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ACTIVE METHODOLOGIES IN ECUADOR: APPROACH TO THE LITERATURE REVIEW OF PROJECT-BASED LEARNING, PROBLEM-BASED LEARNING AND FLIPPED CLASSROOM

METODOLOGÍAS ACTIVAS EN ECUADOR: APROXIMACIÓN A LA REVISIÓN DE LITERATURA DE APRENDIZAJE BASADO EN PROYECTOS, APRENDIZAJE BASADO EN PROBLEMAS Y AULA INVERTIDA

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ABSTRACT

Educational processes are changing in Latin America, adjustments have been made to curricular models, attempts are being made to incorporate technological innovations, attempts are being made to better understand current students, and in that order, in Ecuador it is also a matter of innovating teaching-learning methodologies. The purpose of this study, developed during 2022 as part of the Master's Thesis (TFM), is to identify recurrent conceptual and methodological aspects on the implementation of active methodologies in Ecuador. This is a bibliographic review of journal articles and master's theses, a total of 10 empirical investigations. In Ecuador, the process of methodological change and renewal, from the traditional teaching scheme, would take at least ten years, during which time attempts have been made to implement new methodological strategies, such as: Project-Based Learning (PBL-projects), Problem-Based Learning (PBL-problems), and Flipped Classroom-based learning. There is a certain similarity in terms of concepts and procedural guidelines of application, as well as the resistance to change in a large part of teachers. Based on the results, the widespread application of active methodologies in the Ecuadorian school environment is justified; and, based on unforeseen findings, the convenience of conducting empirical studies to evaluate the presence of aspects of several active methodologies in teaching practice in a combined or simultaneous way is proposed. Keywords: active learning, pedagogical practices, active methodologies.

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Palabras clave:
aprendizaje activo, prácticas pedagógicas, metodologías activas.

RESUMEN

Los procesos educativos están cambiando en América Latina, se han realizado ajustes a los modelos curriculares, se está tratando de incorporar innovaciones tecnológicas, se intentan comprender de mejor manera a los estudiantes actuales, y en ese orden, en el Ecuador se trata de innovar también las metodologías de enseñanzas - aprendizaje. El presente estudio, desarrollado durante el año 2022 como parte del Trabajo de Fin de Master (TFM), tiene como propósito identificar aspectos conceptuales y metodológicos recurrentes sobre implementación de metodologías activas en el Ecuador. Se trata de una revisión bibliográfica de artículos de revista y tesis de maestría, en total 10 investigaciones empíricas. En el Ecuador el proceso de cambio y renovación metodológica, desde el esquema tradicional de enseñanza llevaría al menos diez años, durante los cuales, se ha intentado implementar nuevas estrategias metodológicas, como: Aprendizaje Basado en Proyectos (ABP-proyectos), Aprendizaje Basado en Problemas (ABP-problemas), y Aprendizaje Basado en "aula invertida" (flipped classroom). Se percibe cierta similitud en cuanto a conceptos y pautas procedimentales de aplicación, como también, la resistencia al cambio en gran parte de docentes. En función de los resultados se justifica la masificación de la aplicación de metodologías activas en el ámbito escolar ecuatoriano; y, en función de hallazgos no previstos, se plantea la conveniencia de realizar estudios empíricos para evaluar la presencia de aspectos de varias metodologías activas en la práctica docente de forma combinada o simultánea.

Introduction

This article addresses one of the determining factors in the learning process. As important as the conditions of the educational center, the educational policies or the role of the teacher are, so are the appropriate learning methodologies.

Teaching and learning models, strategies and methodologies are progressively advancing, adapting to the new conditions and circumstances of social change. According to Bauman (1999), the last decades, unlike previous moments of social change in history, are shaping a new characterization of the subject, and therefore of the subject of learning[2]. Therefore, teachers are required to innovate teaching methodologies based on their knowledge of these new circumstances and contextual conditions that are affecting the learning processes.

The traditional teaching-learning methodologies, based mainly on behaviorist and cognitivist theories focused mainly on the role of the teacher, do not correspond to the current contextual conditions of globalization in access to information, digitalization in technological tools, and the new profiles and needs of current students, so it is necessary to move towards student-centered learning methodologies, which promote their participation in the learning process; it is therefore necessary to consider active methodologies, whose theoretical bases arise from constructivist perspectives.

