PROBLEM-BASED LEARNING MEDIATED BY A DIGITAL PLATFORM: COMPETENCY DEVELOPMENT IN BUSINESS ACCOUNTING EDUCATION

APRENDIZAGEM BASEADA EM PROBLEMAS MEDIADA POR PLATAFORMA DIGITAL: DESENVOLVIMENTO DE COMPETÊNCIAS NO ENSINO DE CONTABILIDADE EMPRESARIAL

APRENDIZAJE BASADO EN PROBLEMAS MEDIADO POR PLATAFORMA DIGITAL: DESARROLLO DE COMPETENCIAS EN LA ENSEÑANZA DE CONTABILIDAD EMPRESARIAL

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ABSTRACT

This article analyzes, based on a broader research project, how Problem-Based Learning (PBL), mediated by the Be Active digital platform, contributes to the development of students' competencies in the Business Accounting course of an undergraduate Business Administration program. The study is grounded in the understanding of competencies as the articulation of knowledge, skills, and attitudes, aiming to highlight the formative effects of this proposal in higher education. It is a qualitative and intervention-based study conducted with students from a higher education institution in the interior of the state of São Paulo, Brazil. Data production involved participant observation, document collection, and questionnaires, including the Free Word Association Test, the Kolb Learning Style Inventory, and a questionnaire on PBL. Data were analyzed through triangulation, supported by Similitude Analysis, Discursive Textual Analysis, and Prototypical Analysis. The results indicate that the articulation between PBL and digital mediation fostered the mobilization of knowledge related to course content, the improvement of investigative, communication, and problem-solving skills, as well as the strengthening of attitudes linked to autonomy, responsibility, and collaboration among students. It is concluded that the analyzed experience contributed to a more active and formative learning process in higher education.

Keywords: Active Methodologies. Higher Education. Professional Education. Educational Technologies. Collaborative Learning.

RESUMO

Este artigo analisa, a partir de um recorte de pesquisa mais ampla, como a Aprendizagem Baseada em Problemas (ABP), mediada pela plataforma digital Be Active, contribui para o desenvolvimento de competências de estudantes na disciplina de Contabilidade Empresarial, no curso de Administração. O estudo orienta-se pela compreensão de

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competências como articulação entre conhecimentos, habilidades e atitudes (CHA), buscando evidenciar os efeitos formativos dessa proposta no ensino superior. Trata-se de uma pesquisa de abordagem qualitativa e caráter interventivo, desenvolvida com estudantes de uma instituição de ensino superior do interior do estado de São Paulo. A produção de dados envolveu observação participante, coleta documental e aplicação de questionários, incluindo o Teste de Associação Livre de Palavras (TALP), o Inventário de Estilo de Aprendizagem de Kolb e um questionário sobre a ABP. A análise foi conduzida por triangulação, com apoio da Análise de Similitude, da Análise Textual Discursiva (ATD) e da Análise Prototípica. Os resultados indicam que a articulação entre ABP e mediação digital favoreceu a mobilização de conhecimentos relacionados ao conteúdo da disciplina, o aprimoramento de habilidades de investigação, comunicação e resolução de problemas, bem como o fortalecimento de atitudes vinculadas à autonomia, à responsabilidade e à colaboração entre os estudantes. Conclui-se que a experiência analisada contribuiu para uma aprendizagem mais ativa e formativa no ensino superior.

Palavras-chave: Metodologias Ativas. Ensino Superior. Formação Profissional. Tecnologias Educacionais. Aprendizagem Colaborativa.

RESUMEN

Este artículo analiza, a partir de un recorte de una investigación más amplia, cómo el Aprendizaje Basado en Problemas (ABP), mediado por la plataforma digital Be Active, contribuye al desarrollo de competencias de estudiantes en la asignatura de Contabilidad Empresarial, en el curso de Administración. El estudio se orienta por la comprensión de las competencias como articulación entre conocimientos, habilidades y actitudes, buscando evidenciar los efectos formativos de esta propuesta en la educación superior. Se trata de una investigación de enfoque cualitativo y carácter interventivo, desarrollada con estudiantes de una institución de educación superior del interior del estado de São Paulo, Brasil. La producción de datos incluyó observación participante, recolección documental y aplicación de cuestionarios, entre ellos el Test de Asociación Libre de Palabras, el Inventario de Estilos de Aprendizaje de Kolb y un cuestionario sobre el ABP. El análisis se realizó por triangulación, con apoyo del Análisis de Similitud, del Análisis Textual Discursivo y del Análisis Prototípico. Los resultados indican que la articulación entre el ABP y la mediación digital favoreció la movilización de conocimientos relacionados con los contenidos de la asignatura, el perfeccionamiento de habilidades de investigación, comunicación y resolución de problemas, así como el fortalecimiento de actitudes vinculadas a la autonomía, la responsabilidad y la colaboración entre los estudiantes. Se concluye que la experiencia analizada contribuyó a un aprendizaje más activo y formativo en la educación superior.

