# PORTFOLIO AS AN ASSESSMENT INSTRUMENT IN THE BIOLOGY TRAINING ITINERARY OF THE NEW HIGH SCHOOL IN BRAZIL

*PORTFÓLIO COMO INSTRUMENTO DE AVALIAÇÃO NO ITINERÁRIO FORMATIVO DE BIOLOGIA DO NOVO ENSINO MÉDIO NO BRASIL*

*PORTAFOLIO COMO INSTRUMENTO DE EVALUACIÓN EN EL ITINERARIO DE FORMACIÓN EN BIOLOGÍA DE LA NUEVA ESCUELA SECUNDARIA EN BRASIL*

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**ABSTRACT**: Given that the Novo Ensino Médio organized the students' curriculum between Common Path and Training Itineraries, the objective of this research was to analyze the role of the reflective Portfolio as an assessment instrument in a Training Itinerary of Natural Sciences and their Technologies in the first year of High School. The qualitative research was guided by the Action Research method in a private confessional school in the interior of the state of São Paulo. The results verified that the reflective portfolio, as an evaluation instrument, meets the characteristics of a formative assessment at the service of learning and the expectations of Brazilian curricular references and São Paulo's. Thus, it was possible to develop the skills proposed for the Training Itinerary in High School, even with limitations of time, financial resources, limited teaching experience in carrying it out, and the challenge of students' commitment to reflective portfolios.

**KEYWORDS**: Novo Ensino Médio. Educational pathways in natural sciences and their technologies. Learning assessment. Reflective portfolio.

**RESUMO**: *Dado que o Novo Ensino Médio organizou o currículo dos estudantes entre Percurso Comum e Itinerários Formativos, o objetivo desta pesquisa é analisar o papel do Portfólio reflexivo como instrumento de avaliação em um Itinerário Formativo de Ciências Naturais e suas Tecnologias no primeiro ano do Ensino Médio. A pesquisa de abordagem qualitativa foi orientada pelo método da Pesquisa-Ação em um colégio privado confessional no interior do estado de São Paulo. Os resultados permitiram aferir que o portfólio reflexivo, como instrumento avaliativo, atende as características de uma avaliação formativa a serviço das aprendizagens, bem como atende às expectativas dos referenciais curriculares brasileiros e do currículo paulista. Por meio dele foi possível desenvolver as habilidades propostas para o Itinerário Formativo no Ensino Médio, mesmo com limitações de tempo, recursos financeiros, da escassa experiência docente na realização e o desafio de comprometimento dos estudantes com os portfólios reflexivos no Ensino Médio.*

**PALAVRAS-CHAVE**: *Novo Ensino Médio. Itinerários formativos de ciências naturais e suas tecnologias. Avaliação da aprendizagem. Portfólio reflexivo.*

**RESUMEN**: *Dado que el Novo Ensino Médio organizó el currículum de los estudiantes entre Itinerario Común e Itinerarios Formativos, el objetivo de esta investigación fue analizar el papel del Portafolio reflexivo como instrumento de evaluación en un Itinerario Formativo de Ciencias Naturales y sus Tecnologías en su primer año. La investigación cualitativa fue guiada por el método de Investigación Acción en una escuela privada confesional del interior del estado de São Paulo. Los resultados verifican que el portafolio reflexivo, como instrumento de evaluación, cumple con las características de una evaluación formativa al servicio del aprendizaje, además de cumplir con las expectativas de los referentes curriculares brasileños y del currículo paulista. Fue posible desarrollar las competencias propuestas para el Itinerario Formativo en la Escuela Secundaria, aún con limitaciones de tiempo, recursos económicos, experiencia docente limitada para su realización y el desafío del compromiso de los estudiantes con los portafolios reflexivos.*

**PALABRAS CLAVE**: *Novo Ensino Médio. Itinerarios formativos de las ciencias naturales y sus tecnologías. Evaluación del aprendizaje. Portafolio reflectante.*

## Introduction

According to Da Silva (2018), the high school reform had been under consideration for years and was introduced in 2013 through Bill No. 6,840, aiming to address the need for a diversified and attractive curriculum, with a focus on a more technical rather than theoretical education, restrictions on the availability of evening classes, and an extension of the daily workload. However, it only gained momentum in 2016 through a provisional measure. The impeachment of Dilma Rousseff and the resulting political instability drove the urgency for the approval and implementation of the New High School. The academic community expressed dissatisfaction with this proposal, but there was repression of social movements, and no space was open for dialogue.

Amid this scenario, the Senate approved Law No. 13,415/2017, thereby formalizing the New High School through the Ministry of Education (MEC), which became mandatory in all educational institutions starting in 2022, with gradual implementation beginning with the first year of high school. One of the curricular changes involved dividing the curriculum into Common Pathways and Educational Pathways (Brasil, 2018). Given the hasty and poorly formulated nature of the New High School, it is up to the teaching staff to adapt and make the best of the proposal until a new reformulation is made.

