even to the information to use these resources appropriately. The results also show a marked preference of parents for face-to-face classes at 94.60% which implies a negative perception regarding the remote educational service mediated through technological tools. These results show the distrust that parents have contrasting with the experience lived during the pandemic where they witnessed that such devices contributed very little for educational purposes since the vast majority of children used them basically in activities that were not associated with the development of educational skills such as using them to take photos, watch videos or play. It is also observed that 59.84% of parents always claim to require training which implies an appreciation for tablets but they require support to be technologically literate, so that they can support their children's learning.

This described reality limits the role of parents as companions of the educational process in their children, putting them at a disadvantage compared to those parents who can make appropriate use and take advantage of the benefits of technological resources. Additionally, the lack of connectivity limits the autonomy of students in the learning processes making the dependence on conventional face-to-face methodologies more evident. The mere distribution of technological tools can even be taken home does not in any way guarantee that their use will be effective in learning. Comprehensive interventions are required at the level of the educational institution and even with measures for parents.

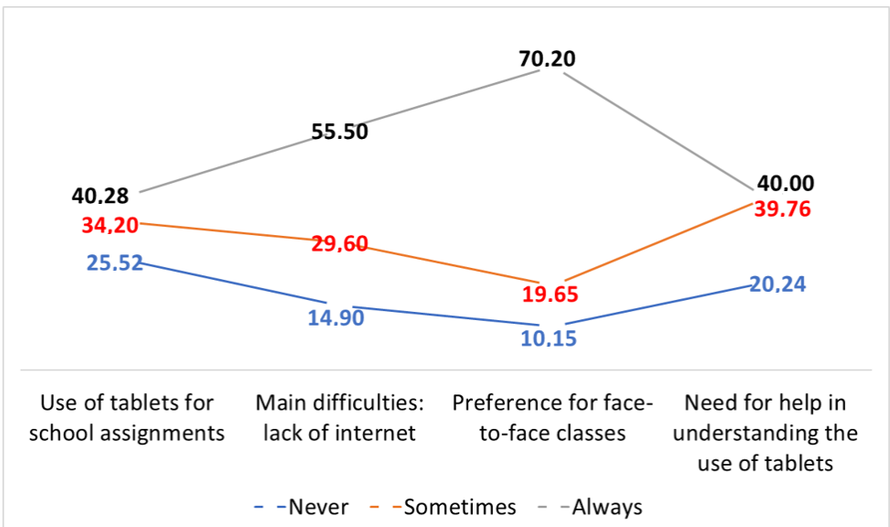

Figure 4. Students' perception of tablet use.

Figure 4 shows students' perceptions regarding tablet use. 40.28% of students always use tablets for their schoolwork while 59.72% of students occasionally or never use tablets for academic work. If we analyze the difficulties associated with the lack of internet, 55.50% always have difficulties of this nature while only 10.15% have no difficulties accessing the internet. The limited access to the internet service by most students becomes a limitation to access and take advantage of online resources to improve their learning. For this reason, coupled with poor management at the pedagogical level, caused the majority of students (70.20%) to always prefer face-to-face classes. This preference is perhaps largely due to the negative experiences that students have had during remote education due to the pandemic in which distance classes were not effective enough. Finally, regarding the recognition of the need to be trained to use tablets properly, 40% responded that they always do so and 39.76% sometimes do so which means that the vast majority are aware that they do not know how to use tablets properly

but at the same time feel the need to be trained. These results do not show that such devices are not useful in education but that poor training and technological capacity of teachers means that students do not perceive the usefulness and value that technological device can have. On the one hand, the figures shown reflect that the proper use of technologies by students continues to be a necessity. On the other hand, there is still a strong dependence on face-to-face classes with conventional methodologies because although tablets were available to students since they do not know on how to use them pedagogically, their possibilities for self-learning or reinforcement of these have been limited. Therefore, once again, the need to implement educational policies that resolve educational needs in indigenous territories is demonstrated but with comprehensive measures closing structural gaps and addressing the training needs of teachers and support for families and students.

5. Discussion

The results of this research regarding the impact of tablets on the learning of indigenous students assessed in Spanish as a second language show that these technological resources have not been sufficiently effective such that only 4.7% of students reached the satisfactory level and 82% of students are at the lowest achievement levels. These results contradict the statements of the Ministry of Education (2023) which in its report maintains that tablets allowed students in rural areas to obtain better learning in the areas of communication and mathematics. However, it is necessary to clarify that this report does not distinguish the indigenous population from the rural population which leads us to affirm that they have not been examined that in indigenous communities there remain major structural barriers at the level of connectivity, electrification, teacher training in the management of technological resources and the very low participation of parents in formal educational processes. The results of this research also diverge from the study by Rahali et al. (2023) who concluded that students who used tablets showed higher academic performance compared to students who did not use them. However, the results of the research agree with Casales (2019) and Chira and Rodríguez (2024) who state that technology by itself is not a guarantee to improve learning, especially in those contexts where a series of structural gaps have to be overcome.

