Active methodologies: terminological survey according to the means and didactic conditions

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ABSTRACT

This article presents a terminological survey and bibliographic review of active teaching-learning methodologies. Conducted during the initial phase of a postdoctoral research project employing bibliometric analysis, this study was motivated by challenges encountered in information retrieval. Specifically, the lack of clear conceptualization and standardized terminology hindered systematic searches within scientific databases. This research aims to identify active teaching-learning strategies discussed in the scientific literature, group them based on theoretical and pedagogical similarities, and clarify potential retrieval issues stemming from inconsistent terminology. A survey of the Pearson and Minha Biblioteca digital libraries, along with the Scientific Electronic Library Online (SciELO), yielded 21 books and 143 articles published between 2011 and 2020. Analysis of these sources revealed 60 terms related to active methodologies, including synonyms and English-language equivalents. Of these, 55 referred to strategies, 2 to approaches, and 3 to tools. The identified strategies were grouped into eleven categories based on similarities in their didactic conditions and employed means: (i) research and/or use of scientific principles; (ii) problem-solving; (iii) representation/role-playing; (iv) flexibility; (v) realistic experiences and achieving shared goals; (vi) assessment; (vii) use of games or game elements; (viii) use of digital technologies; (ix) multiplicity and discussion of ideas; (x) performance of simple and/or conventional tasks; and (xi) others. This categorization, while not exhaustive, provides a crucial foundation for future search strategy development and refinement of terminology within this domain.

Keywords: terminological survey; active methodologies; teaching-learning strategies; bibliographic research.

INTRODUCTION

Active methodologies have gained significant prominence in academic discussions and teaching practices, making it rare to find an education professional who underestimates the importance of active and meaningful learning. These methodologies represent a critical shift from teacher-centered approaches to student-centered ones, breaking away from traditional lectures in favor of engaging technologies and diverse strategies.

As Moran (2015) explains, traditional teaching methods, where the teacher serves solely as a knowledge transmitter, were once justified by limited access to information. However, in today's highly connected society, characterized by abundant information and integrated spaces and times, these methods are no longer sufficient. To move beyond the mere transmission of knowledge, educators must adopt strategies that foster rediscovery and active participation.

> Se queremos que os alunos sejam proativos, precisamos adotar metodologias em que os alunos se envolvam em atividades cada vez mais complexas, em que tenham que tomar decisões e avaliar os resultados, com apoio de materiais relevantes. Se queremos que sejam criativos, eles precisam experimentar inúmeras novas possibilidades de mostrar sua iniciativa (Moran, 2015, p. 17)[1].

Cortelazzo *et al*. (2018) documented significant growth in the use of the terms *active learning* and *active methodologies*. A search on Google Scholar revealed a 5.6-fold increase in English-language articles, rising from 4,660 in 2001 to 26,000 in 2016. For Portuguese-language works, the growth was even more dramatic, with a 172.5-fold increase during the same period—from 8 articles in 2001 to 1,380 in 2016.

> "A curva obtida para os trabalhos em português mostra que eles se encontram em crescimento exponencial, em contraste com aquela dos trabalhos em inglês que, a partir de 2013, atingem um platô com pequena variação […]" (Cortelazzo *et al.*, 2018, p. 93)[2].

Despite its widespread use in Brazil, the term *active methodologies* presents challenges for systematic searches in scientific databases due to its broad and generic nature. During the initial phase of a bibliometric study, it became evident that using the term in full-text searches retrieves any work where it is mentioned, regardless of its relevance to the main topic. Conversely, advanced searches that limit the term to specific fields, such as titles, subjects, or abstracts, yield highly variable results, reflecting the diversity of methodologies encompassed by the term.

1 Translation: "If we want students to be proactive, we must adopt methodologies where they engage in increasingly complex activities that require decision-making and evaluation of results, supported by relevant materials. If we want them to be creative, they need to experiment with numerous new ways to demonstrate their initiative." (Moran, 2015, p. 17, editorial translation).

2 Translation: "The curve for Portuguese-language works shows exponential growth, contrasting with English-language works, which plateaued with slight variations after 2013 […]" (Cortelazzo *et al*., 2018, p. 93, editorial translation).

Additionally, while some authors include the term *active methodologies* in abstracts and keywords, others refer directly to specific methods – such as gamification or the *Método Trezentos* – without mentioning the overarching term. This inconsistency requires search strategies that integrate both generic and specific terms using Boolean operators.

