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STEM education and problem-based learning in biology and mathematics teaching: pre-service teachers' perception

Micheli Bordoli Amestoy
mbamestoy@uepg.br
http://orcid.org/0000-0002-5687-5311
Universidade Estadual de Ponta Grossa (UEPG), Ponta Grossa, Paraná, Brasil.

Daniel Morin Ocampo
daniel.ocampo@ufsm.br
https://orcid.org/0000-0003-1136-4654
Universidade Federal de Santa Maria (UFSM), Santa Maria, Rio Grande do Sul, Brasil.

Luiz Caldeira Brant de Tolentino-Neto
luiz.neto@ufsm.br
http//orcid.org/0000-0001-6170-1722
Universidade Federal de Santa Maria (UFSM), Santa Maria, Rio Grande do Sul, Brasil.

ABSTRACT

The aim of the current study is to investigate pre-service teachers' perception of the Project-Based Learning (PBL) applicability in classrooms, with emphasis on the Science, Technology, Engineering and Mathematics (STEM) fields. A descriptive and qualitative research methodology, focused on the detailed and reflective description of a remarkable experience report was adopted. The sample comprised teacher-training students from two universities in Southern Brazil. Students joined a PBL-based STEM project during their classes. Subsequently, they answered a questionnaire with open-ended questions, based on Likert scale scoring. The questions targeted the acquisition of information about students' perception of this approach's viability. According to the results, participants understood the potential of this assignment type to be extrapolated to different educational contexts. This finding highlights its role in developing skills such as critical thinking, collaboration, communication and creativity. Therefore, it can boost the adoption of active methodologies in the classroom by future teachers in initial training. Furthermore, it is important pointing out students' optimistic attitude towards assignments connecting STEM Education and PBL.

KEYWORDS: STEM approach. Problem-based learning. Teacher preparation.

INTRODUCTION

Teacher qualification or training (depending on the Education concept, is a topic often under debate, not only in the academia, but in information publicized in the national and international media. Results of learning–process assessments have shown teaching accountabilities turning into 'guilt' at different teaching spheres, from basic to higher education (Amestoy, 2019). These findings shed light on teaching performance (Ball, 2014), which brought up questions and broadened the interest of different society sectors.

Teachers' qualification is a research line adopted in several Brazilian post-graduate programs, but it is also assessed as thematic axis in important Education and Science Teaching events. The number of studies focusing teachers' qualification has significantly grown in the country, in recent years (André, 2010). According to Gatti (2014, p.29, translated by the authors), "different aspects and problems associated with basic education teaching, as well as with teachers' qualification, have been investigated by several research groups, from different perspectives and methodologies, and they led to a relatively large current production". However, teacher qualification weaknesses and concerns have increased as the number of studies on this topic also rose. Gatti (2014, p.32) has drawn attention to usual data about the Brazilian educational scenario, namely: "the teaching career has not been attractive enough to senior high school graduates, mainly when it comes to working with specific disciplines like mathematics, physics, chemistry, among others".

Foreign data are not significantly different. According to international research on youngsters' perception of, and interest in, science and technology (S&T), students claim to have little interest in studying Sciences. Based on results of the Relevance of Science Education (ROSE) project, several students in the S&T disciplines have no intention to pursue professional and scientific careers in this field (Sjøberg; Schreiner, 2010).

Brazil is known for its tradition in this research type. The ROSE questionnaire was first applied in 2007; a more recent version of it was applied in 2023. The ROSES-RS Project adopted the most up-to-date ROSE questionnaire version for this 2022 application. It was answered by a significant sample of 15-year-old students from Rio Grande do Sul State, far-Southern Brazil. This sample opened room for the first attempt to carry out an opinion survey with students from Rio Grande do Sul State. The aim of it was to investigate their interests in, and attitudes towards, S&T.