The results obtained in Figure 2 regarding teachers' perception of the use of tablets in learning show that 54.65% never used these devices for pedagogical purposes. 55.10% of teachers always had connectivity problems, and 84.74% of teachers have never received training on the educational use of tablets, and along these lines, 75% require training to take advantage of tablets as a pedagogical resource; the low percentage of teachers who adequately use these technological devices in the educational institution is a consequence of the lack of training and poor connectivity in indigenous communities. These results are consistent with the findings of those who arrived at the conclusions to a certain extent. Teachers rarely use online tools due to a lack of knowledge and digital skills are developed to the extent that they are incorporated into their practice. Indigenous teachers in the Amazon, by not incorporating technology into their teaching work are also unable to develop digital skills or assume a favorable position. These uneven results are a consequence of the poor training that teachers have received in the use of these educational technologies, and the lack of access to the Internet and electricity which are essential factors for these devices to be used appropriately. In this logic, the results of this research are also related to the studies by Gonzales-Macavilca and Quispe (2019) who affirm that the level of technological training of teachers has a direct relationship with their perception regarding the effectiveness of information and communication technologies in the classroom; educators who lack good preparation in the pedagogical use of these tools generally adopt a skeptical or neutral position in relation to their impact on learning. This explains why more than half of teachers (sometimes never) affirm that tablets are not an efficient alternative for improving education. However, the results of this research are inconsistent with the studies of Hernández-Sellés and Massigoge-Galbis (2024) who state that the vast majority of teachers recognize that the incorporation of technologies in the classroom is a fundamental tool for pedagogical innovation and learning. In their studies, they found that more than 80% of teachers are satisfied with the use of ICT in the classroom, obviously these results were made in an urban context in which teachers enjoyed the minimum conditions to make good use of technology.

Figure 3 shows that 49.80% of indigenous parents consider that technological devices such as tablets should never be used at home because they do not serve an educational purpose, and only 15.50% state that these technological tools are always useful for learning. Another relevant fact is that 94.60% of the parents surveyed prefer that classes always be in person at the educational institution. Therefore, it is evident that a large percentage are skeptical about these devices stating that during the pandemic, tablets were used for entertainment and pastime purposes but not to obtain positive learning in students; in this way, the postulate that educational technology to achieve improvements in education must be accompanied by awareness and training mechanisms, including for parents, is reinforced. These results are related to Torrano et al. (2022) who identified that parents in Spain showed greater confidence and high expectations regarding the effect of tablets on school learning. It is also important to note that teachers play an important role in preventing their misuse. Similarly, Zhu, Yang, MacLeod, Shi, and Wu (2018) found that families with a certain technological background tend to have a positive perception regarding these technological tools. 59.84% of parents affirm the need to require training to use tablets appropriately, thus implicitly recognizing their value in the education sector but used appropriately and under the supervision of teachers.

The results regarding the perception of indigenous students indicate that 59.72% occasionally (sometimes) use tablets to do their homework, 55.50% claim to always have difficulties accessing the internet service, and 70.20% of them prefer face-to-face classes in which they could use tablets in class since they consider them an interesting and motivating resource. These results coincide with Seyidova (2024) who states that the mere presence of devices in the classroom is not a guarantee of their success. On the contrary, it depends a lot on pedagogical integration. When students use technological resources promoted by effective strategies, they obtain better learning and consequently develop a more positive perception. When teachers do not promote the proper use of technological resources, the perceptions of those educated also tend to be negative. It is important to note that the results disagree with the study by Mushtaque et al. (2021) who state that students perceive educational technology as an opportunity to improve autonomy, motivation and learning. Once again, the great technological barriers prevailing in indigenous communities do not allow for a good use of educational technology and also generate low expectations; in this way, they agree with Zhu et al. (2018) who state that the effectiveness of information and

communication technologies in education depends largely on digital infrastructure and adequate educational support.

6. Conclusion

The results of this research conclude that the use of tablets in the educational process of indigenous students in the department of Amazonas has not generated a significant impact since only 4.7% of the students evaluated have achieved the satisfactory level and 82% of students are located at the lowest performance levels at the beginning and before the beginning demonstrating that the delivery of technological devices without a comprehensive strategy to train in-service teachers, improve connectivity, electrification and even guidance to parents is no guarantee to improve student learning.

Regarding the perception of teachers, 54.65% of them say that they have never used tablets for educational purposes. 55.10% have constantly faced connectivity problems. Therefore, the low expectations regarding the use of tablets in the school environment are a consequence of the fact that the vast majority of teachers have very little knowledge about the pedagogical use of these tools as they have not been trained in a timely and adequate manner (84.74% have never received training). However, 75% always require training as they consider that, in the long term, these tools could be useful in educational processes, a fact that will materialize if there are policies aimed at closing gaps in these contexts.

Parents, at 49.80% believe that tablets are never used for educational purposes within the family. This negative perception is a consequence of the negative experience they have had during the pandemic when the devices were delivered without prior training, so that students began to use them mostly for hobby and entertainment purposes. Not enough, there is a significant percentage of parents who maintain that tablets should be used in educational institution under the guidance and supervision of teachers, so 94.60% prefer that classes be in- person.

Finally, students show an ambivalent perception regarding the pedagogical use of tablets. While 40.28% consider that they have always used these tools for pedagogical purposes, 59.72% say they have used them occasionally or even never. These results are related to the fact that 40% of students always require training to make good use of these technological tools. Thus, it is concluded that these tools are attractive and motivating resources for students. However, due to the lack of guidance, their effectiveness has been very limited.

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