Palabras clave: Metodologías Activas. Educación Superior. Formación Professional. Tecnologías Educativas. Aprendizaje Colaborativo.

1 INTRODUCTION

Higher education education, especially in applied areas, has been challenged to overcome pedagogical models centered on the transmission of content and the passive performance of students. In the Administration course, this need becomes even more evident, since the training process involves not only the understanding of concepts, but also the ability to analyze situations, make decisions, and act collaboratively in complex professional contexts **(Chiavenato, 2022)**.

In this context, active learning methodologies have been discussed as alternatives that favor greater involvement of students in the training process. Among these approaches, Problem-Based Learning (PBL) stands out for organizing learning based on problem-situations that require investigation, formulation of hypotheses and construction of reasoned responses. For Barrows and Tamblyn (1980), the problem acts as a structuring element of learning, while Hmelo-Silver (2004) emphasizes its potential to promote intellectual autonomy and critical reasoning.

In the field of Administration and Accounting, the use of PBL is particularly pertinent, as academic training requires the development of skills related to problem solving, communication and teamwork. Studies such as that of Manaf, Ishak and Hussin (2011) indicate that this methodology can bring the teaching process closer to concrete situations of professional practice, contributing to a more contextualized learning.

At the same time, the presence of digital technologies in education has expanded the possibilities of organizing activities, interaction between participants and monitoring the learning process. Moran (2012) argues that the pedagogical potential of these technologies depends on their integration with educational objectives, not limited to instrumental use. From this perspective, digital platforms can contribute to structuring more dynamic training experiences, especially when articulated with active methodologies **(Borges; Sousa, 2024).**

In the study that gives rise to this article, the Be Active platform was used as a mediation environment for PBL in the discipline of Business Accounting, bringing together elements such as organization of activities, interaction between students and registration of the investigative path. This use made it possible to observe, in a more systematic way, how the pedagogical proposal developed and what learning was mobilized throughout the process.

Although there are studies that address PBL and, in parallel, studies on digital technologies in education, it is still relevant to investigate more specifically how this articulation contributes to the development of students' skills in higher education. In this context, this study is justified by the need to deepen the understanding of the formative effects

of the integration between active methodologies and digital mediation, with an emphasis on the development of knowledge, skills, and attitudes (CHA), in line with the formative guidelines present in the National Curriculum Guidelines **(Brasil, 2023)**.

In this article, we adopt the understanding of competencies as a category that integrates different dimensions of the training process, involving the construction of knowledge, the development of skills and the mobilization of attitudes. This approach allows for the analysis of learning beyond the acquisition of content, also considering the student's ability to act, interpret and position himself in concrete situations **(Perrenoud, 1999; Zabala; Arnau, 2010).**

This text is an excerpt from a broader research developed in higher education, focusing specifically on the development of students' competencies in the discipline of Business Accounting, based on PBL mediated by the Be Active platform.

In view of this, the study is guided by the following research question: how does PBL, mediated by the digital platform Be Active, contribute to the development of knowledge, skills and attitudes of students in the discipline of Business Accounting in higher education?

Thus, the objective of this article is to analyze, based on the research data, how PBL, mediated by the digital platform Be Active, contributes to the development of knowledge, skills and attitudes of students in the discipline of Business Accounting in higher education.

In addition to this introduction, the article is structured into three development sections and one concluding section. In the first, the theoretical framework is presented, addressing PBL, the concept of competencies and the digital mediation of learning. In the second, the research methodology is described. In the third, the results are presented and discussed in the light of the dimensions of knowledge, skills and attitudes. Finally, the conclusion summarizes the main findings of the study.

2 THEORETICAL FRAMEWORK

2.1 PROBLEM-BASED LEARNING IN HIGHER EDUCATION

The organization of higher education has been strained by demands that go beyond the transmission of content, requiring practices that favor the active participation of students in the learning process. In this context, PBL is configured as an approach that reorganizes the dynamics of the classroom by proposing that knowledge be built from the analysis of problem situations.

PBL is structured based on the presentation of an initial problem that mobilizes students to identify what they already know, what they need to learn and how to seek information to respond to the proposed situation. For Barrows and Tamblyn (1980), this

methodology shifts the focus from teaching to the research process, in which the student assumes an active role in the construction of knowledge. In line with this perspective, Schmidt (1983) highlights that learning occurs through the interaction between previous knowledge and new information, articulated in the context of the problem.

