

## Technological Tools in the Assessment of Meaningful Student Learning

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### Abstract

*Concerning regular basic education in our country public schools after the pandemic, it has been observed that students have a low level in their academic performance, being reflected in the assessments made from the formative approach. The aim of the research was to demonstrate the influence of computer platforms in the assessment of significant learning to students in a public school in San Martín de Porres (SMP), 2023. It is an applied research, with experimental level and quasi-experimental design. The population was made up of 450 high school students, and the sample included 48 third grade students distributed in 2 groups, 24 for the control group and 24 for the experimental group. The survey technique and the Likert scale questionnaire instrument were used, applying the Mann-Whitney U statistic for data analysis. The hypothesis test yielded a significance of  $p=0.006$ ; being the value lower than  $p<0.05$  therefore the null hypothesis is rejected but the researcher's is accepted, concluding that educational platforms influence the evaluation of learning in students of a public educational institution of SMP.*

**Keywords:** Learning, Formative Assessment, Technologies, Regulation, Feedback.

### INTRODUCTION

Information technology is found in most areas of human development and in education it has managed to position itself. As a result, authorities, teachers and students were forced to use computer tools and today it is a concern in many teachers who do not apply them also for the variations that have been occurring in the technological environment and how it influences the knowledge obtained by students in the basic education system, for this reason we resorted to studies conducted in an international, national and local context on the topic to be investigated in Spain, Serrano and Casanova (2018), mentioned that the use of technological tools should motivate students, because through them they can develop significant learning as a team, since it allows them to meet in a room to carry out their activities without being in a particular physical location. Therefore, it was important to implement the use of technological tools in the educational system because it helps both the teacher and the students to improve their social-educational skills and therefore their learning. According to Daquilema et al. (2019) argue that ICT practices are the skills to solve information, communication and intelligence issues, as well as legitimate, social and ethical topics in a digital environment. Likewise, these skills are informatics, exchange, digital and technological relations that have three categories of use: initial, intermediate and advanced.

Ministerio de Educación (2016), stated that the permanent implementation of technologies was seen as an obstacle in the previous decade of the last century; meanwhile, it is possible that adults will understand it in the future as part of a regular process without difficulties. Some teachers do not know about the use of technological tools; it is necessary to carry out a process of implementation and educators training in the use of technological equipment available in schools and thus allow them to develop their pedagogical activities using ICT tools (TIC) (Nova & Sánchez, 2020).

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Evaluation is also one of the main tasks of teachers, however, in order to improve the training system of students and the teacher's condition, radical changes must be made in learning evaluation, taking into account formative evaluation (Jaramillo et al ; Rodriguez et al; Setyawarno et al; 2024) and (Bautista et al; Lorente-Catalán, 2023), which could be understood as any evaluation process in order to improve the teaching procedure with students (Saravia et al ; Giacomino et al .,2023); (Salazar et al ; Callirgos et al; Rodríguez et al.,2022) and (Medina, 2021) and (Pascual-Arias et al, 2019).

The problem arises when students' assessments are carried out, they have not shown positive results because many young people do not participate constantly in the activities developed by teachers and also do not attend the virtual support that some teachers do, indicating that it is due to lack of computer resources; it is also observed that during the class session, some students in the innovation classroom do not develop academic activities fully, but rather they play games on the laptop; therefore a proper formative evaluation of the students is not carried out, considering this, it is necessary to apply modifications in the evaluation with the purpose of evaluating them to train the students of the future, Falcón et al. (2021), analyzed the problem of Peruvian education where the competency-based education system was implemented, but changes are needed in the way it is applied by teachers and that they manage to acquire and become aware that they have to change how they evaluate, but this requires that educators are trained, conduct workshops, GIAS, reflective meetings and take advantage of the contributions that are shared to carry out the formative verification in the knowledge of students.