Active methodologies are better adapted to the profile of the new student, susceptible to be motivated mainly through the manipulation and use of images, this new student that García et al. (2007) describe it in the following terms:

> They were born in the digital age and are consummately skilled, permanent users of technologies. Its main characteristic is undoubtedly its technophilia. They are attracted to everything related to new technologies. With ICTs they satisfy their needs for entertainment, fun, communication, information and, perhaps, also education (p.2).

For their part, Restrepo and Waks (2018) refer to active learning as:

> Active learning is framed within constructivist learning methodologies and consists of using instructional techniques that involve students in the process of their own learning through activities such as writing, reading, speaking, discussing, researching, manipulating materials, making observations, collecting and analyzing data, synthesizing or evaluating elements related to the content covered in the classroom, among other aspects (p.4).

In this sense, active methodologies are by definition drivers of active learning, to the extent that they are the result of didactic strategies that promote participation, cooperative and collaborative work, which, in general, is also achieved through group activities. In this order, Valcárcel et al. (2015) note: "In the interaction fostered by active methods, individual knowledge is socialized, enriching and enhancing it in collective knowledge, which appears as a product of group activity" (p.52).

Moncayo-Bermúdez and Prieto-López (2022) emphasize the application of constructivist techniques in the teaching-learning processes as a strategy to develop 'visible thinking', stating: "Visible thinking, according to studies carried out by Sepúlveda et al. (2018) is any kind of observable representation that helps to document, support, and develop thinking, (...)" (p.48). Therefore, active methodologies, of course, contribute

2 We are facing a new learning subject profile, which has been emerging since only three decades ago, a transmutation catalyzed by this "new normality", which greatly accelerates the transition from analog to virtual-digital.

to the formation of the ability to reason critically, in order to confront meaningful learning with concrete reality.

Muñoz and Pérez (2017) in their work around "invisible learning", point out the importance of using didactic resources in a creative way, for the development of higher levels of reflective capacity in students to relate concepts to concrete problems of everyday life. In other words, the application of active methodologies will have a better chance of contributing to the consolidation of this type of learning, which, moreover, according to the authors, is present in practice in all people.

Restrepo and Waks (2018) address basic concepts about the principles and foundations of active learning, refer to the advantages over traditional techniques, and support them with comparative case research. They also point out the absence of tools to guide active learning when planning: "There are few resources available to teachers and schools that explain in a synthetic, practical and agile way what this active and participatory methodology consists of" (p.3). On the other hand, Restrepo and Waks, regarding the basic characteristic of active learning, point out that not only the student is motivated to greater participation and critical reflection, but also, implicitly, the teacher.

Some authors agree that some general principles of active methodologies are: cooperation, collaboration, metacognition, self-regulation, and the use of ICT. Cooperation refers to the fact that each person shows commitment to his or her task; collaboration, when, in addition to cooperating, people work together with the same objective; metacognition, as the ability to reflect on thought processes and the way in which one learns; self-regulation, the ability to self-manage and self-generate reflections, feelings and actions; and the use of communication technologies, which are gradually and progressively incorporated into the field of teaching-learning processes, until becoming the tool with the greatest incidence at present.

Bernal and Martínez (2009), on the fundamentals of active methodologies, point out:

1. The student is an active protagonist of his or her learning.

2. Learning is social. Students learn much more from the interaction that arises between them than from exposure alone.

3. Learning must be meaningful. Learning needs to be realistic, feasible and complex so that the learner finds relevance in the transfer of such content (p.102).

By incorporating the term meaningful learning we are alluding to a pedagogical current that emerged from constructivism; this perspective considers that new learning is constructed from previous knowledge that the student possesses as preconceptions, forming at the same time a network of knowledge (Ausubel, Novak and Hanesian, 1983).