In higher education, this approach has been used in different areas of knowledge, especially in courses that require decision-making and analysis of complex situations. According to Hmelo-Silver (2004), PBL favors the development of critical reasoning and self-directed learning, by requiring the student to actively participate in the construction of responses. In the field of Administration and Accounting, this characteristic becomes relevant, as professional training involves the interpretation of scenarios and the resolution of problems related to organizational practice.

Despite its potential, the implementation of PBL requires didactic organization, faculty monitoring, and student engagement. Ribeiro (2022) points out that the effectiveness of the methodology is related to the quality of the proposed problems, pedagogical mediation, and the participation of those involved in the process. Thus, PBL is not reduced to a teaching technique, but constitutes a way of organizing learning that demands pedagogical intentionality and articulation between its elements.

2.2 COMPETENCE DEVELOPMENT: KNOWLEDGE, SKILLS AND ATTITUDES

The notion of competencies has been widely mobilized in the educational field as a way to understand learning beyond the simple acquisition of content. From this perspective, higher education education involves not only conceptual mastery, but also the ability to mobilize knowledge in concrete situations, articulating cognitive, operational and attitudinal dimensions (Perrenoud, 1999).

According to Perrenoud (1999), the development of competencies implies the ability to act effectively in situations, mobilizing diverse knowledge in an integrated manner. This understanding allows us to analyze the training process considering not only what the student knows, but also what he is able to do with this knowledge and how he positions himself in the face of the demands of the context.

In this article, the organization of competencies in three dimensions is adopted: **knowledge, skills and attitudes (CHA).** The dimension of knowledge refers to the appropriation of concepts, theories and information necessary to understand a certain field of study. The skills refer to the ability to apply this knowledge in practical situations, involving analysis, communication and problem solving. Attitudes, on the other hand, are related to

aspects such as autonomy, responsibility, participation and collaboration in the learning process.

In the context of higher education, especially in applied areas, this articulation becomes essential for professional training. Zabala and Arnau (2010) highlight that meaningful learning occurs when the student is able to integrate different dimensions of knowledge in concrete situations, overcoming the fragmentation between theory and practice. In this sense, the development of competencies is directly related to the way learning experiences are organized.

In the context of Brazilian higher education, the discussion about competencies is also articulated with the guidelines established by the National Curriculum Guidelines for undergraduate courses, which emphasize training oriented to the development of CHA, as well as the critical and reflective performance of students in professional contexts (Brasil, 2023). These guidelines reinforce the need for pedagogical practices that promote the articulation between theory and practice, in line with more integrated training processes.

From this perspective, the use of active methodologies, such as PBL, is particularly pertinent, since it proposes learning situations that require the integrated mobilization of CHA. Thus, the focus on the CHA allows a more comprehensive analysis of the formative effects of pedagogical practices in higher education, constituting itself as the analytical axis of this study.

2.3 DIGITAL TECHNOLOGIES AND LEARNING MEDIATION

The presence of digital technologies in higher education has reconfigured ways of organizing pedagogical practices, expanding possibilities of communication, registration, monitoring and circulation of information (Moran, 2012). However, its educational potential does not result only from the presence of technological resources, but from the way these resources are integrated into didactic planning and training purposes. In this sense, Moran (2012) emphasizes that pedagogical innovation is not in the isolated use of technology, but in its articulation with methodologies that favor the active participation of students.

Within the scope of active methodologies, digital technologies can contribute to the organization of pedagogical work, to the systematization of learning stages and to the expansion of interaction spaces beyond the classroom. This contribution becomes especially relevant when it comes to PBL, since the methodology requires investigation, recording of the course, monitoring of tasks and collaborative production of responses. In this sense, Borges and Sousa (2024) highlight that the articulation between PBL and Digital Information

and Communication Technologies (DICT) expands the possibilities of investigation, collaboration, and monitoring of the learning process.

More than serving as technical support, digital environments can assume a mediating role in the development of the pedagogical proposal, making visible the stages of the work, the materials used, the interactions between the participants and the records produced throughout the activity **(Borges; Sousa, 2024).** This perspective displaces the understanding of technology as an accessory tool and situates it as a component of the didactic arrangement, capable of sustaining more organized, interactive and procedural formative practices.

In the research that supports this article, the Be Active platform was used as a mediation environment for PBL, bringing together in a single digital space the organization of activities, the interaction between students and the monitoring of the proposed problem. According to the platform itself, its proposal consists of supporting practices based on active methodologies through integrated digital resources, favoring the conduction of different stages of learning in the same environment (Be Active, 2022). This characteristic is particularly relevant in experiences that require continuous monitoring of the investigative path.