As for the local context, there are computer resources in technological innovation and virtual English classrooms where teachers of this area can join, and also the computer workshop, where students and teachers of the education area for work (EFA) take part too, while in the first classroom teachers of other areas attend to develop the transversal competence “develops in virtual environments generated by ICT” and according to the students of an educational institution (I.E) de Jornada Escolar Completa – JEC (“Complete School Day”), alarming results were obtained in the prioritized areas where the use of ICT and formative assessment have been implemented according to the National Curriculum of Basic Education (CNEB), as described before, the following general problem arises: How does the use of technological tools influence the evaluation of learning of secondary level students in a public school in San Martín Porres, 2023?.

## **METHODOLOGY**

This is an applied type research with a positivist paradigm, quantitative approach and experimental method, the scientific method verifies the authenticity of theoretical explanations with the support of the test (García-Arguelles et al; 2017) likewise, the explanatory level of research is when studies in which the objective is to determine the origin of the facts, problems or phenomena are investigated (Hernández and Mendoza 2019) this article is of experimental design and quasi-experimental sublevel because through this work we seek to propose solutions to the problem of learning assessment through the use of technological resources, looking to obtain new knowledge, and the results obtained will allow us to deepen our knowledge in order to propose solutions to the problem (CONCYTEC, 2023). In the same way, due to the nature of the research, a study was conducted whose unit of analysis had a population of 450 students at a public educational institution in San Martín de Porres, 2023, the sample used was 48 students who were part of the study divided in two groups (control and experiment) applying the survey technique and as an instrument the Likert scale questionnaire which was developed by the author. A pilot test was carried out to a group of students who belonged to the same institution but did not participate in the research and for the reliability test the Cronbach's Alpha statistic was applied, obtaining a reliability of 0.823, which allowed the instrument to be applicable, and it was validated by the judgment of experts like doctors in education and a statistician, a pre-test was applied to both groups, then a workshop on the use of technological tools was developed with the experimental group, to later apply the post-test to both the control and experimental groups. To elaborate the database, we used Microsoft Excel and the data analysis was performed with SPSS v.26 statistical software, also the Mann-Whitney U test was used for the analysis test.

## RESULTS

Descriptive and inferential statistics were used in the analysis using Excel and the SPSS statistical program to perform the summation and classification of the variables and dimensions, in the descriptive analysis of the data tables and figures were prepared and then the interpretation of the data.

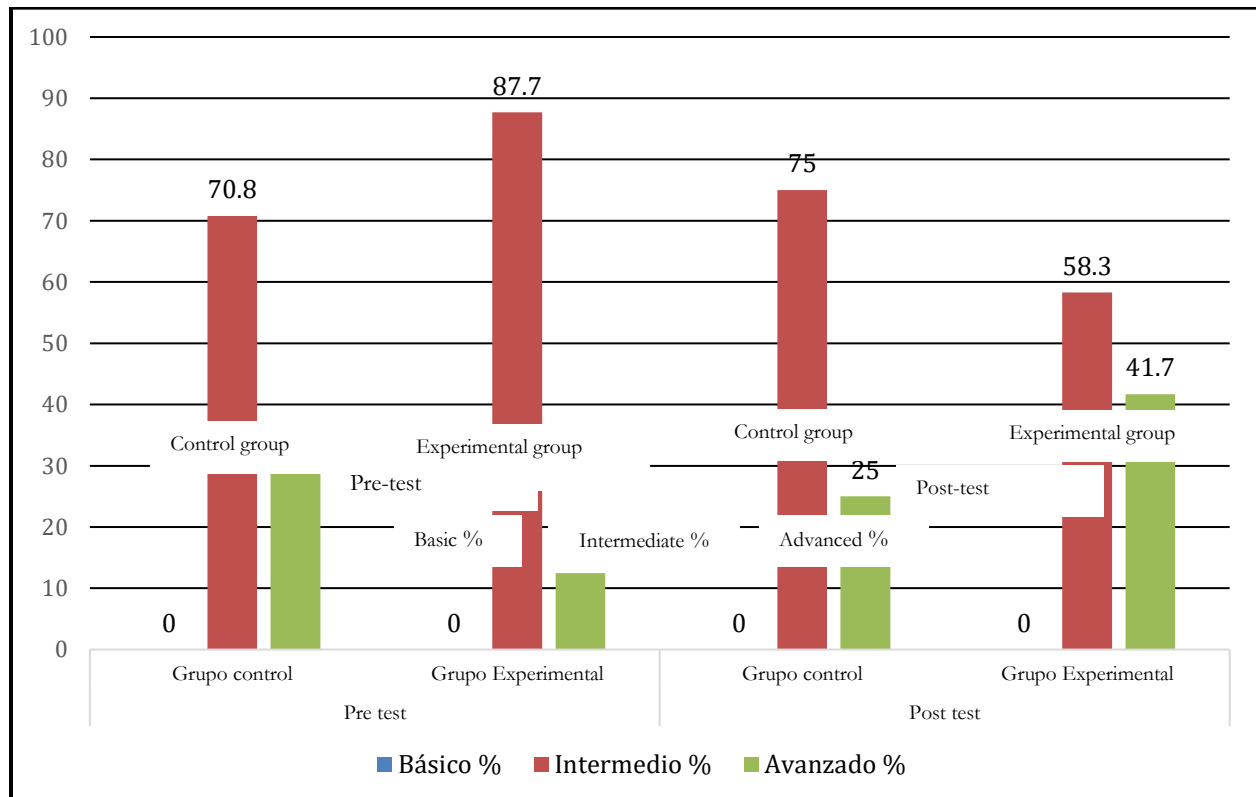
**Table 1** Achievement levels of the pre-test and post-test of the learning assessment (EA)