Theoretically, there are several active methodologies: participatory master class, thinking-based learning, inverted classroom, project-based learning, problem-based learning, design thinking-based learning, gamification-based learning, solidarity service learning and team-based learning; but, for this review, based on direct daily observations and approximate surveys in information search platforms on the web, this study focused on three of them, which may be the most recurrent in the Ecuadorian school environment: Project-based learning (PBL-projects), problem-based learning (PBL-problems), and flipped classroom learning (flipped classroom).

Project-based learning is essentially "learning by doing". Castellano (2021), refer to its definition as:

> (...) Project Based Learning, in its acronym PBL, can be defined as a teaching modality that focuses on different tasks through a shared process of negotiation between the different participants, student-teacher and student-student, its main

> objective being the achievement of a final product or project that provides a solution to a challenge, problem or key question posed. (p.178).

The problem-based learning as well as project-based learning is made viable through collaborative work, self-regulation and the use of ICT, the characteristic result of this methodology is the creation of critical-reflective capacity in the student; in this sense, Morales (2018) points out: "(...) PBL is the means by which it becomes possible to establish the conditions conducive to active, contextualized, integrated and comprehension-oriented learning, providing opportunities to reflect on the educational experience and apply what has been learned" (p. 93).

Méndez and Méndez (2021), in one of the first conceptual considerations, emphasize that one should not confuse or consider in an equivalent way the task of solving problems with the learning methodology, thus, quoting several of their sources, they point out "However, problem solving is an extension of PBL and may or may not be included in this learning method" (p.12). These authors, on the other hand, analyze the learning-by-problems methodology from the cultural-historical approach, pointing out the following, based on Vygotsky's foundations:

> In this process, the central axis is the articulation of the psychological processes, which allow us to become aware of ourselves and the environment in which we develop, as well as the sociocultural ones where social relations intervene in the environments established by the subject. (...) (p. 80).

Therefore, the difference between PBL-projects and PBL-problems lies in the fact that while in projects, the final product of learning must necessarily be a tangible product, in problems, the final product is the solution of a case, generally at a theoretical-abstract level.

In turn, "inverted classroom" is the methodology that, whether operating as an exclusive methodology or complementing another methodology such as PBL problems or PBL projects, is the one that best adapts to the new characteristics that educational processes are acquiring. In its procedural sequence, two stages are differentiated: individual autonomous and group directed and facilitated by the teacher in the classroom, together, the student progressively advances in the different phases of knowledge construction. In this sense, Berenger (s/f) points out:

> The flipped learning model manages to cover all the phases or levels of the well-known Bloom's Taxonomy, since, when the student faces the previous work outside the classroom, he/she exercises the first three, that is, knowledge, comprehension and application (skills or cognitive processes considered of lower order) and in the classroom he/she works on the cognitive processes of greater complexity (knowledge, comprehension and application) (p. 5).

On Tools for Implementation in the Ecuadorian Context

Noguera and Mejía (2017) propose a didactic guide on active techniques of the direct method in the development of communicative competencies, emphasize the need to use active strategies in the teaching-learning processes of the English foreign language. In this regard, it can be said that guides such as the one proposed in this work can be applied in a conditioned manner to the learning of other contents.

The Ministry of Education of Ecuador has made available to teachers the document called "Instructive for the elaboration of interdisciplinary projects" (Ministry of Education of Ecuador -MINEDUC, 2021), as a guide for the implementation of the so-called "interdisciplinary projects" during the last two school years. The following are some relevant ideas from these instructions.

An interdisciplinary project is a means to develop competencies anchored to the current curriculum, it is based on the ABP (Project Based Learning) methodology, which is approached from different subjects and/or curricular disciplines, it aims to:

- Integrate areas of knowledge.
- Strengthen competencies according to the sub-level of General Basic Education and High School level.
- Apply knowledge. (p. 6).

Méndez and Méndez (2021) about the procedure of Learning by problems refer to four sequential phases: "knowledge activation and analysis; research and study; problem solving; and, presentation to the class and evaluation" (p.23).