Thus, digital mediation, when articulated with PBL, can favor not only access to information, but also the organization of reasoning, the distribution of tasks, communication among students, and the visibility of the collective construction process. In this way, technology does not act in parallel with the methodology, but integrates the learning movement itself, offering conditions to enhance investigative, collaborative, and reflective processes in higher education.

3 METHODOLOGY

This article derives from an analytical excerpt from a qualitative research with an interventional nature, developed in the context of higher education, focusing on the use of PBL, mediated by the digital platform Be Active, in the discipline of Business Accounting of the Administration course. The qualitative approach was adopted because it enables the understanding of the meanings attributed by the participants to the pedagogical experience, allowing the analysis of processes, interactions and learning built throughout the proposal (Triviños, 1987; André, 2005). The interventional character of the research stems from the intentional implementation of the methodology in the context of the discipline, with the objective of monitoring and analyzing the pedagogical effects of the action developed (Damiani *et al.*, 2013).

The research was carried out with students regularly enrolled in the Business Administration course of a higher education institution located in the interior of the state of São Paulo. The selection of participants occurred intentionally, considering the class in which the pedagogical proposal was applied. The intervention consisted of the implementation of PBL throughout the course, structured from a problem related to Business Accounting, elaborated with the purpose of articulating theoretical content to practical situations, requiring students to investigate, analyze and build solutions.

The production of data involved multiple procedures, organized in such a way as to enable the triangulation of information. Participant observation, document collection and questionnaires were used. Participant observation allowed us to follow the development of the methodology, the dynamics of the activities and the participation of the students, being understood as a relevant strategy when the researcher is inserted in the investigated context and directly follows the subjects and processes analyzed (Gil, 2008).

The documentary collection focused on the records produced in the digital environment of the Be Active platform, including materials prepared by the students, interactions carried out, team organization and stages of the problem resolution process. These records made it possible to analyze the investigative path and the forms of participation throughout the pedagogical experience.

The questionnaires included different data collection instruments. Among them, the Free Word Association Test (TALP) stands out, used to identify representations associated with the experience with PBL (Coutinho; Bú, 2017), the Kolb Learning Style Inventory, which allowed the characterization of the learning profiles of the participants (Cerqueira, 2008), and a structured questionnaire aimed at evaluating the methodology, covering aspects related to learning, collaboration, engagement and participation.

Data analysis was conducted through triangulation, articulating different sources and analytical techniques, with the objective of increasing the consistency and reliability of the results. For the treatment of textual data from the TALP and part of the discursive corpus of the research, the IRAMUTEQ software was used, through which the word cloud, the similarity analysis (Donato *et al.,* 2017) and the dendrogram of the lexical classes were generated, making it possible to identify frequencies, co-occurrences and semantic groupings in the analyzed material (Camargo; Justo, 2013). Discursive Textual Analysis (DTA) was also used, aimed at producing understandings based on the unitarization and categorization of data (Moraes; Galiazzi, 2016; Medeiros; Amorim, 2017), as well as Prototypical Analysis, applied to data from the TALP, based on the organization of the central and peripheral elements of social representations (Vergès, 1992; Abric, 2001; Wachelke; Wolter; Matos, 2016). In

addition, descriptive analyses of the answers obtained in the questionnaires were carried out, seeking to identify regularities and meanings attributed by the participants to the learning experience.

For the purposes of this article, we chose to focus on data related to the development of students' competencies, organized in the dimensions of **knowledge, skills and attitudes**. This approach is consistent with the original research design and makes it possible to deepen the analysis of the formative effects of PBL mediated by a digital platform in the context investigated.

Regarding the ethical aspects, the research was conducted in accordance with the guidelines for studies with human beings, ensuring the confidentiality of the information and the preservation of the identity of the participants. All subjects were informed about the objectives of the research and participated voluntarily, upon acceptance of the Informed Consent Form.

As a limitation of the study, the fact that the research was carried out in a specific context, with a single class and institution, which restricts the generalization of the results, stands out. In addition, as it is a pedagogical intervention, the data reflect a situated experience, influenced by the conditions of the context, by the teacher mediation and by the participation of the students. Even so, the findings offer relevant contributions to the understanding of the articulation between active methodologies and digital technologies in higher education.

4 RESULTS AND DISCUSSIONS

The data analysis was guided by the objective of understanding how PBL, mediated by the digital platform Be Active, contributed to the development of students' competencies, considering the dimensions of **knowledge, skills and attitudes**. To this end, the results were organized based on these three dimensions, articulating evidence from the TALP, the similarity analysis, the ATD, the platform records and the students' responses to the instruments applied.