Relying solely on "active methodologies" as a search term often leads to excessive retrieval noise, impacting both recall and precision. For instance, a Google Scholar search yielded 11,200 results on this topic between 2023 and 2024 alone (excluding citations) – a volume too vast for practical analysis.

Preliminary search tests further revealed inconsistencies in the terminology employed by authors, including variations in spelling, the use of both Portuguese and English terms, and overlapping concepts. This terminological confusion often goes unnoticed among researchers and educators, potentially leading to theoretical and practical distortions. For example, "collaborative learning" may be conflated with "cooperative learning," resulting in pedagogical inaccuracies and conceptual errors in lesson planning and research.

Thus, identifying relevant keywords and descriptors for systematic searches is essential. It was also observed that discovering new methodologies often led to the identification of further methodologies, underscoring a likely proliferation of terms. In an integrative literature review, Paiva *et al*. (2016, p. 151)[3] noted:

> Há grande diversidade de metodologias ativas de ensino-aprendizagem; as experiências relatadas nos artigos selecionados apontam a validação e a eficiência do uso dessas metodologias. Ao mesmo tempo, constata-se que não existe consenso absoluto sobre as formas de operacionalização dessas metodologias, elas constituem bases teórico-críticas congruentes, mas não absolutas.

Given these challenges, this research aims to identify active teaching-learning strategies in the scientific literature and conduct an exploratory terminological survey of terms that could enhance the retrieval of works on active methodologies. The identified terms will be systematically categorized into semantic fields based on their conceptual relationships within the domain of Education, considering the means and didactic conditions required for each active methodology.

It is important to emphasize that this study does not aim to create a vocabulary or glossary or establish definitive definitions. Instead, it offers an exploratory terminological survey, not a fixed terminology effort. The goal is to promote a systematization that facilitates scientifically grounded searches using terms that are thematically accurate and coherent. In the future, this work may inform the creation or revision of thesauri within the semantic field of active teaching-learning methodologies.

3 Translation: "There is significant diversity in active teaching-learning methodologies; the experiences reported in the selected articles highlight the validation and effectiveness of these methodologies. At the same time, there is no absolute consensus on how to operationalize them. These methodologies provide congruent theoretical-critical bases but are not definitive." (Paiva *et al.,* 2016, p. 151, editorial translation).

This qualitative and exploratory bibliographic research draws on Bourdieu's (2004) concept of the scientific field, which comprises a network of relationships among scientists, researchers, and institutions involved in the production and legitimation of scientific knowledge. These relationships are structured by the positions agents occupy within the field. As Sousa (2019) notes, scientific nomenclature plays a crucial role in delineating these positions and legitimizing the field itself.

Additionally, the study adopts principles of documentary terminology, defined as the systematic study and analysis of terms and their usage in specific contexts, aiming to identify, describe, and standardize terms across different knowledge domains (Lara, 2004). However, this research does not address terminological standardization, as vocabulary control falls beyond its scope.

METHODOLOGICAL PROCEDURES

This exploratory study represents the initial phase of postdoctoral research on scientific production related to active methodologies. Its purpose is to identify specific active strategies, their theoretical and pedagogical similarities, and their terminological diversity to enable better systematization for future investigations.

Exploratory research aims to provide a general overview and a better understanding of a problem, phenomenon, or situation that remains underexplored. It is often used in the early stages of a study to identify new ideas or hypotheses (Hernández Sampieri; Fernández Collado; Baptista Lucio, 2013).

To achieve these objectives, the study adopts a qualitative bibliographic research approach, which enables a broad and contextualized analysis of the object of study and its social, political, and cultural interrelations (Brito; Oliveira; Silva, 2021).

> Portanto, a importância da pesquisa bibliográfica está relacionada ao fato de se buscar novas descobertas a partir de conhecimentos já elaborados e produzidos. Isso se dá ao passo que a pesquisa bibliográfica se coloca como impulsionadora do aprendizado, do amadurecimento, levando em conta em suas dimensões os avanços e as novas descobertas nas diferentes áreas do conhecimento (Brito; Oliveira; Silva, 2021, p. 8)[4].

For carrying out of the study, the steps outlined by Marconi and Lakatos (2003) were followed: (i) selection of the research topic; (ii) development of the work plan; (iii) identification of relevant sources; (iv) localization of these sources; (v) compilation of the selected materials; (vi) note-taking; (vii) analysis and interpretation of the collected data; and (viii) writing of the research report.

