Teacher Competence and Meaningful Learning of Microeconomics in Virtual Environments

Jaime Raúl Urday-Cáceres *1*, Angel Deroncele-Acosta*1* and David Rondón*2*

1 Universidad San Ignacio de Loyola, Lima, Perú
2 Universidad Continental, Arequipa, Perú

Abstract

The following research work has the objective to diagnose the current state of the significant learning of Microeconomics in university students in the virtual mode, as well as teaching competences in university professors. It is a mixed approach educational research of explanatory scope. The study sample consisted of 50 students and 20 teachers from a private university in Lima. Four instruments were applied (survey, interview, pedagogical test, and observation). The results show limitations in teaching skills related to traditional and reproductive didactic forms, as well as insufficient use of digital tools that support learning. This negatively influences the meaningful learning of the students, so it is concluded, recognizing the need to dynamize virtual education from elements that guarantee the motivation, interaction and reflection between the educational actors that participate in the virtual learning environments.

Keywords 1

ICT, virtual learning environments, meaningful learning, teacher competence, virtual education.

1. Introduction

The 21st century brought technological and scientific advances that are available to any individual and in a few seconds, you can access information such as the use of the Internet as they claim [1]. Teaching – virtual learning has brought about a radical change in planning, didactic strategy, the form of teaching and learning. The acceptance of virtual education has spread in different areas and at all levels of education, from informal learning to university-level learning. Currently, and in the context of the COVID-19 pandemic, the offerings of online education from basic to postgraduate levels have increased. This offer includes all forms of designs with respect to the planning of this form of teaching. Although little progress has been made regarding the study of student learning and the design of teaching or instruction in relation to the traditional method or that of face-to-face teaching [2].

These technological advances, the advancement of the economy that plays an important role in the development of a society that aims to seek alternatives of qualitative and quantitative methods that digital teaching gives us, if the teacher can use it properly, which can prepare the student to face the difficulties and problems that arise both in social and professional life. In this regard, the role of research both in generating knowledge and scientific-technological innovation, as well as in the training of research teachers, with scientific and critical culture to analyze and intervene in reality [3], hence the need to promote epistemic competition as a critical, proactive, and analytical attitude of the teacher [4].
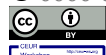
From the technologies to achieve a comprehensive training, this highlights the need to manage institutional conditions for educational innovation with ICT, especially in Latin American universities [5], developing teachers with talent in the use of new technologies being ICT essential

for pedagogical innovation and modernization of university education [6], [7], [8], where the student has the knowledge and skills necessary to be able to perform responsibly, with humanism and ethics that allows a participation that is transformative of the course itself as well as its context.

2. Methodology

The study is of the explanatory type in the educational field, which is identified by considering the qualitative and quantitative method in a dialectical way in the treatment of the problem that is studied taking into account from the pedagogical exercise, which according to [9], the dialectical in an investigation is based on the tasks of the methodology at the different levels of knowledge and in connection between thinking and being, and the role that practice has as a point of assessment of knowledge. In the present study, different theoretical methods such as deductive inductive and synthesis analysis were used to achieve knowledge that contributes to the improvement of the quality of the training processes of the institution of higher education. The study has a non-experimental design and is of a transversal type because the techniques were applied in a single time.

2.1. Instrument design and construction

They were constructed based on the goal category Significant Learning and considering its subcategories. According to [10], in qualitative investigation different methods are used to gather empirical information, one of them and the one most used is the interview. The instruments designed were a semi-structured interview guide, Likert scale questionnaire, observation guide and a questionnaire of questions on the Microeconomics course.

Validation of data collection instruments. The evaluation of its effectiveness was carried out through the criterion of experts, made up of 5 specialists from the field of Education who, after analyzing and evaluating the effectiveness of the items of the instrument based on the objectives, determined its relevance of the instrument for its application. After this, the validity of the teacher survey instrument was carried out using the Aiken coefficient, which shows a high quantification of the 0.98 coefficient. This shows the acceptance of the experts to the items formulated in the instrument. Similarly, the validity of the instrument applied to students using the Aiken Coefficient was 0.99, showing a high validation value of the instrument.