The Common National Curriculum Base (BNCC) stipulates the areas of knowledge and skills in the Common Pathway. In the new structure, the Common Pathway, or Common Curriculum, encompasses the skills and competencies outlined in the BNCC related to the four areas of knowledge: Mathematics and its Technologies, Languages and their Technologies, Natural Sciences and their Technologies, and Human and Social Sciences (Brasil, 2018).

The Educational Pathways, which have a more technical training aspect, are based on the local curriculum, specifically the São Paulo Curriculum. Thus, each educational institution has the freedom to create and develop its educational pathways.

Within the proposal for Natural Sciences, the official description and declaration are as follows:

> Students will study natural sciences and their technologies through an integrated approach to Biology, Physics, and Chemistry. This involves a deepening of foundational knowledge to apply various concepts in social and work contexts, organizing curricular arrangements that allow for an in-depth exploration of themes such as Matter and Energy, Life and Evolution, and Earth and the Universe. The conceptual knowledge associated with these themes provides a foundation for students to investigate, analyze, and discuss problem situations arising from different socio-cultural contexts, as well as to

understand and interpret laws, theories, and models, applying them to solve individual, social, and environmental problems. In this way, students can rework their knowledge related to these themes, as well as recognize the potential and limitations of Natural Sciences and their Technologies (Brasil, 2021, our translation).

The proposed objectives are: i) to study the role of the Portfolio in developing students' ability to analyze, solve, understand, and critically engage with knowledge through reflective portfolios; ii) to discuss the role of the portfolio in the Educational Pathway of natural sciences and their technologies (biological); iii) to investigate whether the Portfolio is an evaluative approach that can meet the needs of the Educational Pathway in Natural Sciences and their Technologies.

This research was structured based on the competencies and skills outlined for the New High School in the BNCC and the São Paulo Curriculum, adopting the term Educational Pathway in the Biology curriculum for the educational network of this study (Brasil, 2017a; São Paulo, 2019).

The assessment of learning experienced over many years was focused on a traditional pedagogy that favored a school culture of quantification with a classificatory and punitive nature, devoid of personal meaning and social relevance. Numerous mechanisms promoted authoritarianism and power through control mechanisms, often leading to exclusion. Classes in this model were based on oral explanations, followed by exercises for reinforcement and oral or written tests. These evaluative practices were present in the pedagogies of the 16th and 17th centuries and, in some way, became entrenched in Brazilian school culture through the dominance of a classificatory evaluation system that extended to the present day (Zukowsky-Tavares, 2012).

The term "evaluate," in its broadest sense, can be related to various areas of knowledge and everyday life, originating from the Latin "valere," which means to assign value to something. This assignment of value implies a qualitative judgment that guides specific decisions, whether favorable or unfavorable, concerning the object in question (Depresbíteris, 2004).

In analyzing, in 2023, a proposal for evaluating students' learning, it is pertinent to question whether it is possible to advance to an evaluative approach that serves students' learning needs in the final stage of Basic Education.

According to Araújo (2015), evaluation can play a central and irreplaceable role in improving and ensuring the quality of learning, even though it has long been designed to

separate the outcomes of students' success and failure, highlighting and controlling these differences. Fernandes (2019) emphasizes the need for all involved to understand the purposes of pedagogical and formative assessment. This requires developing a complex set of relationships between assessments, learning, and teaching, contributing to all students being able to enhance their proficiencies.

The formative assessment approach advocated by the New High School curriculum runs counter to the traditional and classificatory trends in evaluation. Educational assessment in high school, according to BNCC guidelines, is based on a formative approach, where all data collected through various assessment tools inform decision-making for the reorientation of processes and outcomes (Brasil, 2017b):

> [...] to build and apply formative assessment procedures, whether process or outcome-based, that take into account the contexts and conditions of learning, using such records as a reference to improve the performance of the school, teachers, and students (Brasil, 2018, p. 5, our translation).

When the focus of assessment is students' learning, it is understood that this practice involves selecting an approach to teaching, learning, and assessment that is contextualized within a single framework, whether constructive or reproductive of knowledge. The pursuit of active and knowledge-building methods has intensified and become more frequent across educational environments at all levels. In this regard, Ambrósio (2015) states that the assessment tool should have clear objectives and promote the redefinition of the product, i.e., the valuation and qualification of results, making the assessment continuous, creative, investigative, participatory, and dynamic.