The survey was answered by 1.892 students, with an average age of 15 years, from 54 public schools, in 48 cities, who responded to the printed version of ROSES-RS 2022 questionnaire. The application team visited 44 schools and, by doing so, they crossed more than 6 thousand kilometers on highways, dirt roads and even by ferryboat! (Tolentino-Neto, 2023, p.15). Figure 1 shows students' answers for the 'My Science Classes' section.

Figure 1 - Section – My Science Classes

Source: ROSES–RS Project Report in Tolentino-Neto (2023, p. 67).

ROSES-RS Project 2022 data have shown that approximately "70.5% of youngsters would not like to teach, 74% would not like to be scientists and 86.8% would not like to be Science teachers" (p. 17). These findings pointed out the need for rethinking Science and Mathematics teaching methods adopted in schools. According to studies by Hoolbrok and Rannikmae (2009), and European Commission (2015), teachers should adopt new methodological approaches to make scientific contents more understandable for students and to highlight the relevance of having students learning Science by applying it to their everyday life.

Results in the current research have shown that "most youngsters' curiosity is triggered during Science classes; they would like to carry out a larger number of experiments and practical assignments" (Tolentino-Neto, 2023, p.18). Bizzo (2009, p.16, translated by the authors) stated that "teaching sciences in nowadays' world must be one of several priorities in all schools, which must invest in forming a population that is both aware and critical of the choices and decisions to be made".

Using active methodologies focused on allowing students to play a leading role in their teaching and learning process is one way to foster their interest in school disciplines. Therefore, learning is actually meaningful when students play key role in how to learn scientific subjects. There are converging elements between them as both the Ausubelian theory and active methodologies emphasize students' prior knowledge, the relevance of the knowledge to be learned, and individuals' willingness to apprehend, produce and transform knowledge (Diesel; Baldez; Martins, 2017). According to Gedrovics *et al*. (2014, p.11), "knowing how and what students think about science, as well as their interests and priorities, is essential to achieve a meaningful education".

The current study focuses the Problem-Based Learning (PBL) among many other active methodologies available in the literature. This educational methodology has been implemented in higher education institutions in Brazil and abroad. The aim of active approaches is to promote highly practical,

interdisciplinary and problem-solving-oriented education to prepare students to face real-world challenges. Its choice as study methodology in the present study is justified by the close association between STEM education (Science, Technology, Engineering and Mathematics) and PBL. The aim of the present study is to investigate the perception of teachers attending the training on PBL applicability in classrooms for STEM implementation. The next sections address these approaches' application in Biology and Mathematics teaching, in Brazilian higher education institutions.

STEM AND PBL: BETWEEN TRENDS AND HIGHER EDUCATION POSSIBILITIES

Discussions about STEM Education (Science, Technology, Engineering and Mathematics) have grown over the last three decades. The acronym "STEM" was created in the United States of America back in the 1990s and emerged from concerns with how to encourage the growth of these four fields - Science, Technology, Engineering and Mathematics, given their relevance for the North American scientific society. However, youngsters in the country did not share interest in these four fields. Based on a National Science Foundation report, only few US students intended to pursue careers in STEM fields (El Sayary; Forawi; Mansour, 2015). Thus, the way to take the STEM approach to schools was to turn it into a critical training focused on improving teachers' skills and competences to better understand the demands of the coming 21th century (White, 2014).

This new proposition quickly outspread on the globe and became a phenomenon (Smith *et al*., 2022), mainly in European and Asian countries. On the other hand, countries like Brazil, took too long to join this discussion, mainly in the academia. According to Tolentino-Neto *et al*. (2021), the first initiatives to study this proposition in Brazil took place in mid-2006, mainly in the private sector.

Despite the several STEM definitions, there is no consensus in this topic. Some STEM features encompass interdisciplinary integration, developing skills associated with 21stcentury demands, having a STEM-literate society and learning based on real issues (Bybee, 2013; Smith *et al*., 2022, Melo *et al*., 2024). STEM disciplines can be integrated in many different ways; however, there is likely little, or no, interaction among these fields. It happens because whenever one field is demanded, the others leave the scene. Assumingly, none of these disciplines is taught in a way to integrate the other three ones. In this case, these disciplines' teachers account for achieving such an integration.