4 Translation: "The importance of bibliographic research lies in its potential to generate new discoveries based on existing knowledge. Bibliographic research drives learning and intellectual maturation by taking into account advancements and innovations across different fields of knowledge" (Brito; Oliveira; Silva, 2021, p. 8, editorial translation).

The research drew on books in Portuguese, published in Brazil between 2011 and 2020, available in the Pearson and Minha Biblioteca digital libraries. It also included original and review articles in Portuguese indexed in the Scientific Electronic Library Online (SciELO), Brazil collection.

The selection criteria prioritized works where the authors explicitly identified "active methodologies" as a central focus. Broader studies on learning that did not address specific methodological aspects—such as strategies, techniques, procedures, contexts, planning, and evaluation—were excluded. This process resulted in a final corpus of 21 books and 143 articles. The identification, localization, and compilation of these materials were completed during the first quarter of 2021.

The analysis and interpretation focused on identifying the means and didactic conditions underlying various teaching-learning strategies. Anastasiou and Alves (2007) emphasize the frequent confusion between the terms *strategies*, *techniques*, and *dynamics*, which are often used interchangeably. They define *strategy*, derived from the Greek, as the art of applying or leveraging available means and conditions to achieve specific objectives. Accordingly, the study evaluated the teaching means and conditions required for each active strategy to distinguish and classify them.

Future research will conduct a more detailed theoretical-pedagogical alignment through bibliometric analysis, aiming to explore the conceptual and historical roots as well as the scientific production in this field.

This study employed a judgment sample, meaning the research design was tailored to the study's objectives, with results intended solely for the selected sample (Hernández Sampieri; Fernández Collado; Baptista Lucio, 2013). Thus, the initial exploration was limited to a maximum of 60 samples to define a manageable quantitative scope for qualitative examination.

For the terminological work, the study followed the steps outlined by Mardegan and Cervantes (2015):

i) Selection of the domain and language of the work;
ii) Delimitation of the subdomain;
iii) Consultation with domain/subdomain specialists (in this case, the researchers);
iv) Compilation of the terminological corpus;
v) Establishment of the domain tree;
vi) Expansion of the representation of the selected domain;
vii) Establishment of research boundaries;
viii) Collection and classification of terms;
ix) Verification and classification of terms and their meanings;
x) Presentation of terminological data.

These steps aligned with the bibliographic research stages described by Marconi and Lakatos (2003), particularly the stage of "analysis and interpretation".

The research identified 55 methodologies (and their synonyms, where applicable), 2 approaches or models, and 3 tools. Categorization was performed *a posteriori* based on the focus of each strategy – specifically, the principle underlying the teaching-learning process –emphasizing pedagogical praxis over theoretical considerations.

It is important to emphasize that this article does not aim to exhaustively cover the subject or compile a comprehensive terminology of active methodologies.

Analysis and discussion of results

According to Tálamo (1997), the credibility of a specialized language is not derived merely from grouping typical expressions but from establishing a network of relationships between them and applying a classificatory principle that reflects the field of knowledge and its users. Focusing solely on words, without considering the concepts they represent, can lead to retrieval issues such as noise or omissions.

A concept, as the basic unit of thought and knowledge, conveys an idea, object, or phenomenon through the combination of its characteristics. Although concepts exist independently of the terms that represent them, they are always anchored by a sign (Dahlberg, 1978; ANSI/NISO Z39.19-2005). For this reason, scientific information retrieval must prioritize concepts over words.

Building on this premise, the study identified, characterized, conceptualized, and grouped 55 distinct strategies.

> A formação do conceito acontece pelo reconhecimento de objetos e seu agrupamento em unidades significativas em um dado campo. Objetos que partilham as mesmas propriedades são agrupados em unidades. E essas propriedades são as características abstraídas desses objetos, e combinadas com um conjunto na formação do conceito (Lima; Santos; Vogel, 2013, p. 320)[5].

The analysis of the terms' characteristics considered the following criteria derived from the scientific literature: (i) treatment of program content; (ii) definition of learning objectives; (iii) mobilization of skills and competencies; (iv) instructional sequencing; and (v) assessment. These criteria enabled the identification of strategies as expressed in the texts.

As Mardegan and Cervantes (2015, p. 6)[6] explain, "o objetivo da Terminologia seria estabelecer limites entre os conceitos". Accordingly, these elements facilitated the delimitation of concepts, grouping methodologies based on their similarities and pinpointing synonyms used within the educational domain with greater precision.