The reliability of an instrument is estimated by internal consistency which implies that all the items are highly correlated and measure the same construct, for this, Cronbach's alpha is used [11]. In this regard [12] indicates the grading scales of the reliability levels when using the Cronbach's Alpha, which are from -1 to 0 (not reliable) up to 0.9 to 1 (high reliability). Where the minimum accepted value is 0.70. After applying the pilot survey to teachers and students, the Cronbach's Alpha was used for this, the SPSS program was used. Reliability was obtained using the Cronbach's Alpha of 0.981 in the teacher survey and the student survey instrument of 0.988. This tells us that in it is highly reliable.

2.2. Process for collecting information

The study sample consisted of 50 students and 20 professors from a private university in Lima; sampling was non-probabilistic, for convenience and at the discretion of the researcher. The application of the instrument made it possible to gather objective information on the current state of the problem category investigated.

The application of the instruments. Likert scale surveys were applied to both teachers and students using the Google Form format; semi-structured interviews with teachers individually, given the current situation of the pandemic, were carried out via Zoom; class observation was also carried out, a question guide was used, and a pedagogical test was applied to students in the Microeconomics course. The interviews were recorded in audio and transcribed verbatim. The

ethics of informed consent to record interviews, to subsequently analyze their responses, was granted to each teacher at the beginning of each interview.

Analysis of the data obtained. We proceeded with the process of transcribing data from the interviews in order to analyze and interpret it at a later stage. The data obtained in quantitative order were processed with frequency tables using the SPSS program; and the qualitative ones were processed with the Atlas.ti and the data reduction tables, where the coding was made to identify and record one or more passages of the content and that have coincidence in the same theoretical and descriptive idea [13], which made it possible to identify emerging categories. In data analysis it is not a question of summarizing, but of gradually interpreting the information and reaching more generic and abstract levels, finding the nodes to understand the event [14].

Triangulation. Finally, the triangulation was carried out, which according to [15], is a heuristic and in turn global process, which makes it possible to reflect on the information obtained in an integral way and contrast with the theoretical assumptions systematized in a holistic way to understand how it affects the problem that is the object of study. This stage meant identifying what was relevant and what was important to the topic of study [16], of the content analysis of the responses of teachers and students to form descriptive relationships based on studied facts. Likewise, during the research, the hermeneutic-dialectical approach was sustained, the inductive-deductive method, the analysis-synthesis and the generalization abstraction method were used in order to interpret the information [17]. This gender as a result emergent categories and some approximate conclusions of this study were reached.

3. Results

The following are the results of the instruments applied to students, whose objective was: to diagnose the current state of significant learning of Microeconomics in students of the Management career of a private University of Lima. For this purpose, the techniques of the survey and the pedagogical test were used, which are shown below:

Closed questions survey results. The instrument that was applied is relevant for the study, to be able to verify the level of interest, motivation, importance, and the use of digital technologies in the teaching-learning process of students for learning the content of Microeconomics. In the study, the survey was used on a Likert scale of 16 questions including totally disagree answers, to totally agree. It was applied to 50 students. The Data was processed using the SPSS statistical program.

Below are the measures of central tendency of the subcategory conceptual significance of the category meaningful learning in table 1.

Table 1
Conceptual significance subcategory

		Frequency	Percentage	Valid percentage	Accumulated percentage
	Low	7	13.8	13.8	13.8
Valid	High	43	86.2	86.2	100
	Total	50	100	100	100

Of the total of 50 students surveyed, in the conceptual subcategory 86.2% reach a high level, which means that students consider the exploration of previous knowledge related to new learning important, teachers identify different theories to address in the session and ICTs should be support tools in the teaching of the different courses, leaving traditional education the essence of the construction of knowledge by the student, in such a way that they help the student to reflect and discuss, reaching significant learning. Meanwhile, 13.8% has a low level in this subcategory, which would mean that they do not value or do not take into account the relationship with previous knowledge, different theories to address a new issue or the use of ICT as appropriate and relevant tools for it.