Studies in Favor of a Methodological Change in Middle School Education in Ecuador

Villacrés (2016) establishes the need to consolidate the application of active methodologies, in a given educational unit, noting first that teachers, despite having some institutional guidelines and directives on active methodologies, tend to use the traditional methodology, which results in low performance in student learning. In this research a description of the problem is made, such as the poor training and lack of training of middle level teachers in active methodologies, added to this the lack of available tools, a situation that according to the author is having a negative impact on the learning level of students. In one of the conclusions it states:

> The learning by skills with performance criteria that students have achieved are the following: estimating, identifying, listening, recognizing, among others, those that have not yet been achieved are understanding, constructing, solving, contrasting, due to the fact that teachers are not adequately developing the learning by skills with performance criteria. (p.97).

Granja (2019) mentions that teachers continue to adopt traditional roles in their actions within the classroom, typical of traditional methods and school, which continue to apply the master lecture as the basic methodology, with which, effectively, it is agreed that it "kills the creativity and autonomy of students", deriving in low academic performance. The author refers to studies such as the "PISA assessment standards" (pp. 15-17); and ends by emphasizing the advantages of active methodologies over the traditional teaching method.

For his part, Morales (2011), referring to the nature of active methodologies in contrast to traditional methods, points out: "The active and participatory methodology demands that the subjects engage with and strengthen the group" (p.45). In her research with a qualitative approach of descriptive scope, Morales starts with a diagnosis of the application of active strategies in teachers of an educational unit in the south of the city of Quito, and ends by recommending the "study circles" strategy.

Alvarado-Miles et al. (2017), diagnose the training needs of teachers in a certain school in the city of Quito, emphasize the importance and need to incorporate the tools that information technology currently provides to teaching strategies.

The following objectives were established for this literature review: 1) Characterize the bibliographic production on implementation processes of: Project-based learning (PBL-projects), problem-based learning (PBL-problems) and flipped classroom learning in Ecuador; and, 2) To identify the conceptual and procedural particularities in the experiences of project-based learning (PBL-projects), problem-based learning (PBL-problems) and flipped classroom learning in Ecuador.

Method

The bibliographic production on experiences of active methodologies in the Ecuadorian space is relatively scarce in databases; on the other hand, no doctoral theses from Ecuadorian universities were found that have directly addressed the subject; therefore, methodologically, this is a bibliographic review of narrative order in the terms expressed by Reyes (2020): "They are a selection of data collected from the literature, presented to readers as a synthesis to which the review authors add their own comments, conclusions and recommendations (...)" (p. 5).

The following search equations were used in the Google Scholar and SciELO databases: thesis, active methodologies, active learning, project-based learning, problem-based learning, inverted classroom. In addition, the Boolean operator AND was used in the case of the SciELO database; to make search combinations among the selected descriptors, 'methodologies AND active', 'methodologies AND active learning', 'methodology AND projects', 'learning AND problems', 'learning AND flipped classroom' and the descriptor thesis AND most of the other descriptors mentioned above were combined.

The inclusion criteria were theses and articles should have been published within the last five years. In particular, the articles should be empirical research, and the theses should correspond to master's degree levels and be included in repositories of Ecuadorian universities.

Of these, 3 are articles where empirical methods were used, published in Ecuadorian journals and 7 master's theses (Master's thesis) obtained from repositories of the following Ecuadorian universities: Universidad Central del Ecuador, Pontificia Universidad Católica del Ecuador-PUCE, Universidad Técnica del Norte, Universidad Nacional del Loja and Universidad Regional Autónoma de los Andes - UNIANDES. This is shown in Table 1.

Table 1

Studies on the implementation of active methodologies in Ecuador analyzed

Study	Type of publication	Magazine/Repository	Database
Eras (2022)	Thesis	Repositorio Universidad Nacional de Loja	Google Scholar
Fonseca-Factos and Simbaña-Gallardo (2022)	Empirical article	"Novasinergia" magazine.	SciELO, LATINDEX
Macias-Peñafiel and Arteaga-Pita (2022)	Empirical article	"Polo del Conocimiento" Magazine	Google Scholar
Mancheno (2013)	Thesis	UNIANDES University Repository	Google Scholar
Lopez (2017)	Thesis	Central University of Ecuador -UCE Repository	Google Scholar
Ortega (2015)	Thesis	National University of Loja-UNL Repository	Google Scholar
Red (2021)	Thesis	Repository of the Pontifical Catholic University of Ecuador - PUCE	Google Scholar
Rumipulla (2020)	Empirical article	Repository of the Pontifical Catholic University of Ecuador - PUCE	Google Scholar