The strategies were categorized into eleven groups: (i) Research and/or application of scientific principles; (ii) problem-solving; (iii) representation/role-playing; (iv) adaptability;(v) realistic experiences and achievement of shared goals; (vi) assessment; (vii) use of games or game elements; (viii) use of digital technologies; (ix)multiplicity and discussion of ideas; (x) performance of simple and/or conventional tasks; and (xi) others.

Table 1 presents the categories, the identified strategies, and their corresponding synonyms.

5 Translation: "The formation of a concept occurs through the recognition of objects and their grouping into meaningful units in a given field. Objects sharing the same properties are grouped into units. These properties are the abstracted characteristics of these objects, combined into a set to form the concept" (Lima; Santos; Vogel, 2013, p. 320, editorial translation).

6 Translation: "the goal of Terminology is to establish boundaries between concepts" (Mardegan; Cervantes, 2015, p. 6, editorial translation).

Table 1 – Categorization of Didactic Strategies

Focus on	Nomenclature
Research and/or use of scientific principles	Teaching and Research-Based Learning (TRBL) – Investigative Case-Based Learning (ICBL) Research-Oriented Learning – Guided Inquiry Investigation-Based Learning (IBL) Case Methods and Simulations – Case Study Field Practice – Fieldwork – Field Study – Environmental Study Investigative Experimentation – Problematizing Experimentation Inquiry-Based Learning – Inquiry-Based Science Education *WebQuest*
Problem-solving	Spiral Learning – Constructivist Spiral (CS) Maguerez Arc – Problematization with the Maguerez Arc – Problematization Methodology – Problem Tree Problem-based learning (PBL) Analysis of All Factors or Ideas (AAF/I) Predict-Observe-Explain (POE) Method Hands-on-tec (HoT)
Representation/ role-play	Theatrical Representation – Theatrical Techniques Mock Trial Role-Playing Game (RPG) – Role Play Mock Panels
Adaptability	Educational Coaching Personalized Learning Just-in-time teaching Flipped Classroom
Realistic experiences and shared goals	Design thinking Educommunication Collaborative Learning Project-Based Learning (PBL) – Interdisciplinary Project-Based Learning Experiential Learning Cycle (ELC) – Kolb's Experiential Learning Challenge-Based Learning (CBL) Maker Movement in Education – Maker Education Integrative Projects
Assessment	Test-enhanced learning Peer instruction Team-based learning (TBL) Practice Improvement Cycles – Peer Review Trezentos Method
Game use or gamification	Game-based learning (GBL) Gamification
Use of digital technologies	Educational Robotics
Multiplicity and idea exchange	Integrated Panels Station Rotation – Learning Station Rotation Shared Classroom – Co-teaching Seminar Thematic Integrative Seminar Verbalization/Observation Groups Cognitive Thematic Seminar (CTS)
Simple and/or conventional tasks	Learning with Films – Cinemeducation Forum – Discussion Forum *Minute paper – One minute paper* Portfolio Reflective Portfolio

Others	Cooperative Learning Contextual Learning Methodology (CLM) Storytelling – Digital storytelling – Storytellin Multidimensional Teaching Technique (MTT) Framework-Based Teaching

Source: Research data, 2022.

It is important to emphasize that this categorization does not aim to exhaustively cover all existing active strategies, nor to create rigid dichotomies or a fixed classification. Many strategies have overlapping elements and could be organized differently depending on the adopted classification principle. Additionally, these strategies are not mutually exclusive; they can complement or intersect with one another.

Each category represents a semantic field, meaning it comprises all the words and expressions that are interconnected in terms of meaning, forming associative groups based on shared characteristics. The characterization of each category is described below.

Active strategies focusing on **research and/or scientific principles** emphasize reconstructing knowledge through scientific reasoning. These strategies involve exploring real-world problems, formulating hypotheses, conducting bibliographic or documentary research, and verifying results through experiments.

However, research in the classroom often faces challenges. It is sometimes reduced to simple consultations, a misconception criticized for its disconnect from students' realities and interests (Bagno, 2003).

Demo (1996) advocates research as an educational principle, encouraging questioning to reconstruct knowledge, as exemplified by WebQuest, which focuses on bibliographic research using the internet. Other strategies expand on this principle, integrating scientific methodology as a core component of learning.

However, the Portuguese acronym for Reaserch Based Approaches (ABP) creates confusion, as it can refer to research-based (*pesquisa*), project-based (*projeto*), and problem-based (*problema*) learning . Authors like Maia and Furnival (2020) and Antunes et al. (2019) propose distinct Portuguese acronyms (ABPesq, ABProj, ABProb) to clarify these conceptual distinctions, highlighting the need for standardization to avoid misunderstanding.