The following table 2 analyzes the results with respect to the experiential subcategory:

Table 2
Experiential significance subcategory

		Frequency	Percentage	Valid percentage	Accumulated percentage
	Low	7	13.8	13.8	13.8
Valid	Medium	43	34.5	34.5	48.3
	High	26	51.7	51.7	100
	Total	50	100	100	

Of the students surveyed, in the experiential subcategory, 51.7% reached a high level, 13.8% reached a low level and finally 34.5% reached an average level. In this subcategory, students recognize their abilities and aptitudes for the achievement of their learning, as well as put into practice what they have learned in their daily experiences, which include the use of technological tools. This analysis is validated by finding that the mean has a value of 15.76, which is in the average range and mode shows a value of 16.

Table 3 shows the results of the affective subcategory of meaningful learning:

Table 3
Affective significance subcategory

		Frequency	Percentage	Valid percentage	Accumulated percentage
	Low	7	13.8	13.8	13.8
Valid	Medium	7	13.8	13.8	27.6
	High	36	72.4	72.4	100
	Total	50	100	100	

In the affective subcategory, the results of the survey carried out on students show a high trend, since 72.4% achieved a high level, however, two groups located in the low and middle levels are observed with 13.8%. These results show that students are motivated when they work voluntarily, participate actively in the class, the teacher develops innovative and creative activities, and have good electronic connectivity that allows them to participate in virtual learning activities. The result was an average of 26.8 and a mode value of 35. Therefore, teachers must consider how the Internet used properly can improve the quality of the student, since when accessing this tool, students must analyze and interpret the objectives set in the classes.

The result of the global analysis of the Significant Learning category shows the high predominance in achievement in the conceptual, experiential and affective subcategories. They indicate that most students agree on the importance of the relationship of previous knowledge with the new content, the care in the preparation of the "non-arbitrary" material suitable for the session by the teacher, which includes the use of ICT, since 35% of students indicated that the level of usefulness of ICTs in the course that is taught is low, while good use in the course had a 25% preference, while the alternative "Not used in the course" had a similar percentage. It can be deduced that ICTs have advantages for autonomous learning, since they promote collaborative work, allowing students to share information, work together and facilitate problem-solving and decision-making, and finally students recognize that they must achieve attitudes and skills in the use of digital technologies that allow them to achieve meaningful learning.

Results of the pedagogical test applied to students. The instrument used in the study was used to determine the level of knowledge and skills that students possess in the Microeconomics course, and whether they achieve a significant learning. The pedagogical test was applied to 42 students of the Administration department, who take the Microeconomics course. It was a list of questions related to different topics of the course, which after the analysis of the data led to the following result:

Of the 42 students, only three, representing 7%, were able to correctly define what Microeconomics is as a science, while the remaining 38 (93%), gave incomplete answers, or answered incorrectly. There is a lack of knowledge in the students of a basic concept for this

discipline, which shows deficiencies in the teaching of the theoretical content that was reflected in the response of the students.

In conclusion, of the 42 students to whom the pedagogical test was applied, only 17 who represent 40% passed, while 25 (60%) failed, which shows that the level of knowledge and the development of skills and attitudes are below the curricular requirements of the career profile, which in turn shows that there are theoretical and methodological deficiencies in the direction of the teaching-learning process by teachers that prevents students from carrying out the learning activity from reflective, critical positions that allow them to raise awareness of what they learn, how they learn it and the importance of what they have learned for their daily and professional life. In addition, in the current curriculum, ICTs must be inserted as tools to support the pedagogical practice of the teacher in the different courses leaving traditional education, without leaving the essence of the construction of knowledge by the student, teacher the educator must adapt its contents, in such a way that they help the student to achieve significant learning.