Pre-test (PT)		Control group (CG)	Experimental group (EG)
Intermediate	Count	17	21
	%	70.8	87.7
Advanced	Count	7	3
	%	29.2	12.5
Total	Count	24	24
	%	100,0%	100,0%
PT		GC	GE
Intermediate	Count	18	14
	%	75.0	58.3
Advanced	Count	6	10
	%	25.0	41.7
Total	Count	24	28
	%	100,0%	100,0%

Regarding the inferential analysis for hypothesis testing, the Mann-Whitney U statistic was used to obtain the significance of the results.

The following image was prepared to allow interpretation of the data.

**Image 1.** Achievement levels of the pre-test and post-test of the learning assessment of full-day school students.



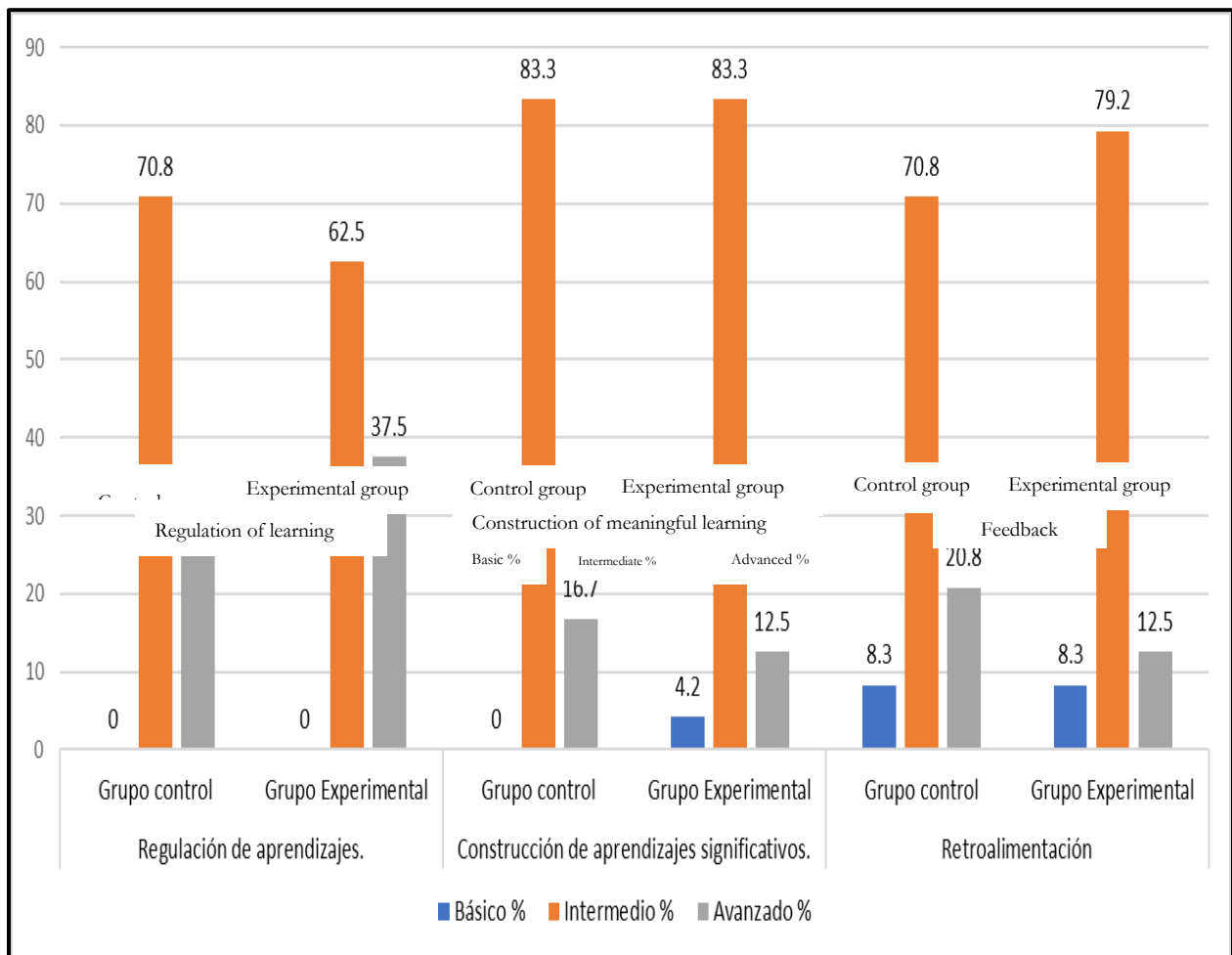
The analysis of the main hypothesis was carried out and the following table was obtained. From Table 1 and Figure 1, the control group of 17 students representing 70.8% achieved the intermediate level in the formative evaluation and the experimental group of 21 students represented 87.7%. Likewise, in the post-test in the control group, the amounts and percentages of the students' achievement levels did not change significantly.

On the other hand, in the experimental group there is a significant change in the advanced level reaching 41.7% whose percentages change was 17.7%.

**Table 2** Achievement levels of the pre-test of the EA dimensions.

Pre-test			Regulation of learning		Construction of meaningful learning		Feedback		
Groups			GC	GE	GC	GE	GC	GE	
Basic	Rec.		0	0	0	1	2	2	
	%		0	0	0	4.2	8.3	8.3	
Intermediate	Rec.		17	15	20	20	17	19	
	%		70.8	62.5	83.3	83.3	70.8	79.2	
Advanced	Rec.		7	9	4	3	5	3	
	%		29.2	37.5	16.7	12.5	20.8	12.5	
Total			Rec.	24	24	24	24	24	24
			%	100%	100%	100%	100%	100%	100%