Strategies in the *problem-solving* category address tensions expressed through problems or problem situations, following frameworks like the Maguerez Arc and its five steps: (i) observation of reality, (ii) identification of key points, (iii) theorization, (iv) formulation of solution hypotheses, and (v) application to reality.

According to Aquilante *et al*. (2011), a learning-triggering problem can be well or poorly defined, simple or complex, long or short, familiar or unfamiliar. However, its classification is summarized into three types of problems:

i) Enigmas or puzzles: These problems include all the elements required for their solution, rely on logical reasoning, and allow only one correct answer. However, due to their lack of connection to real-life situations, their potential impact is limited.

ii) Structured problems: These require a clearly defined field of knowledge, a structured statement, theoretical principles, and a well-formulated problem description. While they involve established theoretical foundations, their relevance to everyday issues is restricted, as is the scope of their solutions.

iii) Unstructured problems: These problems are characterized by undefined aspects, resembling real-life situations and allowing for multiple solutions. Unlike structured problems, they are not confined to specific disciplines but instead draw on everyday practice, requiring the integration of diverse areas of knowledge. As a result, they tend to be more meaningful and engaging.

Structured problems are grounded in the theory of information processing, whereas unstructured problems align with constructivist principles (Aquilante *et al*., 2011). In this study, strategies involving puzzle-like problems were classified under the ***evaluation*** category. Conversely, strategies that use structured problems or, more prominently, unstructured problems were placed in the ***problem-solving*** category.

It is important to clarify that Hands-on-Tec (HoT), despite its name, does not focus solely on digital technology. Although laptops, smartphones, and tablets are utilized, its foundation lies in problem-solving through three stages: (i) problematization; (ii) contextualization; and (iii) research/socialization (Miyamoto; Souza; Aylon, 2020). The term “hands-on” is broader and refers to practical, hands-on activities, while “Hands-on-Tec” specifically involves manipulating digital devices and resources for problem-solving purposes.

Strategies based on **representation or role-playing** are grounded in the interpretation of roles aligned with the content being addressed. This approach fosters student empathy with the created situation and its characters. It encourages a shift in the student’s perspective, requiring them, much like in theater, to embody various characters—such as professionals, historical or fictional figures, or individuals from divergent groups—to engage with their viewpoints, positions, skills, competencies, attitudes, functions, and so forth.

The *adaptability* category emphasizes aligning the educational process with students’ interests, needs, and life projects. This principle involves adapting the didactic structure, including activities, classes, content, and teaching materials, to better support individual learners. A key aspect is fostering a collaborative relationship between teacher and student, with ongoing communication and continuous feedback to achieve the desired objectives. The term ***adaptability*** was chosen because it encompasses the concepts of differentiation, personalization, and individualization, each of which has distinct meanings as outlined by Caetano *et al*. (2018):

i) Differentiated learning: Addresses the individual needs of each student or group while maintaining consistent academic objectives;

ii) Individualized learning: Retains the same academic objectives but adjusts curriculum progression to match the student’s learning pace; and

iii) Personalized learning: Actively involves the student in designing the pedagogical activities they will undertake, tailoring the process to their specific interests and needs.

Strategies focused on **realistic experiences and achieving shared goals** are rooted in learning through real-world challenges or situations that closely reflect the reality of the school community. This approach empowers students with the autonomy to define their actions based on a deep understanding of identified problems and the practical conditions required to address them.

Rather than adhering to predefined steps, these strategies are informed by a range of theoretical and pedagogical frameworks. They align strongly with a socio-interactionist perspective, emphasizing the development of key skills such as interaction, negotiation, self-regulation, critical thinking, and self-reflection. The collaborative nature of these activities is a defining characteristic, encouraging group work to achieve shared objectives. Mutual assistance, grounded in interdependence, ensures that the decisions and actions of each individual impact the process, fostering a sense of co-responsibility among participants.

It is essential to distinguish collaborative learning, which falls under this category, from cooperative learning, classified under **other**. Torres and Irala (2014, p. 68)[7] explore the nuances of this distinction in detail. To summarize concisely: “na colaboração, o processo é mais aberto e os participantes do grupo interagem para atingir um objetivo compartilhado. Já na cooperação o processo é mais centrado no professor e orquestrado diretamente por ele”. Additionally, cooperative learning typically involves more rigidly defined tasks and roles, where each member assumes responsibility for specific components. The coordination among participants is less integrated, relying heavily on the teacher to oversee activities and ensure their completion.