The following are the results of the instruments applied to teachers, whose objective was: to diagnose the current state of teaching competence in Microeconomics teachers in students of the degree of Administration of a private University of Lima. For this purpose, survey, interview and observation techniques were used, which are shown below:

Results of the Closed Questions Survey for teachers. The instrument of this technique was applied to obtain valuable data on experiences, opinions and to carry out a thorough analysis of the data, on the competences of the teachers at a private University of Lima and how it affects the meaningful learning of the students. The analysis was carried out from the data obtained from the Likert scale survey of 16 questions. It was applied to 20 teachers. For the analysis, the Inferential Analysis of Comparison Tests: Student's "T" statistical test was used to evaluate the significant difference between two groups with respect to their means in a variable. The data were processed using the SPSS statistical program. The results are shown in Table 4 below:

Table 4
Differences between subcategory conceptual significance and significant learning by sex

	Male		Female		t	Sig. (bilateral)
	M	SD	M	SD		
Meaningful learning	70.14	12.575	60.00	13.528	1.147	0.285
Conceptual Significance	22.29	3.684	18.00	5.000	1.532	0.164

*p≤ .05   **p≤ .01

Table 4 indicates that there are no statistically significant differences between the perceptions of male teachers and female teachers, with respect to significant learning and subcategory conceptual significance. It follows that all the teachers surveyed have the same conception of what meaningful learning means and that the subcategory referring to the conceptual is perceived as a capacity that students have when they recognize the importance of previous knowledge and its relationship with new learning, likewise, the importance of the different methods used by teachers and the relevance of educational materials, where new pedagogical practices coupled with ICT are promoted that significantly enrich the teaching-learning process.

Table 5 shows the inferential analysis among teachers, according to sex, with respect to significant learning and experiential significance subcategory:

Table 5
Differences between the experiential significance subcategory and significant learning by sex.

	Male	Female		M	t	Sig. (bilateral)
	SD	M	SD			
Meaningful learning	70.14	12.575	60.00	13.528	1.147	0.285
Experiential Significance	18.29	2.752	16.33	1.528	1.131	0.291

Table 5 shows the values of 0.285 and 0.291 reveal that there is no significant difference between the perceptions of male and female teachers in relation to significant learning and the experiential significance subcategory. These results would indicate that the teachers surveyed consider important the development of students' skills and abilities to interact actively in learning activities, as well as the need for adequate use by the teacher of technological tools and ICT, which allows students to achieve significant learning.

Table 6
Differences between the affective significance subcategory and significant learning by sex

	Male		Female		t	Sig. (bilateral)
	M	SD	M	SD		
Meaningful learning	70.14	12.575	60.00	13.528	1.147	0.285
Affective Significance	29.57	6.554	25.67	7.024	0.848	0. 421

As in the previous cases, the results of Table 6 indicate that there is no significant difference between the perceptions of male and female teachers in relation to significant learning and the subcategory affective significance. The values of 0.285 and 0.421 for the levels of bilateral significance, indicate that both teachers and men and women, consider the development of skills and affective skills in students important. Motivation and creativity as emotional and motivational factors are fundamental to create propitious environments and achieve meaningful learning in students. is, what enriches the teaching learning process in a remarkable way, promoting new pedagogical practices coupled with ICT.

Results of the teacher interview. This technique is relevant for the study because it allows to evaluate the level of theoretical, didactic and methodological knowledge that the teachers of the Microeconomics course have about significant learning and the requirements of the methodological process and the use of ICT in the process of teaching-learning the content of Microeconomics. A semi-structured interview was applied to six teachers of the Microeconomics course of the Faculty of Administration of a private University of Lima and the interpretative results are as follows:

Of the 6 teachers interviewed, 3 stated that they did not know the basics of the conceptual category, meaningful learning, what aspects it involves and what the theory refers to in this regard; one mentioned that it meant knowing how to think, use knowledge and reasoning in everyday activity, but no adequate argument what it consists of and how to treat each other in class. This demonstrated, in general, theoretical, and methodological ignorance by teachers to contribute to the development of meaningful learning that guides and stimulates students for the study activity. In general, there were deficiencies in the theoretical and didactic field of teachers to direct the teaching - learning process of Microeconomics; use of a traditionalist conception didactics that does not promote the development of reflection, critical thinking, and meaningful learning of students. In addition, the ways to achieve motivation in the class are unknown, they argue that they are only motivated by having them intervene through the questions and do not realize that motivation is something more than that, and that the educator in the class must expose the content in a dialogic, problematizing, creative and playful way in the contexts, which stimulate according to the characteristics of the student their motivation for new learning.