**Image 2.** Achievement levels of the pre-test of the dimensions of learning assessment of full-day school students.

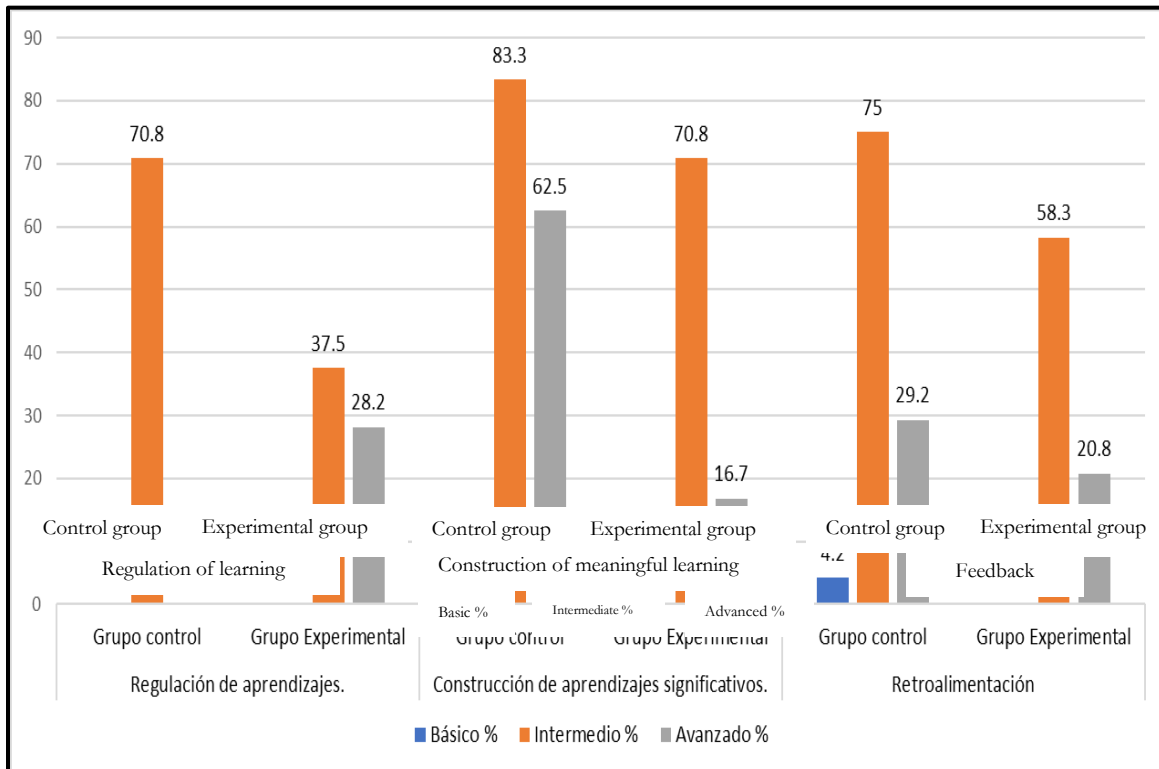


From Table 2 and Image 2, in the pre-test of the dimensions in both groups of the CG and the EG, at the basic level, 1 student, representing 4.2% in the dimension of construction of meaningful learning, and 2 students from both the control and experimental groups in the dimension of feedback, representing 8.3%, reached the basic level. In addition, the level of achievement of students at the advanced level ranges between 12.5% and 37.5%, with the lowest performance in the feedback competence by the experimental group and the highest experimental achievement level in the learning regulation dimension.

**Table 3** Achievement levels of the post-test

Post-test			Regulation of learning		Construction of meaningful learning		Feedback	
Groups			GC	GE	GC	GE	GC	GE
Basic	Rec.		0	0	0	0	1	0
	%		0	0	0	0	4.2	0
Intermediate	Rec.		17	9	20	17	18	14
	%		70.8	37.5	83.3	70.8	75.0	58.3
Advanced	Rec.		7	15	4	7	5	10
	%		28.2	62.5	16.7	29.2	20.8	41.7
Total	Rec.		24	24	24	24	24	24
	%		100%	100%	100%	100%	100%	100%

**Image 3.** Post-test achievement levels of the dimensions of the EA variable.



From Table 3 and Image 3, in the post-test of the feedback dimension of the control group, 1 student reached the basic level, which represents 4.2%. Likewise, the significant difference between the experimental group and

the control group can be seen, for example, the students achieved the advanced level in the learning regulation dimension, 28.2% in the CG and 62.5% in the GE. Likewise, in the learning construction dimension, there was a 16.7% of the control group and a 29.2% of the CG and finally, in the feedback dimension, the CG reached 20.8% and the experimental group 41.7%. It can be deduced that the program improved student learning in considerable percentages.

## DISCUSSION AND CONCLUSIONS

The research is based on the use of ICT tools in the assessment of learning in JEC students, having evaluated the hypothesis, references and theoretical bases to define the use of ICT tools and EA of students in an institution. It was developed as follows. In the development of the research to conduct the workshop, the directors of the educational institution were requested and then coordinated with the teachers of the grade and request the authorization of the parents of the participating students, to make them aware of this in order to develop the workshop with the experimental group, who were provided with materials such as application cards, activities and internet to develop the workshops, during the process there were internet network difficulties, being force to hire a separate line for the computer workshop.