More than identifying recurrent words or isolated categories, we sought to understand how the students constructed meanings about the lived experience and how this experience had repercussions on their formative process. In this sense, the triangulation of the data allowed us to observe that the pedagogical proposal did not only focus on the learning of the contents of the discipline, but also on ways of analyzing problems, organizing strategies, interacting with colleagues and assuming responsibilities along the way.

4.1 KNOWLEDGE DEVELOPMENT

The dimension of knowledge showed that the experience with PBL favored the construction of meanings from the articulation between theoretical contents of Business Accounting and practical situations of analysis. Instead of being restricted to the reception of ready-made concepts, the students were mobilized to interpret data, understand indicators and justify decisions based on a problem-situation.

Initially, the word cloud (Figure 1) obtained through the TALP allows the visualization of the terms most frequently evoked by the students in relation to the experience with PBL.

Figure 1

Word cloud of PBL-related evocations

Source: Survey data (Hernandes, 2023).

The centrality of terms such as "company", "analyze", "balance sheet", "liquidity", "equity" and "problem" is observed, which indicates that the students associated the learning experience with concepts directly linked to the field of Business Accounting. This data is relevant because it demonstrates that the methodology did not shift the focus from the contents of the discipline; on the contrary, it contributed to the mobilization of these contents in an applied context.

The presence of words such as "analyze", "problem" and "solution" also suggests that the knowledge constructed was not limited to the memorization of definitions. The students were led to interpret information, establish relationships between concepts and use them to respond to the situation presented. From this perspective, learning has taken on a more

processual and significant character, as the content has come to be understood in terms of its analytical utility.

To summarize this first movement of reading the data, Table 1 is presented.

Table 1

Core Elements of the Word Cloud and Its Formative Meanings

Featured Terms	Predominant direction	Analytical indication
Company	Central context of the problem-situation	Approximation between content and professional practice
Analyze	Recurrent cognitive action	Mobilization of interpretative reasoning
Balance Sheet / Equity	Technical content of the course	Appropriation of accounting concepts
Liquidity	Relevant financial indicator	Construction of applied knowledge
Problem	Structuring axis of the activity	Concrete challenge-driven learning

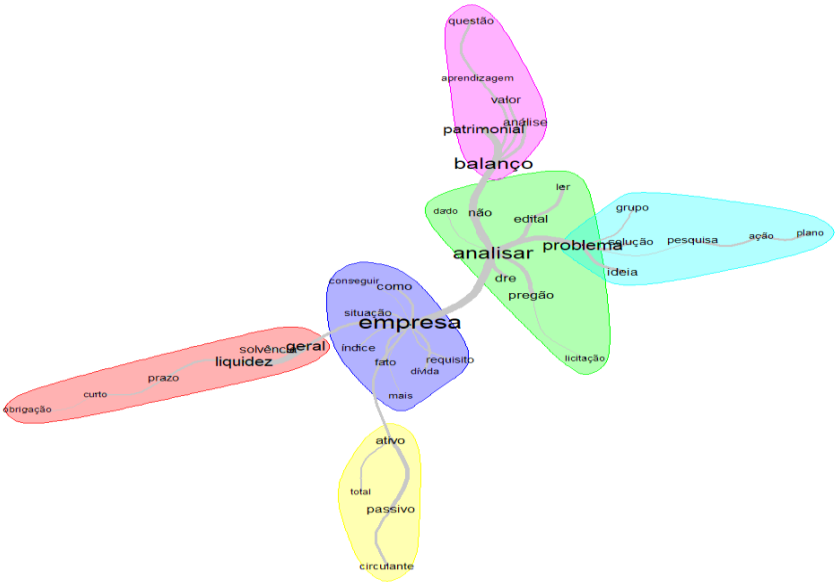
Source: Prepared by the authors based on Hernandes (2023).

The data in Table 1 reinforce that the most recurrent terms do not appear in a dispersed way, but are articulated in a context of accounting analysis and problem solving. This indicates that the methodological proposal favored the construction of knowledge linked to concrete objects of study, strengthening the understanding of the contents in the situation.

To deepen this understanding, the analysis of similarity made it possible to identify the relationships established between the evoked terms, evidencing the semantic organization of the representations constructed by the students.

Figure 2

Analysis of the similarity of evocations related to PBL



Source: Survey data (Hernandes, 2023).