Analysis of the observation of teachers in class. The instrument used was used to verify the theoretical and didactic treatment provided by the teacher, and the use of digital technologies in directing the teaching-learning process of Microeconomics content in the students of a private university in Lima. Four classes of the Microeconomics course were observed in a non-participant manner. The results are as follows:

In a general sense, regarding the treatment and stimulation of the motivation achieved in the students by the new content to be developed, it was verified in two classes that the teachers

carried it out through questions that allowed them to inquire about the previous knowledge and orients the new content to learn, while in the third the teacher fails to create an exchange situation that allows him to explore the previous knowledge of the students. In the virtual environment almost 85% of interventions were from the teacher and 15% of the students, where the interaction originated mainly when the teacher asked about what was explained and if it was clear and towards questions that few were answered. Therefore, the importance of the teacher's activity with respect to the cognitive orientation of students, which affects the motivation of interaction and learning. It was also evident as an achievement, the mastery of the Microeconomics discipline by teachers, however, there were deficiencies in the theoretical domain of learning and in directing the teaching-learning process; also in the 4 classes observed, it was appreciated that teachers do not encourage group and collective work, with individual learning prevailing in the students, which passively affects significant learning, slowing down the development of knowledge, skills and interpersonal and communicative relationships.

The holistic analysis made it possible to identify the emerging categories in a general way that were systematized and those that affect the research problem, see figure 1, which are: Teachers show deficiencies in the didactic order in the teaching – Learning process; Importance of technological resources in virtual teaching; Lack of interest of students in the content of the course; Management of technological resources for learning; and Lack of application of formative evaluation, which are detailed in the following heading: Discussion.
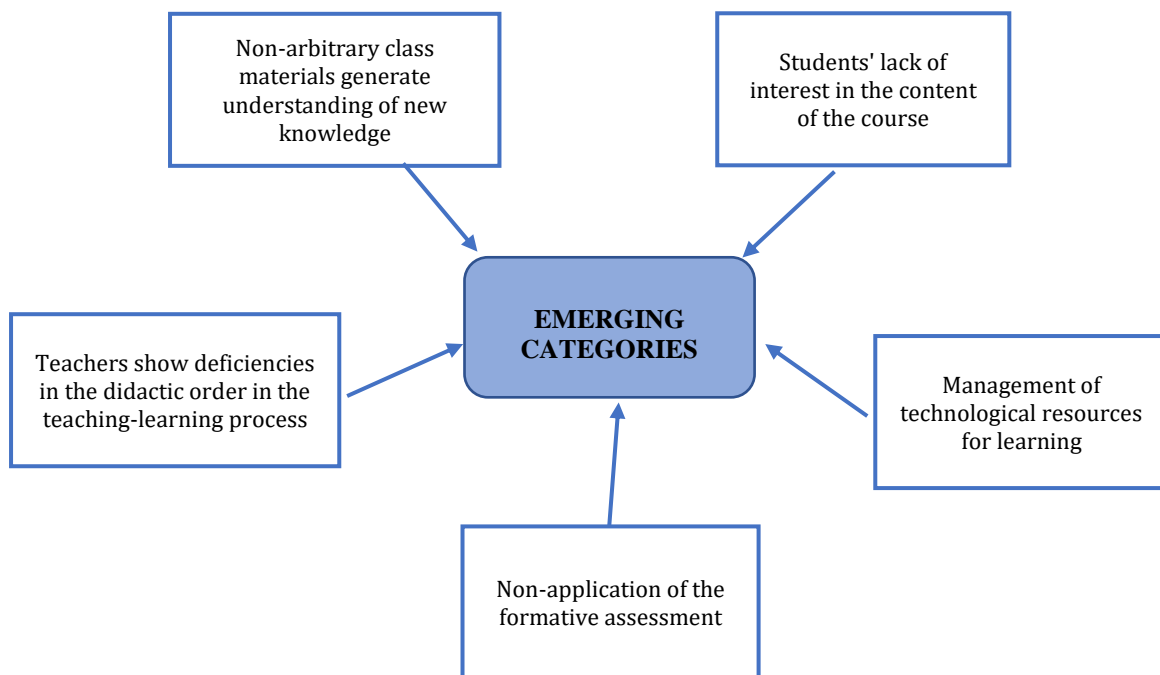
Figure1: Emerging categories resulting from the diagnostic process or fieldwork