We were able to develop activities with students in the use of technological tools and resources, achieving an improvement in its use and then the result would be presented to the educational institution for its implementation.

Contrasting the general hypothesis, the Mann-Whitney U statistic result was obtained for the experimental group 30.06 and the control group 18.94, showing different data and a higher performance of the experimental group. In addition, the significance of the hypothesis testing is  $p=0,006$ ; being the low value  $p<0,05$  therefore the null hypothesis is rejected, and the hypothesis of the researcher is accepted, inferring that: the use of technological resources influences the formative evaluation in students of the school JEC in SMP. This result confirms what Rivera et al. (2023) stated, who argued that formative assessment in virtual environments is a significant development of observation of solutions that help both the teacher and the students to implement changes in teaching-learning activities techniques and make decisions to achieve the proposed objectives. Similarly, Roca (2023) said that the Moodle platform has generated positive results in the digital competencies of teachers and students. Meanwhile, Cortez et al. (2023) pointed out that technological resources are part of the educational processes at school, so they say that it is important to analyze the contributions of technological tools in education. In addition, it is important that computers and social networks have provided new opportunities for teaching students always with the attention of teachers and parents (Navarro-Martínez y Peña-Acuña, 2022), while Montoya (2023) argued that new technological workshops should be conducted to enrich students' knowledge, which would allow achieving a formative evaluation with meaningful learning in students. Likewise, Flores (2020) stated that tangible or intangible technological resources allow students to perform operations such as processing data, organizing information and that the management of technological tools influences the activities of learners in the classroom. Similarly, Drozdicova-Zaripova and Sabirova (2020) said that one of the most effective ways is the correct use of digital educational tools. Therefore, when students make use of technological resources in RBE areas, they build their learning in a constant and formative way. Hence, what Fernández (2020) said that technological resources are part of an educational system because of its dynamics and development which has been linked to the growth of technology and that it is an alternative for education based on learning in a flexible way bringing benefits to the students' studies by decreasing the limitations where the traditional model has failed to solve from a community point of view and thus support access to education and training of students. While Ccallohuanca-Mamani (2022) stated that it is important to evaluate the students' pedagogical processes permanently.

In terms of results, there is an influence of technological resources in formative assessment, from the point of view of Otaki et al. (2023) formative assessment plays a fundamental role in the achievement of students' learning. In addition, it makes it easier for students to know the progress of their performance during the educational process, giving them the opportunity to improve by knowing their weaknesses and potentialities during the evaluation process. And according to Chávez (2022) formative assessment supports progress in the basic competencies of learners. For Ccallohuanca\_Mamani (2022) with respect to formative evaluation, they

argued that evaluation is carried out continuously throughout the process and feedback is given to students during the different activities carried out in the area. However, in terms of formative evaluation, Garumendi-Alvarado et al. (2022) said that it allows collecting as much information as possible from the results to make the necessary readjustments. For Rumiche and Solís (2022) formative assessment is provided both in the development of teaching and learning, which enables teachers and students to make accurate decisions with a view to enriching learners' studies, while Huamán et al. (2021) argued that formative assessment is fundamental during teaching-learning, specifically the learning feedback that constantly evaluates the progress of the learner, due to the pandemic, abrupt changes were made in education, moving from face-to-face attendance to teaching through technological devices. Meanwhile Anijovich (2019) argued that formative assessment is a diacritical and concrete orientation for virtual education. Prado (2020) in his research observed that there is coherence in the appreciation that students have of the application of formative assessment, concluding that 48.2% of students predominantly achieved desired learning and 28.3% are in average learning, while the desired achievement shows strength in the variable studied. While Tigelar and Sains (2020) stated the opposite, that for professional learning, not only the formative assessment approach is important, this position means that formative assessment must be accompanied by other elements to achieve learning in students.