Regarding the teacher's role in formative assessment, Pires Vaz (2022) argues that the teacher is a crucial element in students' learning processes and serves as a reference for students' self-concept formation. The way in which the teacher interacts with students is fundamental for them to feel capable. The author describes formative assessment as an interpretative and descriptive process where students can clarify doubts about their learning during the journey while the teacher reviews their methods to better assist students in their pursuit of pedagogical improvement. During this process, the teacher is responsible for evaluating the student using various means while also engaging in self-evaluation. This is the concept of formative assessment, a pillar of the new teaching and learning paradigm.

Cavalcanti *et al*. (2022), in using the reflective portfolio and analyzing its performance, reflected on their pedagogical work, highlighting that the reflective portfolio is a tool that allows

for the development and evaluation of cognitive, psychomotor, and attitudinal capacities. It focuses on the individual practice of the learner concerning the experiences encountered throughout their learning journey. They further emphasize that the process of stimulating conceptual, procedural, and attitudinal enrichment promoted reflection on action, ensuring mechanisms for theoretical and methodological deepening. Additionally, it fostered the learner's creativity and originality and facilitated learning assessment through reflective processes of metacognition.

It is essential not to confuse a portfolio with a journal, for example. The portfolio should also not be seen as a folder for randomly accumulating activities, functioning merely as a repository of materials. It is a space where students can record both implicit and explicit elements of the teaching-learning process in a reflective and creative manner. A portfolio is a tool that can be adopted in various fields of study, provided that certain steps are followed for its implementation, such as: defining a purpose for the portfolio; establishing learning goals from the student's perspective; integrating evidence and learning experiences; selecting the sources that will compose the portfolio; and reflecting on the student's development (Sousa, 2023).

## Methodology

This study is qualitative and exploratory, with a focus on applied methodology. It is characterized as exploratory because, according to Toledo and Shiaishi (2016), the exploratory research model allows for a more complex investigation of the problem due to the broad range of information obtained through a detailed analysis of the events or objects examined.

The study also adopts a qualitative approach by analyzing procedures, such as the content of seminars/classes, excerpts from physical portfolio records, and transcripts of semi-structured interviews. Toledo and Shiaishi (2016) discuss that the qualitative approach is often used in studies aimed at understanding human life in groups, without focusing on numerical measurements.

The research project was approved by the Ethics Committee of the Adventist University Center of São Paulo, under opinion number 5.286.559. The study involved 38 students, aged between 14 and 15 years, enrolled in the first year of high school across different classes (A, B, C, and D) at a confessional institution in the interior of São Paulo. The participating students came from various parts of Brazil due to the institution's boarding system and the migration of

several families from other states to the region near the school, as the institution is renowned for its education. In the boarding system, most students return home only during vacation periods.

The action-research method was chosen as it was necessary to conduct an intervention, rather than merely a diagnosis, with the active participation of the students in the New High School curriculum. According to Thiollent (2011), action research is a type of social research based on empirical evidence, designed and conducted in association with an action or resolution of a collective problem, in which researchers and representative participants of the situation or problem are involved in a cooperative or participatory manner. The intervention work, monitored and scientific, allowed for results that evaluated the potential of the portfolio, meeting the research objectives.

A weekly meeting was held for each class throughout one semester, with each session lasting 45 minutes, taking place in the second semester of 2022. The location of the classes varied according to the needs and the development of the portfolios; however, most of the classes were held in the anatomy laboratory, as previously proposed by the school's administration. In this research, the technical documents consulted were the students' reflective portfolios, from which excerpts were taken and counted by the school as evidence of learning present in this assessment tool within the focused curricular unit.

Data collection procedures included records in the researcher-teacher's field diary throughout the meetings. In qualitative research, a field diary is a tool used by the researcher to record reflections, observations, insights, and impressions during the data collection process. In this research, the diary accompanied the researcher continuously and reflectively, documenting her experiences, thoughts, challenges, and discoveries, as well as the students' speech, actions, and reactions throughout the study. Qualitative records also included excerpts from the students' portfolios and the transcription of an interview conducted at the end of the intervention, with a semi-structured script, with four research participants, one student from each participating class. The collected data revealed successes and challenges in applying the portfolio within the formative itinerary, challenging students to propose solutions to the issues raised (Minayo, Gomes, 2015; H. Caria, Sacramento, Mendes, 2023).

After a content analysis in the thematic modality of the qualitative data extracted from the portfolios and interviews, the results were processed using the WebQDA software (qualitative data analysis), a tool specifically designed to facilitate and enhance qualitative

research. This software was incorporated due to the need for detailed, in-depth, and systematic analysis, which are essential characteristics of qualitative research (Ferreira *et al*., 2020).