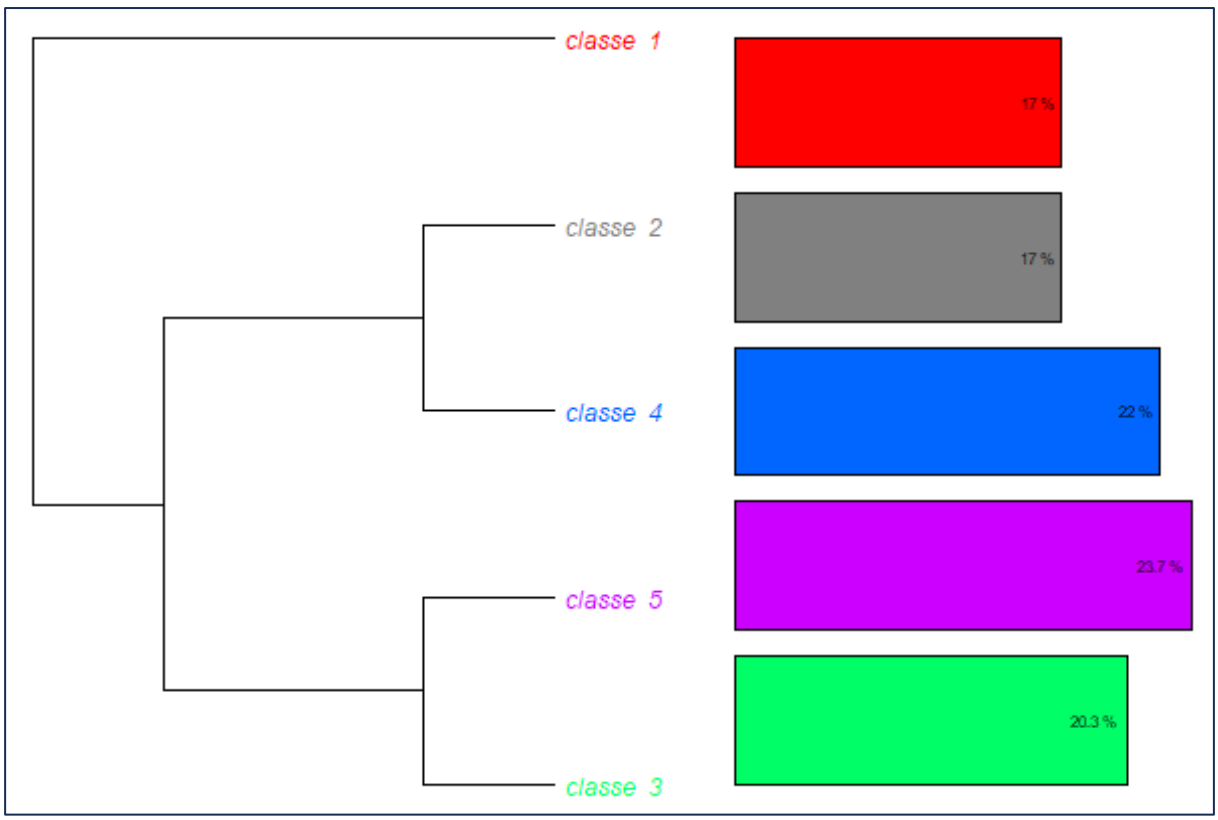
The structure of similarity (Figure 2) reveals the centrality of the term "company" as the articulating nucleus of the relations, connected to technical concepts such as "liquidity", "solvency", "balance sheet", "assets" and "liabilities", as well as to elements associated with the methodological path, such as "analyzing", "problem" and "planning". This configuration indicates that the learning process occurred through the articulation between concepts, analysis procedures and decision-making.

This aspect deserves to be highlighted because it shows that the students not only recognized terms specific to the area, but also began to relate them to each other. The presence of connections between technical concepts and cognitive actions suggests that learning involved a movement of integrated understanding, in which theory and practice do not appear dissociated. In formative terms, this means that PBL favored not only the acquisition of knowledge, but also the ability to organize it in a structure of reasoning applicable to the resolution of situations.

In the same direction, the analysis in the form of a dendrogram broadened the understanding of this path, by evidencing the organization of the corpus into lexical classes, whose interpretation was carried out in the light of the DTA.

Figure 3

Dendrogram of the lexical classes obtained in the similarity analysis



Source: Survey data (Hernandes, 2023).

The structure of the dendrogram (Figure 3) shows the formation of five thematic classes, which express different stages of the learning process experienced by the students. Class 3 (20.3%) refers to investigative strategies and resolution planning, characterizing the initial moment of the experience, in which students dedicate themselves to reading the notice, searching for information and defining ways to understand the problem. This data reveals that the construction of knowledge began with the organization of the investigation.

Class 2 (17%) evidences the conceptual appropriation of accounting indicators, marked by the understanding of notions such as current liquidity, general liquidity and general solvency. At this stage, students seek to master concepts that were not yet fully consolidated, which shows that PBL has driven them to seek theoretical foundations to support the analysis.