4. Discussion and Conclusions

The triangulation process applied to the instruments applied from the qualitative and quantitative criteria allowed to interpret, analyze, codify, and contrast the a priori categories with the emerging categories that resulted from the diagnosis, among which stand out:

Teachers show deficiencies in the didactic order in the teaching-learning process. According to [18], didactics enables the educator to plan the norms, functions, and principles to direct the teaching-learning process. Its purpose is to achieve the integration of the didactic components, and to use methods to problematize, analyze, question, investigate the content so that the student assumes a leading role when interacting with the activity as what they do, and what application it has in professional practice. Technology can act as a mediator in teaching-learning processes

where the digital competence of teachers includes the knowledge and skills both in teaching and in the methodological use that each teacher has, which must be aimed at a teaching that achieves a conscious and meaningful learning in the student [19].

In the interview with the teacher and the classes observed, a traditional teaching was observed where the teacher exposes and does not promote interaction much, and students are simple recipients, previous knowledge is not considered, nor do they use didactic resources that stimulate being active such as mental maps, rubrics, among others; circumstances that limit the growth of meaningful learning throughout the teaching – learning process in the virtual environment.

Importance of technological resources in virtual education. Developing knowledge, attitudes, and skills towards the educational use of technologies in the digital age are one of the most requested competencies among current teachers [20]. All this became more than evident with the recent crisis of the pandemic, in which technology became the virtual scenario that interconnected students with the study [21]. The importance of applying pedagogical and technological resources to promote meaningful learning in future professionals, where students experience a significant improvement in digital skills and competencies in the learning process, as well as becoming aware of their main strengths and weaknesses. And when learning is significant and when regulation and reflection on the process are encouraged, critical awareness increases in students' self-perception of their own formation [22].

In the survey and interview with teachers, it was evident that most teachers are totally in agreement with the use of technological resources during the development of their classes, as well as the constant practice and performance of activities based on the contents of their learning session and the use of technological means that facilitate virtual teaching, but the development of digital skills is lacking to this end to optimize teaching. Students show a lack of skills in the use of technologies and a slight mistrust in their own abilities to use technology as an ally in the classroom.

Students' lack of interest in the content of the class. According to [23] and [24], the motivation and interest in studying is important to achieve meaningful, conscious, metacognitive, and self-regulated learning. In addition, when extrinsic and intrinsic motivation have been strengthened, they are willing to perform the activity actively, feel satisfaction because they know how to proceed and build significant knowledge. The educator must achieve the theoretical preparation to direct the teaching-learning process from the use of heuristic, problem-based methods and organize the learning in groups, workshops, investigations so that the students are aware of what they learn and how they learn it. To this must be integrated theory and practice, interdisciplinary approach, as well as innovate to achieve those relevant learning in students, which considers integrating e-learning for the development of their critical thinking [25], in addition the teacher through research can identify alternatives that offer authentic training routes, through innovative didactics and a dynamic curriculum.

In this regard, it was found in the survey, in the interview with teachers and in the observation deficiencies in the theoretical references of how the motivation category and interest intervene in the teaching-learning process, which was corroborated in the surveys carried out on students and in the pedagogical test where more than 50% failed the Microeconomics discipline test, showing a low level of knowledge and skills. Students do not show interest nor are they motivated to inquire, investigate where ICTs are not used as a tool to gain knowledge, since the teacher does not always try to create attractive learning conditions, which arouses interest and motivation for the contents and the lack of methods that contribute to reflection, critical thinking, among others.