Two, or more, disciplines are likely emphasized in a project developed by mathematics and science teachers, for instance. Thus, they might be emphasized to the detriment of the other two disciplines in the STEM approach (El Sayary; Forawi; Mansour, 2015). This approach naturally meets 21st century-associated skills if one bears its emergence in mind. Developing the skills and knowledge necessary for the current labor market is one of STEM-education's concerns (Corrigan, 2020). In addition, according to Bybee (2013), contextualized STEM education can help developing these skills in ways isolated disciplines cannot.

Although the STEM Education stemmed from professionals' training in all its four fields, it is important addressing the relevance of forming STEM - literate students. It is essential making them qualified to identify real-world issues, and willing to position themselves towards such problems (Corrigan, 2020). Scholars,

such as Bybee (2013), advocate that the main goal of the STEM Education lies in fostering a STEM-literate society. The STEM Education/real-world issues association is unbreakable. Actually, one of its non-negotiable points focuses learning based on facing real-world situations (Smith *et al*., 2022). Therefore, the connection between STEM and problem-solving teaching methodologies (Melo *et al.,* 2024), like the Problem-Based Learning (PBL) one, will be addressed in the next section.

PROBLEM-BASED LEARNING AS TEACHING METHODOLOGY

The power of the problem-oriented Education has been addressed for some decades, now. John Dewey highlighted the role of the students and their experience, as well as the problem-oriented education associated with students' democratic participation (Dewey, 2023).

The PBL methodology was introduced in Canada, in the 1960s, and stands out among methodologies focused on problem solving. It was first adopted in medical schools, given the need for extrapolating theoretical knowledge into complex hospital practices (El Sayary; Forawi; Mansour, 2015; Thomassen; Jørgensen, 2021). PLB is a student-centered approach whose principles are based on constructivist elements (Nariman; Chrispeels, 2016)

Thus, from this perspective, students produce knowledge through problem solving. It is one of the most relevant cognitive assignments for their real-life routines. It is possible inferring that "Learning through PBL takes place when students overcome three main questions: What do they know? What do they need to know? And how can they find out what they need to know?" (El Sayary, Forawi; Mansour, 2015).

Based on Wood (2003), this process demands seven steps to be accomplished:

- ✓ Step 1. Defining unclear terms,
- ✓ Step 2. Defining the problem to be explored,
- ✓ Step 3. Talking about possible solutions or explanations for the problem by emphasizing students' prior knowledge,
- ✓ Step 4. Defining learning goals,
- ✓ Step 5. Individual studies,
- ✓ Step 6. Sharing individual studies with the group,
- ✓ Step 7. The group shares its solution and identifies whether pre-defined goals were achieved.

Students produce knowledge to develop communication, collaboration, creativity and critical thinking skills, within this complex process (Nariman; Chrispeels, 2016). The National Education Association (2012) has shown that these four skills, the so-called '4 Cs', play key role in helping students to get better prepared to face the global challenges brought along by the 21st century. The 4 Cs are often associated with STEM Education (Tolentino-Neto *et al*., 2021; Van Horn; Rakedzon, 2022) because they open room for the development of soft skills.

The current study adopted Onuchic *et al.* (2021) concept of problem as a given situation one does not know how to respond to, in advance. On the other hand,

this individual is willing to solve the problem, although it keeps on demanding the adoption of a cognitively complex approach. Thus, problems differ from exercises, because exercises can be algorithmically solved without great cognitive effort. Students must understand that Biology and Mathematics are not limited to numerical solutions in problem-solving or in face of problem situations. This process allows Biology and Mathematics' teaching and learning to provide constructs enabling students to critically reflect about, advocate for and outline, their viewpoints, based on the knowledge they have produced. According to Leite (2001), problems can be solved through 'paper and pencil using' but, yet, they can require laboratory and computer work, as well as fieldwork and interviews, among others.