Sanchez (2022)	Thesis	National University of Loja-UNL Repository	Google Scholar
Yépez (2022)	Thesis	Universidad Técnica del Norte Repository	Google Scholar

Results

In the initial steps, we proceeded to characterize the studies analyzed, 4 refer to PBL-projects, 3 to PBL-problems, and 3 to Inverted Classroom; in most studies the survey is used as data collection technique, only in one case observation is used; as for instruments, the questionnaire prepared for the study (ad hoc questionnaire) predominates, one study is quasi-experimental with application of pre-test and post-test; as for the level of education, where the study populations and samples are located, 2 correspond to the primary or basic general education level in Ecuador, 6 to the middle or high school level, particularly at the baccalaureate sub-level, and 2 to the higher level; as for the year of the research, the oldest identified is 2012-2013; as for the subjects participating in the samples, they are teachers and students of the educational levels referred to, which, in terms of number, range between 1 and 11 teachers, and between 21 and 256 students, as shown in Table 2.

Table 2
Characterization of the studies analyzed

Study	**Thematic**	**Technique and instruments**	**Level of education and school year of study**	**Research subjects**
Eras (2022)	PBA - Projects	Survey Ad hoc questionnaire	Primary level	6 teachers 30 general basic education students
Fonseca-Factos and Simbaña-Gallardo (2022)	PBA - Projects	Survey Likert Scale	Medium level	11 teachers 256 students of the Rural Educational Unit
Macias-Peñafiel and Arteaga-Pita (2022)	PBA - Projects	Survey Ad hoc questionnaire	Medium level	4 teachers 31 high school students
Mancheno (2013)	PBA-Problems	Survey Ad hoc questionnaire	Higher level	12 teachers 87 students from Instituto Técnico Superior
Lopez (2017)	Inverted Classroom	Survey Ad hoc questionnaire Pre test and post test Quasi-experiment	Higher level 2016-2017	University students 30 students for the experimental group 30 students for control group
Ortega (2015)	PBA-Problems	Survey	Medium level 2012-2013	3 teachers

		Ad-hoc questionnaire Pre test and post test		21 first year high school students
Red (2021)	PBA - Projects	Survey Ad hoc questionnaire	Medium level 2020-2021	10 teachers 80 students in the third year of high school
Rumipulla (2020)	PBA-Problems	Survey Ad hoc questionnaire	Medium level 2019	31 teachers of the Educational Unit
Sanchez (2022)	Inverted Classroom	Observation, interview and survey Ad hoc questionnaire	Primary level 2021 - 2022	1 teachers 30 students in the first year of high school, seventh grade, general basic education
Yépez (2022)	Inverted Classroom	Survey Ad-hoc questionnaire	Medium level 2021 - 2022	90 high school students

In the bibliographic review, an attempt was made to identify the basic concepts of active methodologies, such as active learning; from there, to the procedural guidelines, difficulties, achievements, and more particularities related to the application of the three selected active methodologies: Project-based learning (PBL-projects), problem-based learning (PBL-problems) and flipped classroom learning.

On the other hand, the Ecuadorian bibliographic production of research on the implementation of active methodologies is directly related to the institutional structure of teacher training in Ecuador. In approximate terms, in the Ecuadorian university system, at least 15 universities, most of them state universities, train teachers at the bachelor's or third level, from faculties that are generally called "Education Sciences", of which no more than 10 faculties have master's degrees in education, while there are no universities with completed doctoral programs in education.

Project-Based Learning (PBL-projects)

Macías-Peñafiel and Arteaga-Pita (2022), referring to the relevance of the student's role in the learning process in the Project-Based Learning methodology, point out: "The role of the learner in PBL is central, since a project must incorporate the component of learner autonomy in their choices, as well as unsupervised work time (p. 1589).

The authors start from the importance of the diagnosis for the application of strategies for teaching mathematics to high school students of a certain educational unit in the city of Guayaquil; in the results of the research, they refer to the following: "Most teachers know about active methodologies such as project-based learning, but they are unaware of the importance of these methodologies and how they can contribute to the teaching and learning process with students" (p.1590).