Management of technological resources for learning. Information and communication technologies [ICTs] enhance meaningful learning and have a multiplier effect of creativity and resources if used properly by providing controlled use of computational resources to a high performance in student learning, facilitating the teaching of teachers [26], [27].

In this sense, it was evident in the survey of students as well as those of teachers, that particularly in the educational activity, teachers and students have incorporated in their daily practice the use of digital tools becoming an important element in the teaching-learning process. But often it is not used due to lack of knowledge in the efficient use of ICTs by teachers in virtual

teaching, there is not enough interaction, and students do not take advantage of the ideal information in networks for this purpose. They also agree that, if the connection is good and there is adequate interaction, it encourages teaching and learning in the virtual environment.

Lack of application of formative evaluation. Formative evaluation contributes to the student being able to critically recognize their accomplishments, their shortcomings, and take a self-regulated, metacognitive position by developing co-evaluation, hetero-evaluation, and self-evaluation skills in the results of their activity [24], [28]. In this context, [29] mentions that, with the transformations of the digital age, ICTs offer the possibility of improving the use of formative evaluation through the monitoring of learners' learning processes and the detection of advances and learning difficulties. To [30] carrying out the formative evaluation with the use of ICTs, it is essential to consider the temporal dimension, since it is a significant element when analyzing the evaluative practice, since it allows observing how learning is being carried out and making decisions related to the educational process.

In this regard, in the survey and interview with teachers, and the observation of classes, theoretical and methodological shortcomings were observed in the concept and application of a traditional evaluation focused on the results, leaving aside the process, while very few employ formative evaluation. The acquired concepts are mostly evaluated, leaving aside the attitudinal and procedural and attitudinal dimension that is important in the formative evaluation as well as the feedback that allows you to reflect on your achievements and difficulties and receive precise and clear guidance on how to develop your knowledge, skills, and attitudes in an integral way. The teaching competence must incorporate formative feedback that generates a student's reflection on their learning, as an essence to build meaningful learning [31, 32].

From the above, it is concluded that:

ICTs are a valuable support resource for teachers to carry out learning activities, because in this sense, the teacher's initiative must take precedence as a factor that leads to the institution of the use of ICTs in educational institutions together with educational policies that help formulate proposals that address the needs and demands of society in the 21st century. The role of the school is to train citizens in a context where science and technology have made significant advances, and future citizens are able to take on the challenges of the present century.

Educational materials should encourage the active participation of students, challenge students to create and participate in new situations and explore their knowledge. It is also pertinent to consider that the use of educational materials promotes teamwork, collaboration, and interaction among learners, in a pleasant environment for meaningful learning.

Students show a positive disposition towards classes in the virtual environment and this the teacher does not know how to take advantage of it properly because many times they lack the methodological and theoretical mastery to lead the teaching - learning process where the cognitive, volitional, emotional, and affective sphere of the students is enhanced that is reflected in a learning that is significant.

The process of analysis during the process investigated showed that the level of knowledge, attitudes and skills are below the curricular requirements for the level they are studying, due to the lack of application by teachers of methods, procedures, strategies, and the adequate use of ICTs that contribute to enhancing the interest, motivation of the learners for meaningful learning.

The forms of evaluation used by teachers are of a traditional model where the conceptual is prioritized, often leaving aside dimensions such as the attitudinal, or by competencies not employing in many cases the formative evaluation that incurs in socialization and the exercise of criticism and reflection in the formation of knowledge when using instruments, rubrics, self-assessment to contribute to meaningful and conscious learning.

The didactic methodological proposal must allow the teaching competences to contribute to the development of meaningful learning of the content of the Microeconomics discipline by the students, by assigning a leading role to the students, through the application of heuristic problem methods, creative and dialogical research that contributes in the ways of thinking, feeling, and doing independently by the students.

From the results obtained, through the diagnostic process and the holistic triangulation, it was possible to determine the dimension of the scientific problem, analyze it and continue with the modeling of the didactic methodological proposal that aims to contribute through the teaching competencies to the significant learning, in virtual environments, of the students at a private university of Lima.

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