The STEM approach emphasizes interconnections among four fields, namely: Science, Technology, Engineering and Mathematics, and it means interdisciplinary integration. Courses offered in Brazilian higher education institutions can integrate these disciplines and form students supported by broader and better applied-knowledge skills. Furthermore, collaborative projects can be developed with students from different STEM fields. This process can simulate real-world situations by professionals from different disciplines who must work together to solve complex issues. STEM can also introduce practical assignments and acquired knowledge application in everyday situations. These assignments could include laboratory projects, case studies and visits to companies or research institutions.

Higher Education PBL helps developing learning scenarios based on the real issue's students may face in their future careers. This process turns learning into a more meaningful and relevant path because it helps students to develop skills and competences by learning throughout life. Both STEM and PBL allow the development of formative assessments throughout the learning process, rather than the mere conduction of traditional summative assessments. This profile allows students to get continuous feedback.

MATERIALS AND METHODS

This article is the result of the partnership between IDEIA Science Education Group and the STEM Movement Study Group (GEMS). These groups have dedicated part of their efforts on studies about young students' interest in S&T and on didactic propositions focused on developing STEM assignments. Activities focused on the voluntary participation of students enrolled in Biological Sciences and Mathematics courses, from two public universities in Southern Brazil, were developed to meet the aims of the present study. These individuals formed a single sample comprising 14 graduates.

There was no separation between specific fields or universities because the STEM acronym does not differentiate these fields. The assignment was carried out during a class of one of the assessed disciplines: Supervised Internship II and Mathematics-Teaching Technologies, in the second semester of 2023. In addition, participants signed the Written Informed Consent (WIC). Respondents were informed that filling out the forms and joining the research were not mandatory actions. They also learned that the answers would not have any impact on their grades in any subject, and that their anonymity would be preserved. Participants were identified through Student Codes, such as S1, S2, and so on, during the discussions.

PBL-BASED STEM ASSIGNMENT

Components described by Merrit *et al*. (2017) were used as reference to develop the herein conducted assignment, as it will further be described in the Results section. The procedure involved two stages. The first one was scripted into five steps prepared by the authors, as shown in Table 1.

Table 1 - STEM assignment script

Step 1: Problem-situation reading and individual analysis. **Step 2:** Surveying individual hypotheses: elaborating hypotheses based on the following guiding questions - What would happen if these populations were isolated for a long period-of-time? - What are the possibilities to connect these two villages? - What are the likely environmental impacts of this solution? **Step 3:** Surveying team-discussion points: Students must discuss in pairs the individually-raised hypotheses; **Step 4:** Group Resolution: Groups are formed to propose a solution and to make a prototype to show how these likely solutions would be built. They could use paper and pencil, 3D models and build a physical prototype, among other strategies; **Step 5:** Analysis of solutions prepared by the groups; each group should prepare arguments for both the positive and negative points of their solution.

Source: Elaborated by the authors, 2023.

Two neighboring villages located considerably away from each other in a naturally beautiful and preserved environment. Currently, members of these communities must travel a long and complicated path to move between villages. This process leads to inconveniences, such as waste of time and, in some cases, temporary isolation due to adverse weather conditions. Challenge: finding a solution to efficiently and sustainably connect these two villages by causing minimal environmental and social impact.

A problem-situation comprising Biology and Mathematics aspects was elaborated by taking into consideration the target-audience to foster STEM Education' transdisciplinary profile. The problem presented below was elaborated as way to reach this goal (Figure 2).

Figure 2 - Problem-Situation Illustration

Source: Generated by artificial intelligence. Available at https://www.craiyon.com/ (2023).

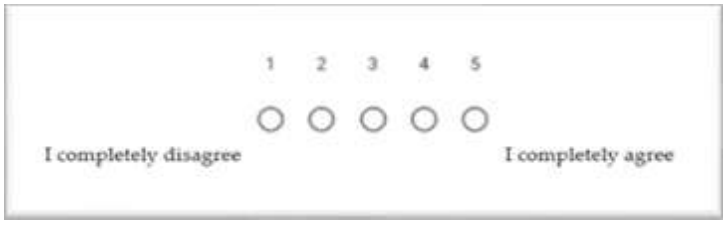
Each step of the assignment was carried out based on the aforementioned sequence, after the problem was introduced to the participants. Students had 4 hours to go through the steps and present their problem-solving proposition. They

were also asked to attend the second stage (described below) of the assignment after the first one was over.