It is concluded that the statistical test obtained the median of 29.13 in the experimental group, and 19.88 in the control group and the significance for hypothesis test is  $p=0.022$ ; being the value  $p<0.05$ , this result refutes the null hypothesis and the alternative hypothesis is admitted, deducing that the use of technological resources influences the regulation of learning students in a state school of San Martín de Porres, 2023. These results confirm what Ccoa and Alvítez-Huamani (2021) argued about the importance of teachers applying ICT in their learning activities since these technological tools are very important to regulate students' learning and this agrees with what Cali and Castro (2022) indicating that the implementation of educational technological resources has greatly supported the strengthening of students' learning, since it encourages them to learn in a different and much more effective way. Therefore, Niño et al. (2019) established that it is the record that students have about their collaborative evolutions and their learning, since it allows identifying metacognitive skills to perform their work. Likewise, the use of technological resources with good advice allows learners to regulate their learning in a meaningful way in a permanent and continuous way, as Pintrich (2020) cited by Daura (2021), for him, self-regulated learning is the talent of the student to choose educational objectives and organize the cognitive, casual, expressive and environmental principles to achieve them. Thus, Juárez (2023) in his work on formative evaluation and autonomous learning, he found that students stated that they were accompanied in the development of their learning, and that the evaluation criteria proposed by teachers in the feedback they provided to students were not well received. Likewise, Montoya (2023) conducted a research with the purpose of specifying the extent to which technological equipment enhances the study of accounting applications of students, demonstrating that the implementation of workshops on new technologies enriched the knowledge of accounting programs in students.

Concerning about the specific hypothesis 2. The Mann-Whitney U statistical test of the dimension: Construction of meaningful learning, a median of 29.58 was obtained for the experimental group and 19.42 for the control group, it is observed that in the group where the workshop on the use of technological resources was developed, these data show a higher performance of the students in the experimental group. And the significance of the hypothesis testing is  $p=0.012$ ; being the value  $p<0.05$ , therefore the false hypothesis is objected, and the alternative hypothesis is admitted: the use of technological resources influences the construction of significant learning of the students at the public school JEC in SMP. The results agree with what Chávez (2022) sustains in his study whose purpose was to analyze the formative evaluation and learning improvement variables, concluding that there is evidence where the formative evaluation supports the progress of the basic elementary competences of the students, emphasizing the need to use it as a strategy of preparation, improvement promoting to achieve the pedagogical purposes executed during the development of the class session. Similarly, for Prado (2020) the use of mobile devices in the creation of texts where they had easier access to information allowed students to reflect on their autonomous learning. Likewise, virtual environments, computer equipment, digital communication devices, video conferencing, worksheets, academic activities, studies, research theses and pedagogical portfolios made possible the creation of new knowledge through

weighting and action (Sánchez et al. 2022). The contribution of Klochko et al. (2020) who stated that the use of reverse teaching supported by technological tools requires a reflexive progress of the virtual field of study, a through classification of the topics to be developed and their adaptation to the specific teams of learners, as well as creativity could transform the existing ones. Soroko et al. (2020) stated that the rapid growth of the knowledge society needs young people capable not only of arguing competences, skills and abilities in specific areas of knowledge, but also of providing creative results to different demanding cases. This made it possible to investigate safe models of structure referred to study contexts that allow endorsing the constitution of learners' skills due to the requirement of documents to finish the school period. According to Gómez et al. (2019) who contributes that the precisions and assumptions that the students make about the evaluation respects the image of the school and its domain in the educational processes. According to the authors, it can be argued that the use of technological resources is important in the teaching-learning process and that through these devices, students build their new knowledge and make it meaningful for their daily work. Quispe (2023) in his work carried out with the purpose of evaluating the mastery of the pedagogical assessment in the development of the students' communication skills, it was obtained that in the application of the formative assessment, the results were significant in the competencies of oral communication, achieving a satisfactory and outstanding level, and the competency of reading diverse written texts also achieved a satisfactory and relevant scale; in the competency of writing diverse types of texts, they obtained an appropriate and outstanding level, concluding the importance of administering the formative assessment supports in an important way to achieve the competencies of the area under study.