Class 4 (22%) highlights the analytical process of the balance sheet and the Income Statement (P&L), evidencing the practical application of the knowledge. In this grouping, students move from conceptual understanding to the operationalization of contents, performing technical readings, reorganizing data and calculating indicators.

Class 5 (23.7%), the most representative, is related to collaborative learning and the collective construction of solutions, which indicates that knowledge was not produced individually and in isolation, but in interaction with the group. Finally, Class 1 (17%) refers to decision-making based on the criteria of the notice, representing the moment when students convert analysis into judgment.

This progression can be seen in a synthetic way in Table 2.

Table 2

Dendrogram classes and identified training path

Class	Main emphasis	Interpretation
Class 3 (20.3%)	Investigative strategies and planning	Beginning of the process: reading the problem, organizing the investigation
Class 2 (17%)	Conceptual appropriation	Construction of theoretical foundations necessary for analysis
Class 4 (22%)	Analysis of the balance sheet and P&L	Practical application of accounting knowledge
Class 5 (23.7%)	Collaborative learning	Collective construction of solutions and social mediation of learning
Class 1 (17%)	Decision making	Final judgment based on criteria in the public notice

Source: Prepared by the authors based on Hernandes (2023).

Table 2 shows that the training path identified in the data is consistent with the assumptions of PBL: students start with research, advance to conceptual understanding, technically apply knowledge, construct responses in collaboration and, finally, make reasoned decisions. Thus, the joint analysis of the word cloud (Figure 1), the similarity (Figure

2) and the dendrogram (Figure 3) shows that PBL favored a more active, articulated and contextualized construction of knowledge.

4.2 SKILL DEVELOPMENT

The analysis of the skills dimension showed that the experience with PBL contributed to the development of competencies related to investigation, problem solving, communication and teamwork. Unlike a didactic organization centered only on the exposition of the content, the proposal required students to take a set of practical and cognitive actions aimed at understanding and solving the situation presented.

One of the most evident skills was investigative. The students needed to locate information, interpret data, identify concepts not yet understood and seek elements that would allow them to support their analyses. In this process, research did not appear as an accessory activity, but as a constitutive part of learning. This can be observed both in the words evoked and in the structure of the classes identified in the dendrogram (Figure 3), especially those related to the planning of the resolution and the technical analysis of the problem.

Another central aspect refers to the ability to solve problems. The proposed activity required students to analyze the documentation presented, interpret the notice, examine equity and financial data, and formulate a judgment on the company's situation. This movement involved analytical reasoning, selection of relevant information and construction of justifications, indicating a formative exercise that goes beyond the conceptual domain.

Communication and collaboration skills were also relevant. The need to construct group responses required negotiation, listening, argumentation, and the search for consensus. In this sense, learning took place in an environment of exchange, in which students needed to make their points of view explicit, dialogue with their classmates and collectively reorganize the constructed interpretations.

In addition, the mediation of the Be Active platform contributed to the development of organizational skills. The monitoring of tasks, the registration of the stages and the visualization of the route allowed the students to better structure their actions, distribute activities and monitor the progress of the work. Technology, therefore, operated as a support for the management of the learning process.

The synthesis of these findings can be seen in Table 3.

Table 3

Skills mobilized in the learning process with PBL

Ability	Observed evidence	Training contribution
Investigation	Search for information, reading the notice, researching concepts	Expansion of cognitive autonomy
Troubleshooting	Data interpretation, equity analysis, solution formulation	Strengthening analytical reasoning
Communication	Group discussions, exchange of ideas, justifications	Development of the argument
Collaboration	Collective construction of responses	Socially mediated learning
Organization	Use of the platform, task tracking	Work planning and management

Source: Prepared by the authors based on Hernandes (2023).

The data in Table 3 should not be understood as isolated competencies, but as articulated dimensions. Research, for example, underpins problem-solving; communication strengthens collaboration; and the organization enables the development of collective work. This articulation confirms that the experience with PBL contributed to the development of skills that dialogue directly with academic and professional training in the field of Administration and Accounting.

4.3 ATTITUDE DEVELOPMENT

The dimension of attitudes evidenced changes in the students' attitude towards the learning process, especially with regard to autonomy, responsibility, engagement and participation. Although these dimensions are not always captured with the same visibility as knowledge and skills, the survey data indicate that they constituted an important part of the formative experience.

The records of the platform, the interactions observed and the students' responses suggest that PBL favored greater involvement with the proposed activities. When faced with a situation that required action, investigation and positioning, the students began to assume a more active role in the development of the work. This change in posture is significant because it displaces the student from a condition of receiver to a position of participant in the process.