Fonseca-Factos and Simbaña-Gallardo (2022) conducted an evaluation of the results of the project-based learning methodology, under the particularity of "Science, Technology, Engineering, and Mathematics (STEM)" implemented in the subject of physics at the high school level, in a specific educational unit in rural Ecuador, reaching the following results, among others:

> 81.8% of teachers say that the use of new technologies for teaching the subject of Physics will always improve the understanding and motivation of students.
>
> 72.7% of teachers believe that establishing interdisciplinary projects will always allow the integration of content and learning experiences in the classroom. (p. 99).

Eras (2022) in his research with a quantitative approach, refers to project-based learning in terms of the role that teachers should play:

> (...) leads teachers to work collaboratively, prevailing order, respect and generation of new ideas that are permanently promoted by the teacher, all this is done to achieve the central objective of learning by doing (p. 6).

In one of his conclusions, the author states: "Project-based learning works mainly under a collaborative learning where it seeks the creation of heterogeneous groups in which students can help others in some aspects of the learning process" (Eras, 2022, p.56). On the other hand, the author refers to the collaborative and participatory nature of the dynamics of this active methodology, which is particularly expressed in the group work in class, which, in addition and in general, is widely accepted to be developed through the workshop strategy.

On the other hand, Rojas Moposita (2021) defines PBA-projects as:

> (...) it is an active methodology, which allows students to develop collaborative integration skills for the search of solutions to real problems through motivation, planning, construction and evaluation, which promote the development of competencies to be applied in the working world (p.22).

In terms of findings, Rojas Moposita, referring to the need for innovation in learning methodologies in the educational unit under study, points out: "teachers use old-fashioned learning strategies, do not allow for the development of creativity, nor for cooperative participation, thus preventing the student from being the main author of his or her learning" (p.101).

Problem-Based Learning (ABP-problems)

Mancheno (2013), in his research with quantitative approach, verifies that university students of the higher education institution of Ecuador of his study consider as a valid alternative option the definitive implementation of problem-based learning instead of the traditional methodology. In relation to the innovative nature of this learning methodology, citing Martínez & Cravioto, (2002), he points out:

> (...) While traditionally the information is first presented and then its application is sought in the resolution of a problem, in the case of PBL the problem is first presented, the learning needs are identified, the necessary information is sought, and finally the problem is returned to (p. 27).

Mancheno (2013), in one of his survey questions notes: "Do you consider that the application of problem-based learning (PBL) at ITSB will lead to improved student understanding?" (p.79). The affirmative answer to this question by the majority of the respondents gives the basis to consider that the application of PBL can have a significant impact on the teaching-learning process of the marketing subject, improving the academic performance of the students of the Higher Cycle of the ITSB of the city of Ambato. In this order, in one of its conclusions it states that:

> The change from the traditional methodology, focused on memory, where the student assumes a passive role, receiver of information, to the active methodology of PBL, where the student takes responsibility for his learning process and undertakes actions that lead him to develop strategies to search for information, select it, organize it and finally employ it for the resolution of the problem posed,

> caused, at the beginning of its implementation, bewilderment and anxiety in most of the students in the test group (Mancheno, 2013, p.126).

Regarding the simultaneous nature of the processes of teaching and learning, which in practice affects both the one who teaches and the learner, Mancheno (2013) points out: "(...) the type of relationship existing between teaching and learning is one of ontological dependence between the two concepts. Teaching cannot exist without learning because if learning did not occur there would never be any sense in talking about teaching" (p.38).

Ortega (2015) refers to the potential and advantages of the problem-based learning methodology, which should be implemented permanently as a teaching-learning strategy in the subject of mathematics in the educational unit of his study, in the province of Loja. It refers to PBA-problems such as:

> (...) is based on the principle of posing problems as a starting point for the acquisition and integration of new knowledge, working in small groups of students and through the tutor's facilitation, selected or specially designed problems are analyzed and solved to achieve certain learning objectives (p.49).