Regarding the specific hypothesis 3, when confronting this hypothesis with the Mann-Whitney U statistic, it was obtained the median of 30 in the experimental group and 19 for the control group, these data show inequality with the experimental group showing higher performance. Likewise, the significance of the hypothesis testing is  $p=0.006$ ; being the value  $p<0.05$  rejecting the false hypothesis and admitting the alternative hypothesis, understanding that: the use of technological resources influences the feedback of the students at a Full School Day of a state school in SMP, 2023. This confirms the proposal made by Mertasari and Yudana (2022) who stated that formative assessment is carried out constantly in learning to provide feedback to students, which is used as information to make changes in the teaching plan to be carried out with the students. The contribution made by Wu and Schunn (2021) where they argue about giving feedback to students is very important to lead them to learn. Although, teachers find it very difficult to provide timely feedback because it requires a lot of time and effort. Likewise, Bizarro et al. (2021) stated that the purpose of educational assessment is to improve and promote student autonomy, since it helps students to identify their own successes and difficulties, and at the same time to reflect on their mistakes. In the same way, didactic assessment is defined as a diagnostic development with feedback throughout the course, very different from summative assessment, which is the final judgment at the end of the learning period (Boston, 2002 cited by Alharbi et al., 2021). For Quezada and Salinas (2021), feedback is a process of sustainable dialogue, where it is important to order teachers and students feelings, considered feedback as an activity that promote self-regulation of learning. For Huayhua et al. (2021) formative feedback is an opportunity to evaluate students' achievements; moreover, they argued that it is an important option to regulate students' performance. It is appropriate for teachers to perform learning feedback using computer tools and available resources such as Padlet, Quizizz, Classroom, Meet or Zoom and then to perform synchronous feedback with learners. Meanwhile, Wang et al. (2020) mentioned that by incorporating formative assessment and articulation with feedback on learners' activities through problem-based learning, they achieved better results in their assessments. Tigelar and Sins (2020) noted that teachers who participate in accompanied feedback programs argued that not only formative assessment is important, but the teachers' willingness is intimately embedded in a high level of fellowship with the school, which allows encouraged teachers to provide good feedback on student learning.

The following conclusions were reached in the research. Regarding the main hypothesis, it is inferred that in the pre-test of the control group 70.8% achieved the intermediate level in the learning evaluation and in the experimental group there was an 87.7%. In the same way, in the pot-test of the control group there were no significant changes in the amounts and percentages in the achievement levels of the students. Meanwhile in the experimental group there were significant changes in the advanced level reaching 41.7%.



In addition, applying the Mann-Whitney U, the significance is 0.006 and the minimum value  $p < 0.05$ , which shows that the use of technological tools influences the evaluation of learning of students of the full-day school students of San Martín de Porres, 2023.

It is concluded that it is observed that in the pre-test the control group in the intermediate level presented 19.88% and the experimental group presented 29.13% in the regulation of learning, being, these different data where it shows a higher performance than the experimental group. In addition, the significance according to the Mann-Whitney U test is  $p = 0.022$  being  $p < 0.05$ . rejecting the null hypothesis and accepting the proposed one by the researcher where the results show the influence of the use of technological tools in the regulation of learning from the workshop conducted with the students.

It was concluded that the use of technological tools influences the construction of significant learning in students, since in the pre-test the control group was 19.42%. Showing these different data a higher performance to the experimental group. In addition, Mann-Whitney U test obtained the value of  $p = 0.012$ ; being much lower than  $p < 0.05$ , therefore, the null hypothesis is accepted, demonstrating that the use of technological tools influences the construction of significant learning in the students at the state school JEC in San Martín de Porres, 2023.

It was concluded that in the feedback dimension, the control group represented a 19% and the experimental group a 30% where the use of feedback was applied, and the experimental group showed a higher performance to the experimental group. The Mann-Whitney U hypothesis test, showed that there was significance in the hypothesis test given that the value of  $p = 0.006$  is lower than  $p < 0.05$ , rejecting the null hypothesis and accepting the alternative one, demonstrating that the use of technological tools influences the feedback of JEC students in a state school in San Martín de Porres.

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