TARGET AUDIENCE PERCEPTION OF THE CONDUCTED ASSIGNMENTS

Students answered an activity-evaluation form on Google Forms at the experiment's second stage. This form comprised seven questions organized based on Likert scale, as shown in section 1. Students should answer each item based on a scale ranging from 1 to 5: 1, the item was not addressed in the assignment; and 5, the item was deeply addressed in the assignment (Figure 3). These questions aimed the likely analysis of the following items: communication, creativity, critical thinking, collaborative work, using knowledge from their problem-solving training, integrating knowledge from different fields and time available to finish the assignment. Two essay questions about the feasibility of the STEM assignment supported by PBL in classroom environment completed the section 2 in the evaluative form.

Figure 3 - Likert scale questions



Source: Questionnaire created by the authors on Google Forms (2023).

PERCEPTION OF STEM STRUCTURING CONCEPTS

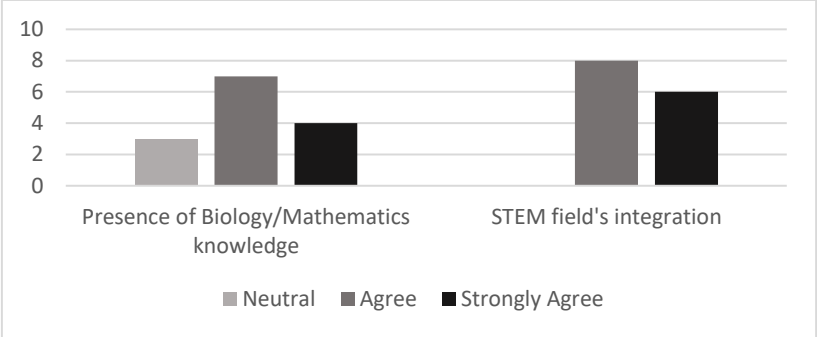
Somehow, the STEM Education could be described as movement to integrate Science, Technology, Engineering and Mathematics teaching. However, it is worth emphasizing some of the concepts structuring it. It was investigated whether the target audience perceived the proposed assignment potential to integrate STEM fields and the development of critical thinking, collaboration, communication and creativity skills (4Cs).

STEM is an interdisciplinary method (Slavinec *et al*. 2019) often classified as transdisciplinary approach (Tolentino-Neto *et al*. 2021). According to Dugger (2010), it can be set through different ways, namely: S-T-E-M structures based on working in each field, in separate; and Stem structures, when Science and Mathematics standout to the detriment of Technology and Engineering. This is how it is more likely to be developed in Brazil due to the discipline matrix in the country. Accordingly, participants were asked about their perception of both STEM fields' integration, and Mathematics and Biology adoption to solve the proposed problem-situation.

According to their answers, none of them disagreed with Mathematics and Biology presence in the proposed assignment, or with the STEM fields' integration (Graph 1). It is essential highlighting that it is important having a strong justification for individualizing the STEM disciplines to be transcended as traditional disciplines

prevail in public policies, and in discipline matrices and large-scale evaluations (Bybee, 2013).

Graph 1 - Perception about the problem's fields



Source: Research data (2023).