In the ***evaluation*** category, strategies emerge from evaluative activities such as tests, questions, or exams, with their feedback processes serving as mechanisms to reinforce learning. The performance of each student in these activities fosters discussions and highlights who may need assistance and who is in a position to provide it, thereby encouraging peer collaboration.

While the authors associate these strategies with the concept of collaboration, we argue that the means and conditions for learning are primarily driven by the evaluations themselves rather than by interaction alone. Furthermore, collaboration extends beyond mere communication or discussion, as highlighted earlier.

It is worth noting that when we refer to strategies derived from evaluation, we are not confining these activities to the act of assessment itself. Instead, we emphasize that the methods and didactic conditions are facilitated through evaluation. Take peer assessment, for example, where the focus lies in the critical evaluation conducted by peers. Much like the blind review process in scientific publishing—a field that inspired this approach—this strategy involves two peers reviewing the work, project, or practice of a third. However, the goal is not simply to correct an activity but to promote the colleague’s development through feedback that enables what Costa (2017) describes as “retroaction”: a process of reinforcing learning.

7 Translation: “Collaboration involves a more open process, where group members interact to achieve a common goal. In contrast, cooperation tends to be more teacher-centered, with the teacher directly guiding and orchestrating the process.” (Torres; Irala, 2014, p. 68, editorial translation).

In the category **use of games or game elements**, strategies are divided into two main approaches: game-based learning (GBL) and gamification. hese two approaches are often confused; however, it is important to highlight that GBL refers to the use of actual games, whereas gamification involves the use of game elements in non-game contexts, such as “sistemas de recompensas, de níveis de dificuldade, de tabelas de pontuação, limites de tempo, limites de recursos, a definição de objetivos claros e a variedade de tipo de jogo” (Barradas; Lencastre, 2017, p. 13)[8].

Within the category **use of digital technologies**, educational robotics stands out as the sole identified strategy. This approach revolves around the use or creation of computational learning objects, often through kits designed for building robots or electronic prototypes. The authors highlight digital technologies for their capacity to engage students, integrate knowledge, and foster creativity.

Silva and Oliveira (2019) note that robotics can integrate various other strategies, including project-based learning, problem-based learning, case methods, and the flipped classroom. However, we have chosen to place this strategy in its own exclusive category, as we believe the means and conditions for learning are uniquely tied to the construction of digital devices.

The **multiplicity and discussion of ideas** category is grounded in the principle that communication tactics – such as listening to others’ perspectives and engaging in discussions – foster a diversity of ideas, enabling meaningful and collective learning. These strategies encourage students to formulate opinions, gather information on a given topic (whether previously addressed or not), and subsequently exchange impressions, engage in debates, and contribute to one another’s work, such as by building upon a peer’s ideas. Some of these strategies, like station rotation, shared classrooms, and seminars, lack predetermined sequences, allowing for greater flexibility and adaptability.

The **execution of simple/conventional activities** category includes common strategies adapted to active methodologies, such as watching and debating films, participating in forum discussions, compiling documents in a portfolio, and answering questions within a set timeframe.

Finally, strategies that could not be aligned with any of the other identified categories were classified as **other**.

A more critical perspective is necessary when examining these last two categories, as certain tasks – such as watching a video, posting a comment in a discussion forum, or completing a simple exercise – do not inherently promote active participation. For instance, in the case of storytelling, merely watching a narrative aligns more closely with passive teaching. While the use of stories can enhance motivation and engagement, encouraging students to create their own narratives proves far more beneficial than simply observing them.

8 Translation: “reward systems, difficulty levels, leaderboards, time limits, resource constraints, the definition of clear objectives, and a variety of game types” (Barradas; Lencastre, 2017, p. 13, editorial translation).

Additionally, two so-called active methodologies were identified that cannot be classified as methods or strategies. These are broader in scope, encompassing multiple elements of the educational system and extending beyond purely didactic concerns. Similarly, certain tools labeled as “methods” or “methodologies” do not meet the criteria for such classifications, as outlined in **Table 2**.

Table 2 – Models and tools mistakenly referred to as methodologies

Teaching model or approach	Blended learning – Hybrid teaching Science, Technology, Engineering and Mathematics (STEM) – Science, Technology, Engineering, Arts and Mathematics (STEAM)
Not strategies (tools)	Hands-on Scratch retroactive design

Source: Research data, 2022.