Responsibility also stood out as a relevant attitude. The monitoring of tasks in the digital environment, the need to contribute to the group and the requirement to substantiate the decisions made favored greater commitment to the activities. The student not only needed to participate, but he needed to participate with quality, justifying his choices and responding for the path developed.

Another important aspect concerns engagement. The pedagogical proposal, by articulating real problem, investigation and collective construction, seems to have favored greater adherence of students to the training process. Engagement, in this case, should not be understood only as the presence or execution of tasks, but as effective involvement with the activity and with the objective of understanding and solving it.

Collaboration, in turn, does not appear only as an operational skill, but as an attitude. This is because the collective construction of the answers required a willingness to listen to the other, review positions, negotiate interpretations and share responsibilities. Such aspects reveal that learning was also a space for ethical and relational formation.

The synthesis of these attitudes is presented in Table 4.

Table 4

Attitudes developed in the context of PBL mediated by the digital platform

Attitude	Observed evidence	Formative sense
Autonomy	Active participation in the search and analysis of information	Protagonism in the learning process
Responsibility	Fulfillment of tasks and justification of decisions	Commitment to the training path
Engagement	Involvement with the activity and the proposed problem	Greater adherence to the learning process
Collaboration	Listening, negotiation and joint construction	Development of a cooperative posture
Participation	Active presence in interactions and activity stages	Expansion of student performance

Source: Prepared by the authors based on Hernandes (2023).

The data summarized in Table 4 reinforce that the experience with PBL, mediated by the Be Active platform, did not focus only on the mastery of content or on the execution of tasks. There were also important repercussions in the way students positioned themselves in the face of learning, the group and the problem. In this sense, the development of attitudes appears as a constitutive dimension of experience, and not as a secondary effect.

In general, the articulation between active methodology and digital mediation contributed to the formation of a more active and committed posture in higher education. This finding is relevant because it shows that learning, when organized based on problems and accompanied by a structured digital environment, can favor not only the acquisition of knowledge, but also the development of skills and attitudes that are fundamental to academic and professional training.

5 CONCLUSION

This study aimed to analyze how PBL mediated by the digital platform Be Active contributes to the development of competencies — knowledge, skills and attitudes — of students in the teaching of Business Accounting, in the context of higher education.

The results showed that the pedagogical proposal favored the construction of knowledge in a more articulated and contextualized way, allowing students to mobilize accounting concepts in practical situations. The analysis of the word cloud, the similarity and the dendrogram indicated the centrality of terms related to the analysis of balance sheets, financial indicators, investigation and problem solving, showing that the learning process was guided by the application of the contents in real contexts. In addition, the organization of the lexical classes revealed a structured formative path, in which students go through stages that involve investigation, conceptual understanding, technical application, collaboration and decision-making.

With regard to skills, the findings indicate that the experience with PBL contributed to the development of investigative, analytical, communicative, collaborative, and organizational competencies. The need to interpret data, seek information, discuss in groups and construct reasoned answers favored capacities that go beyond the conceptual domain and approach the requirements of the professional context.

Regarding attitudes, it was observed that the methodology favored greater autonomy, responsibility, engagement and participation of students. The organization of activities on the digital platform contributed to the monitoring of tasks and the visibility of the process, encouraging a more active posture and commitment to learning. In addition, the interaction between students strengthened collaboration and the collective construction of knowledge, evidencing the social dimension of the training process.

In general, the results indicate that the articulation between PBL and mediation through a digital platform enhances the development of competencies in higher education, by integrating knowledge, skills and attitudes in an active and contextualized learning process. In theoretical terms, the study reinforces the understanding that active methodologies associated with digital technologies expand the possibilities of analysis on the development of competencies in higher education. In practical terms, the findings offer subsidies for the planning of more participatory pedagogical strategies in disciplines of applied nature, such as Business Accounting. In this way, the results also dialogue with contemporary guidelines for higher education education, which emphasize the development of integrated competencies and the articulation between theory and practice. In this sense,

the use of active methodologies mediated by digital technologies is in line with current training demands, by favoring the critical, reflective and collaborative action of students.

As a limitation, the fact that the research was carried out in a specific context, with a single class and institution, which restricts the generalization of the results, is noteworthy. In addition, as it is a situated pedagogical intervention, the findings are related to the specific conditions of implementation of the proposal. Even so, the results offer relevant contributions for future research that seeks to deepen the relationship between active methodologies, digital technologies and skills development in higher education.

As future perspectives, it is suggested the expansion of the study to different institutional contexts and areas of knowledge, as well as the long-term investigation on the impacts of PBL mediated by digital technologies on the academic and professional training of students.

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