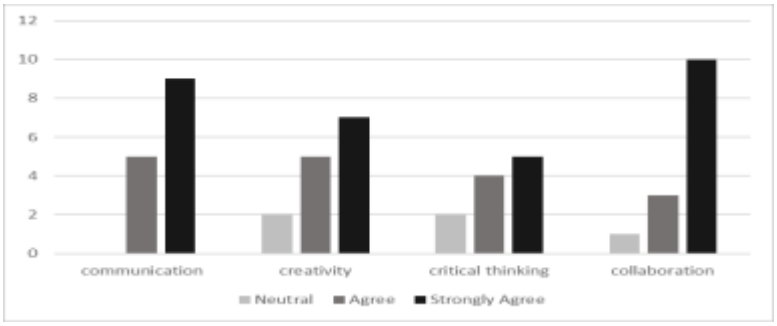
In Brazil, there are significant requirements to meet the specific content of each discipline and large-scale assessments gain relevance every year. This scenario impairs the implementation of interdisciplinary approaches, such as STEM. However, pre-service teachers attending the current study agreed with STEM fields' integration and with the presence of specific Mathematics and Biology knowledge in assignments aimed at solving the proposed problem-situation (Graph 1).

It is possible raising the hypothesis that the perceptions of pre-service teachers who envision an ideal classroom have not yet been influenced by the aforementioned impairments. According to Delizoicov, Angotti and Pernambuco (2017), they have not yet experienced the discouragement from reality.

Initiatives focusing STEM adoption often pinpoint the development of skills and competences. The guide "Preparing 21st Century Students for a Global Society" (NEA, 2012), by the National Education Association, stresses the four essential skills to be developed by school students, namely: Critical Thinking, Collaboration, Communication and Creativity. They must guide several initiatives based on STEM education, since it has the potential to develop such skills (Kurniahtunisa *et al*. 2023).

Participants were asked about 4Cs presence in the assignment. They agreed that the scripted assignment had the potential to help developing these skills (Graph 2). Only few participants agreed that Creativity and Critical Thinking were addressed in it. STEM Education mainly matches the development of higher-order thinking skills, such as Creativity and Critical Thinking (Wahono; Lin; Chang, 2020).

Graph 2 - Perception about 4Cs



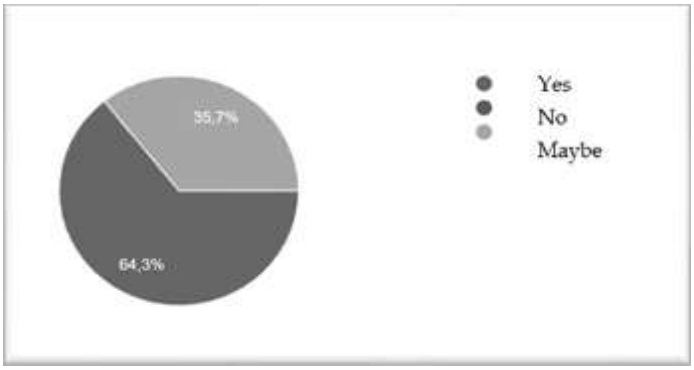
Source: Research data (2023).

The Critical Thinking skill rated the lowest agreement level among the four addressed ones. This finding does not match results in a study conducted in Indonesia by Kurniahtunnisa *et al*. (2023). He got to the conclusion that STEM has the potential to foster all four skills, mainly Critical Thinking. Clearly, each proposition has high potential to develop one of these skills. However, it is worth highlighting these pre-service teachers' perception about the potential of using STEM in association with PBL to develop all 4Cs.

ABOUT THE POTENTIAL OF THIS ASSIGNMENT IN BASIC EDUCATION AND AT TEACHING LEVEL

Future STEM-field teachers believed in the likely applicability of the herein introduced assignment to basic education (64.3%), as shown in Graph 3. However, 35.7% of them reported some degree of uncertainty about it.

Graph 3 - Perception about this assignment in basic education



Source: Research data (2023).

Frame 1 introduces some justifications presented by the participants. They were analyzed and categorized into three emerging response groups: Incentive to Collective and Teamwork, Reflection and Critical Thinking, and Creativity and Productivity.