STEAM is an acronym for **Science, Technology, Engineering, Arts, and Mathematics**, with the inclusion of the “A” (Arts) occurring at a later stage. In the scientific literature, variations of this acronym also appear, such as **STEM**, which excludes the Arts component, and **CTEAM**, a term used by Portuguese scholars (as noted in Botelho, 2020).

STEAM education is not defined as a specific methodology but rather as a movement that advocates for a new approach to Science and Technology (S&T) education. This movement draws inspiration from the American model developed in the 1990s, which introduced systemic changes across the entire educational landscape.

Holanda and Bacich (2020) identify three distinct conceptions of STEAM: (i) an initiative aimed at promoting the field and related careers without integrating the disciplines; (ii) a strategy centered on the use of specific technologies and artifacts; and (iii) a model focused on creating a final product, where the process becomes superficial and disconnected from students’ lived experiences.

The authors advocate for a STEAM approach rooted in project-based learning: “Os projetos devem ser elaborados cuidadosamente com foco nos objetivos de aprendizagem que se deseja alcançar e, também, nas competências que queremos desenvolver com os estudantes”. (Holanda; Bacich, 2020, p. 5-6)[9]. In this context, STEAM may resemble a strategy or method; however, we interpret it as a broader approach that shapes the entire educational design, extending beyond strictly methodological considerations.

The same applies to **blended learning**, which can be defined as an approach that integrates in-person and remote activities facilitated by information technologies.

> De acordo com essa abordagem, o conteúdo e as instruções sobre um determinado assunto curricular não são transmitidos pelo professor em sala de aula. O aluno estuda o material em diferentes situações e ambientes, e a sala de aula passa a ser o lugar

9 Translation: “Projects must be carefully designed with a focus on the learning objectives to be achieved and the competencies we aim to develop in students”. (Holanda; Bacich, 2020, p. 5-6, editorial translation)

> de aprender ativamente, realizando atividades de resolução de problemas ou projeto, discussões, laboratórios, entre outros, com o apoio do professor e colaborativamente com os colegas (Valente, 2015, p. 20)[10].

It is clear that *blended learning* requires significant transformations in the overall educational design, including teaching spaces and environments, extending well beyond methodological considerations.

In the **category not-strategies (tools)**, we identified the following: (i) **hands-on**, defined as a hands-on laboratory or activity;(ii) **Scratch**, a programming language; and (iii) retroactive **design**. The latter appeared in only one study (Maia & Furnival, 2020), where its mention could cause confusion, as it pertains to instructional design rather than a teaching strategy.

Additionally, the **cephalonic method** (Maia; Furnival, 2020) and **multifaceted interventions** (Souza; Antonelli; Oliveira, 2016) were described as active methodologies. However, the cephalonic method yielded no corresponding results in further searches, and multifaceted interventions refer to a medical approach unrelated to teaching. As a result, both were excluded from the findings of this study.

The categorization proposed in this study provides a broader and more systematic perspective on strategies, enabling their organization and association with the terminology used to define them. This framework can serve as a foundation for future research, facilitating the grouping of closely related strategies and applying corresponding nomenclature – whether or not synonyms are used – in a logical and well-grounded manner.

The diversity of methods and terminology identified in this study underscores that careless use of terms may hinder systematic searches, potentially excluding relevant works and authors.

It was also noted that many authors use the expression "**learning methodology"**, which suggests a shift from the term "**teaching"** to "**learning**." This raises the hypothesis that researchers and educators may associate teaching with traditional methods and learning with active methods.

Many active methods originate in the North American context, where the term "**learning"** is frequently used (e.g., problem-based learning, game-based learning, etc.). This prompts the question of whether this shift stems from simple translation or confusion between the concepts of "teaching' and "learning". Future research could clarify this issue. If confirmed, this hypothesis would suggest that the change in terminology reflects a desire for innovation and a departure from traditional assumptions.

We agree with Anastasiou and Alves (2007), who argue that teaching is an intentional act that already encompasses learning, even though the goal of learning is not always fully

10 Translation: "In this approach, the teacher does not deliver content or instructions for a given curriculum topic directly in the classroom. Instead, students engage with the material in diverse contexts and environments, while the classroom transforms into a space for active learning. Here, activities such as problem-solving, project work, discussions, and laboratory sessions take place with teacher guidance and peer collaboration " (Valente, 2015, p. 20, editorial translation).

achieved. For this reason, the authors advocate for the use of the term “teaching-learning” (“*aprendizagem*” in Portuguese), which emphasizes that the act of teaching effectively triggers the process of apprehending (not merely learning) knowledge, requiring a dialectical method.