The aforementioned author starts by establishing, by means of quantitative techniques, the situation of the didactic strategies that mathematics teachers usually apply. In his conceptual framework, the author refers to the definition of the problem as as: "To have a problem means to consciously seek an appropriate action to achieve a clearly conceived, but not immediately achievable goal" (Ortega, 2015, p.10). It concludes that "PBL improved the teaching-learning process of linear and quadratic functions in the first year of high school at the Colegio Nacional Mixto Manuel Benjamín Carrión in the parish of Yangana, in the canton and province of Loja" (p.141).

On the other hand, Rumipulla (2020), in his research with a qualitative approach, in defining and describing the specific characteristics of PBL-Problems points out: "(...) it is a didactic method, which falls in the domain of active pedagogies and more particularly in that of the teaching strategy called learning by discovery and construction, which is opposed to the expository or magisterial strategy" (p. 9). On the other hand, it is referred to as: "an active method of learning based on the principle of using problems for the integration of new knowledge" (p.11).

Rumipulla (2020) states in one of the specific objectives "To diagnose the knowledge that teachers of the "María de Nazaret" Fiscomisional Educational Unit have about Problem-Based Learning" (p.7); and in results, he points out:

> (...) it was possible to verify that the teachers of the "María de Nazaret" Fiscomisional Educational Unit do not agree with the theme of teacher training by the Ministry of Education, since they consider that it does not meet their professional needs (p.35).

Learning Based on "Inverted Classroom"

Yépez (2022), research with a qualitative approach and explanatory scope, in the theoretical framework, regarding the concept of "inverted classroom", citing Vidal (2016), points out:

> A pedagogical orientation in which direct education moves from a collective learning space to a space particular to the school, and the resulting collective knowledge space becomes a dynamic and participatory knowledge environment, where the teacher guides the group as it uses the concepts and participates creatively in the subject. (p.12).

Yépez (2022) defines his research problem through the following question: "Is it possible to change traditional teaching with the use of active methodologies to achieve meaningful learning for high school students?" (p. 6); the general objective: "To strengthen the learning process of the high school students of Victoria Bilingual Christian Academy based on the Inverted Classroom methodology, which will allow the implementation of more effective teaching strategies in the 2021 - 2022 school year." (p. 8); in one of its conclusions, it states:

> The active methodology of the inverted classroom is a modality for learning that combines the virtual environment with the face-to-face, where the teacher is a guide that contributes to complete the cycle of knowledge based on this methodology that includes: knowledge, comprehension, application, analysis, synthesis and evaluation, these strategies used to fulfill the cycle of knowledge are effective and keep them motivated, also encourages them to be part of the teaching-learning process of their school life (p.154).

López (2017), in his research with mixed approach and correlational explanatory level, tries to explain the incidence of the inverted classroom methodology in the academic performance of the learning of specific topics of the English subject in the students of the period September 2016-February 2017 of the university of his study. Regarding the specific characterization of inverted classroom, he points out:

> (...) focuses on the student's autonomous work to be reinforced collaboratively in class. In addition, this technique accepts any type of materials such as videos designed by the teacher or videos previously made by other teachers related to the topics, books, workbooks, multimedia broadcasting or countless other materials that introduce key concepts about any topic that can help the student to better understand the subject he/she wants to learn. (p. 11).

Lopez (2017) poses the problem in the following terms: "How does the inverted classroom model impact the learning of independent morphemes of the English language in students of initial levels at La Universidad de las Américas during the period September 2016-February 2017?" (p.4); and, in one of its conclusions, it states: "(...) it was possible to increase the learning of the independent morphemes of English in students of initial levels of the University of the Americas" (p. 45).

To conclude this review, Sanchez (2022) evaluates through mostly quantitative procedures the teaching techniques of a teacher in the educational unit of his study, in the city of Loja. Based on the results of the problem, a proposal for improvement is presented in the form of a didactic guide on the implementation of the inverted classroom methodology. Regarding the definition of the inverted classroom, Sanchez points out: "The inverted classroom methodology allows the student to be the subject of knowledge formation, the main axis in the learning process". (p.7). As a general objective, it states: "Incorporate the inverted classroom in the teaching-learning process of seventh grade students at Zoila Alvarado de Jaramillo School to generate collaborative learning environments" (p.5). As for the application procedure, based on the "Aulaplaneta" portal, it proposes three phases with differentiated roles for the teacher and student: phase 1, before the class, phase 2, during the class, and phase 3, after the class; and, in one of its conclusions, it points out:

> (...) the teacher used traditional tools such as books, blackboard, notebook and puzzles in the development of the different subjects; this is a negative factor in the development of constructivist learning, since the application of videos, multimedia and other interactive activities are fundamental for the improvement of the teacher's actions and should be constantly updated (p.35).