Frame 1 - Analysis of emerging categories (translated by the authors)

Incentive to Collective and Teamwork	Reflection and Critical Thinking	Creativity and Productivity
*"Yes, because this type of activity, besides helping students to learn and solve problems, also promotes **collective work and overall communication**."* *"This type of class encourages students to think and to be critical, promotes discussions and makes students **work as a team** to reach consensus; and it is really important, since we live in society and we often need to adapt to the place we are in".* *"**Collectivity** means reading work".* *"**Group** production".*	*"Because it enables students to know new tools that take them out of the dull teaching and learning routine and that simultaneously encourage and challenge their **thinking and reflection processes**."* *"Collaborative activities aimed at **critical thinking** are always good options and they can be easily applied."* *"Communication, integrity,* **critical thinking***...".* *"**Critical thinking**, analysis skills, democratic development, because we must understand our colleagues' viewpoints and check the best solutions [...]"*	*"It is possible developing this type of activity, since it can **make classes more productive and interesting**, as long as there is a structure everyone can participate in."* *"Sharing ideas, cooperation, **creativity**".* *"The activity can be adjusted, so the story can be adjusted to the public. **Creativity** and the involvement of different knowledge fields challenge us to find a solution based on little information."* *"It is a different way of teaching students, by making the class more interesting, by **stimulating** students' **creativity**, imagination and communication. It is also a connection between content and practical class, and it also adds to students' individual development".*

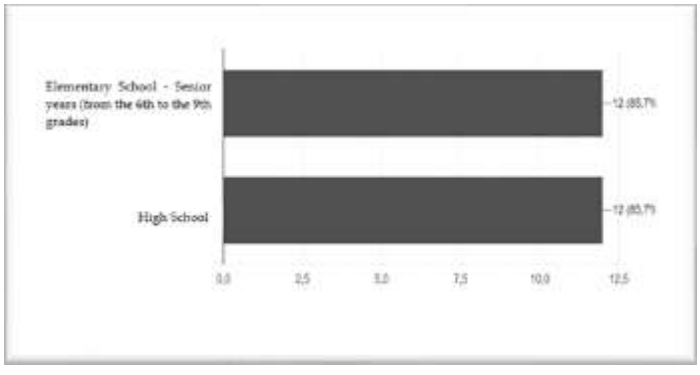
Source: The authors (2023).

Emerging categories corroborated studies available in the literature, according to which, active methodologies give students a leading role in the teaching-learning process by encouraging reflection and critical thinking. These are important skills for human and integral formation (Ribeiro *et al.,* 2023).

In addition, the analyzed answers met the STEM Education assumption, according to which, the teaching approach stems from propositions to structure traditional disciplines over an integrated disciple matrix focused on problem-solving, as well as on developing critical thinking and creativity for decision-making about new and future challenges (Yakman, 2008; Lorenzin, 2019).

Pre-service teachers were asked about the education levels the conducted assignment could be developed at. They were even in choosing senior-year Elementary School and High School students.

Graph 4 - Perception about teaching levels



Source: Research data (2023).

Participants reported to believe in the applicability of this STEM assignment at levels beyond Elementary School, as shown in the following excerpt: *"For both basic education and, why not, for higher education?" (S1, 2023); "Based on my answer to the previous item, I believe that an assignment carried out in such a way stimulates students' critical thinking"* (S2, 2023).

Students stood for the viability of applying this assignment at both aforementioned education levels. Some answers stood out among the participants: "*An assignment that can be applied to everyone because it requires a lot of creativity and knowledge, which students already have" (S4, 2023).*

> *"I believe that, nowadays, Brazilian High School requires special attention, since its senior year classes account for forming and shaping what we are going to be for society, and this exercise will help teenagers to learn about teamwork and to hold group discussions to find a viable and acceptable solution for everyone involved in the process"* (S3, 2023).
>
> *"It can start being developed at both levels, although it is more interesting to acquire this knowledge type shortly after concluding basic education in order to encourage students to learn more by using different ways of teaching, other than using the blackboard, notebooks and pens" (S5, 2024).*

The excerpts above pointed out that future STEM-field teachers are aware of how important it is to apply and encourage the adoption of such assignments in the senior years of Elementary School and High School, with emphasis on the need for using new teaching approaches, and for understanding teamwork and group communication. Answers by Brazilian public university students complied with international studies. According to Bybee (2013), foreign research has proven that STEM-based assignments have worked well for the US basic education. Pugliese (2017) advocated that STEM education enables students to learn how to plan and collaborate with each other, i.e., they are challenged to work in teams and it can improve their leadership skills, besides the possibility of playing the leading role in their own learning process.