CONCLUSIONS

Cortelazzo *et al*. (2018) use the expression “methodological menu” to describe the wide range of possibilities available in teaching practices. However, merely browsing the *menu* is not enough, as the risk of “indigestion” is high and can prove costly if we lack awareness of its “nutritional value.” This study sought to clarify some of the so-called “active methodologies” by offering a more systematic framework for both scientific research and teaching practice.

This study established eleven categories of active teaching-learning strategies, organizing them into semantic fields based on the means and conditions necessary for their implementation:

i) research and/or use of scientific principles: Focused on methods that promote investigative, research-based learning;

ii) problem-solving: Encouraging the active resolution of problems through practical and theoretical approaches;

iii) representation/role-playing: Utilizing techniques of representation and dramatization to facilitate learning through simulations of real-life situations;

iv) Adaptability: Tailored to the individual needs of students to promote personalized learning;

v) realistic experiences and shared goals: Emphasizing hands-on, collaborative experiences to achieve educational objectives;

vi) Evaluation: Employing assessment techniques as a learning resource;

vii) use of games or game elements: Integrating games or game mechanics into the teaching process to engage and motivate students.;

viii) use of digital technologies: Leveraging technological tools to support and enhance the learning process;

ix) multiplicity and discussion of ideas: Encouraging the exchange of ideas and group learning;

x) Execution of simple and/or conventional tasks: Focusing on traditional and straightforward activities to consolidate learning; and

xi) other: Diverse methods that do not fit neatly into the previous categories but still contribute to learning.

Active strategies were allocated to the most appropriate category, including their synonyms, to create a system capable of distinguishing between different methods and grouping similar ones based on their pedagogical characteristics. This approach helps clarify the conceptualization of each term and its variations.

This study has not use vocabulary control, meaning that the most suitable term to represent each expression was not defined. Instead, the terms will serve as tools for retrieval in various databases as part of the continuation of this research. Nonetheless, the terminological analysis conducted here ensures that technical and specific terms can be used consistently in future search strategies. Additionally, this analysis may serve as a preliminary foundation for the creation or revision of specialized glossaries, dictionaries, or documentary languages.

The abundance of methods identified prompts reflection on the growing demand for innovation in education and science. As Bourdieu (2004, p. 35)[11] states, “a inovação científica não ocorre sem rupturas sociais com os pressupostos em vigor [...].” One could argue that the use of distinct nomenclatures is itself a strategy of innovation, as the creation of a name helps to delineate assumptions, methods, and tools, thus defining—or claiming—specific domains within scientific fields.

It becomes evident that many of these strategies share similarities and underlying principles yet are presented as distinct, such as learning based on teaching and research (TRBL), research-based learning (RBL), oriented research-based learning, and investigation-based learning (IBL).

Researchers and educators must approach the incorporation of new knowledge with rigor and a critical perspective, ensuring that their work encompasses not only theoretical, methodological, and practical assumptions but also the nomenclature they adopt. Without such precision, the proliferation of strategies risks creating a “Tower of Babel,” complicating the understanding and application of both existing and emerging approaches.

For instance, team-based learning and peer instruction involve predefined steps and tasks, yet they are often conflated with any group activity or explanation-sharing among students. This lack of clarity undermines the understanding of the method’s intended meaning and its theoretical-methodological foundation

The accurate use of terminology must be observed not only by readers but especially by authors when preparing their texts, selecting keywords, and depositing their work in institutional repositories. It is urgent that these expressions be incorporated into educational thesauri and glossaries with due rigor. For example, in the *Thesaurus Brasileiro da Educação* (Brased), the descriptor most semantically aligned with the theme addressed in this article is “active methods.” However, this term is inaccurately described as synonymous with the Montessori method.

Future research should focus on specific strategies to facilitate bibliometric data collection on active methods. Concentrating on a single category – such as problem-solving – would enable the identification of a corpus of studies grounded in similar theoretical-pedagogical assumptions, improving research design and facilitating data comparison and analysis.

11 Translation: “scientific innovation does not occur without social ruptures with prevailing assumptions [...].” (Bourdieu, 2004, p. 35, editorial translation).

The categorization presented here does not exhaust the topic or establish definitive definitions and classifications for the strategies studied. On the contrary, it represents a first step toward future productive discussions, paving the way for new discoveries rooted in scientific, theoretical, and didactic principles.

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