Discussion and Conclusions

This study provides characteristic elements of the bibliographic production on the implementation processes of Project-Based Learning (PBL-projects), Problem-Based Learning (PBL-problems) and Flipped Classroom Learning in Ecuador, as well as identifying procedural particularities of their application.

The experiences of the 3 selected methodologies analyzed in this study have been identified as the most recurrent. No reviews were identified that included more than one active methodology. On the other hand, most of the studies analyzed emphasize the following as the foundations and general principles valid for all active methodologies: active learning, collaboration, cooperation and student-centered teaching.

The way in which the Ecuadorian authors define the three methodologies that are the subject of this review are similar to each other and to other studies in the Latin American context; thus, in the case of PBA-projects, with the systematic review of Ruiz and Ortega-Sanchez (2022): "According to the most recent international scientific literature, PBL continues to be perceived as a teaching method capable of enhancing the characteristics expected in successful learning processes" (p.10). In PBL-problems, with the review of Bermudez Mendieta (2021), who, regarding the absence of connection between the constructivist perspective and PBL-problems in the studies of his research, points out: "The theory underpinning this research with respect to problem-based learning is constructivism, although it is not explicitly stated in some research" (p.82). And, in the case of Aula invertida, with the review of (Pino-Apablaza and Taipe-Mayhuire, 2022), in the Latin American context, of the last 10 years; as well as, with the review of (Cantuña Avila, and Cañar Tapia, 2020), for the Ecuadorian context; and, with the empirical study of (Laura and Almanza, 2020), developed in the Peruvian school system.

The studies analyzed do not allow us to perceive whether the levels of success in the implementation of active methodologies are related to any particular school level; likewise, no comparative analyses were identified between private and public school systems; nor were ex-ante and ex-post studies of the application of active methodologies.

From which, it can be concluded that active methodologies are the alternative in the teaching-learning processes that best correspond to the profile of today's students at different levels, which due to the particular social change of recent decades tend to be motivated mainly by visual stimuli and deconstruct their preconceptions quickly.

Most active methodologies are based on general methodological principles, such as cooperation, collaboration, participation, metacognition, self-regulation and the frequent use of ICT, which together implicitly induce and promote active learning. In this sense, it could be said, according to the main theorists of constructivist pedagogy, both the classics such as Lev Vygotsky, Jerome Bruner, Jean Piaget and John Dewey, as well as contemporary ones such as Maria Montessori and Paulo Freire, and also sociologists of education such as Pierre Bourdieu and Edgar Morin, that it is the type of teaching-learning that best suits the nature of socialization processes in the early formative stages.

As one of the unanticipated results, it can be pointed out that there are indications that teachers, particularly at the intermediate level, are applying in their daily pedagogical practice, generally without knowing or conceptually differentiating, some procedural aspects that could correspond to various active methodologies, which is in line with the starting idea of this review that supported the choice of the 3 active methodologies analyzed: assumptions based on daily observations during teaching and exploratory surveys on web-based information search platforms.

As educational innovation processes continue in parallel with changing conditions, circumstances and educational policies, it is expected that new and more extensive reviews will emerge, accounting for progress in the implementation of active methodologies in Ecuador.

Perhaps the main limitation of the present study is its unrepresentative sample, given that it analyzes three active methodologies, which leads to the need for reviews focused on a single one, to determine trends in the impact of its application results in different geographic areas, educational levels and more variables of analysis of the teaching-learning processes in Ecuador.

This review could serve as a basis for quantitative and qualitative empirical studies to determine whether active methodologies are being applied simultaneously or in a complementary manner in Ecuadorian schools.

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