CONCLUSIONS AND PRACTICAL IMPLICATIONS

STEM and PBL-based assignments provide an integrative and practical way of developing knowledge in different scientific fields, besides helping de development of investigative skills. Moreover, they also encourage the "maker" culture. Overall, STEM approaches are based on project-implementation, as several STEM techniques take into account the general skills provided for on the Common National Curriculum Base - BNCC, whose principles lie on both student leadership role and on building meanings for the learning process.

The STEM/PBL integration in Biology and Mathematics teaching, mainly in teacher qualification courses, can provide a remarkable educational experience by preparing future teachers to face real challenges in the school environment. However, it is equally important to address the challenges inherent to education institutions' context and structure. It must be done to ensure proper support for these practices' successful implementation through research and critical analysis. It can also be promoted through interconnection among disciplines.

Pre-service teachers have an optimistic stance towards PBL-associated STEM education. All students' answers expressed their belief in the proposed assignment to help achieving the interdisciplinary development of skills demanded for 4Cs' adoption at all education levels. Future studies must increase the number of assessed classes and STEM fields for this scripted assignment application, and implement a prototype construction stage based on using the solutions proposed for the herein presented problem-situations.

LIMITATIONS

The main challenges and limitations faced to perform STEM and PBL assignments included difficult communication among group members; turning several ideas and opinions into one; and availability of appropriate spaces (laboratories), materials and time to perform the assignment. The small size of the analyzed sample is a limitation for further analysis and discussions. Issues involving technological infrastructure can also be considered a limitation for the effective implementation of these approaches, since they depend on the availability of technological and infrastructure resources that are not often found in higher education institutions. The successful implementation of STEM and PBL approaches in classrooms, either in Brazilian basic or higher education institutions, requires collaborative effort among educators and educational institutions.

Educação STEM e a Aprendizagem Baseada em Problemas no Ensino de Biologia e Matemática: A percepção de professores em formação inicial

RESUMO

O presente estudo teve como objetivo investigar a percepção de professores em formação sobre a aplicabilidade da Aprendizagem Baseada em Projetos (PBL) em sala de aula, nas áreas de Ciências, Tecnologia, Engenharia e Matemática (STEM). Utilizou-se de uma metodologia de pesquisa descritiva e qualitativa, focada na narração detalhada e reflexiva de uma vivência significativa, a partir de um relato de experiência. A amostra foi composta por estudantes em formação para docência, de duas universidades da região sul do Brasil. Durante as aulas, os estudantes participaram de uma proposta STEM fundamentada no PBL, e após tal atividade responderam a um questionário com questões em escala de *Likert* e dissertativas, onde expressaram sua percepção sobre a viabilidade de tal abordagem. Os resultados apontam que os participantes entendem que esse tipo de atividade tem potencialidades para ser desenvolvida nos diferentes contextos educacionais, tendo destaque para desenvolver habilidades como pensamento crítico, colaboração, comunicação e criatividade. Conclui-se que esse tipo de atividade, durante a formação inicial, pode colaborar para a adoção de metodologias ativas dos futuros professores em sala de aula. Além disso, é importante destacar a postura otimista dos estudantes diante das atividades que relacionam a educação STEM e o PBL.

PALAVRAS-CHAVES: Abordagem STEM. Aprendizagem baseada em problemas. Formação de professores.

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Correspondência:
Micheli Bordoli Amestoy
Universidade Estadual de Ponta Grossa. Departamento de Biologia Geral. Praça Santos Andrade, número 01, Centro, Ponta Grossa, Paraná, Brasil.