**Results**

The content analysis of the qualitative research data led to the selection of five dimensions and categories of analysis:

1. Identification of the portfolio as formative assessment (Identification with Formative Assessment – IFA);

2. Skills that students were expected to develop with the portfolio (skills);

3. Possibilities that the portfolio provided to students, either directly or indirectly (possibilities);

4. Limitations that students encountered while completing the portfolio (limitations);

5. Suggestions, based on students' feedback, for improving the portfolio (suggestions for the portfolio).

**Figure 1** – Tree Codes with Segments and Subcategories for Results Analysis
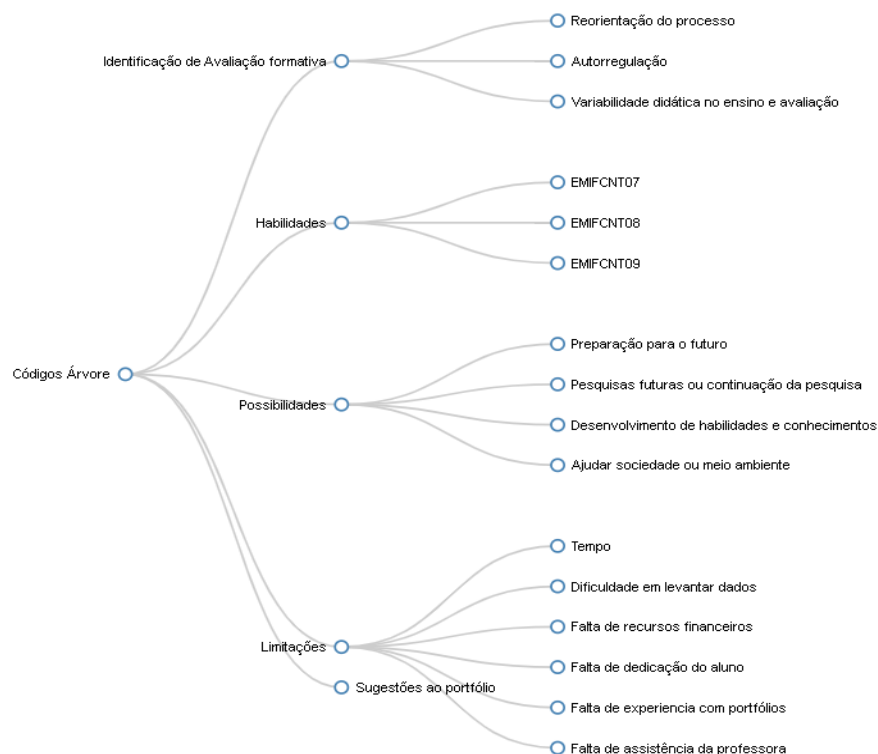


Source: Prepared by the authors, constructed with the assistance of WebQDA software (2023).

The portfolio, as developed and applied, contributed satisfactorily to the development of students' skills. This is evidenced in the table presented in Appendix H, in the skills section, which includes excerpts from students' writing that demonstrate the development of the following competencies:

● (EMIFCNT07) Identify and explain sociocultural and environmental issues related to physical, chemical, and/or biological phenomena.

● (EMIFCNT08) Intentionally select and mobilize knowledge and resources from the Natural Sciences to propose individual and/or collective actions for mediation and intervention on sociocultural and environmental issues.

● (EMIFCNT09) Propose and test mediation and intervention strategies to solve sociocultural and environmental problems related to the Natural Sciences.

The acronym for skills EMIFCNT00 is defined as follows: EM refers to Ensino Médio (High School); IF corresponds to Itinerário Formativo (Formative Pathway); CNT refers to

Ciências Naturais e Suas Tecnologias (Natural Sciences and Their Technologies); and the subsequent number indicates the categorized skill.

An essential characteristic of a formative assessment process is the possibility of reorientation throughout the process, as evidenced in the field diary notes, which highlight the reflective peer process: "*A student brought the collected water sample to the class for her experiment, and other students provided suggestions to improve her methodology*" (FD).

Another piece of feedback was extracted from the field diary:

> The student approached the teacher because she loves animals and wanted to focus her project on this area. Since she identified that there were already people in her neighborhood feeding stray animals, the student felt unsure about what to do. The teacher asked, "How can we help these animals on a larger scale?" The student researched and came back with the idea of NGOs. The teacher then inquired about what was needed to start or maintain an NGO. The student became interested and decided to research and develop her project on what is required to establish an NGO (FD, our translation).

The second subcategory of Formative Assessment Identification (FAI) is self-regulation. Self-regulation is intrinsically linked to self-assessment and constitutes one of the main goals of formative assessment. When a student is able to analyze their learning through metacognitive strategies, they begin to understand how their thoughts are internalized, developing a greater awareness of their competencies and difficulties (Cristofari; Irala, 2022).

In the process of self-regulating learning, a student reflected on how they could have achieved the proposed goal in their portfolio in a simpler and more effective manner:

> The sample was a bit difficult to create and then open, so I think I can also improve on creating the sample. Maybe I could use something that contains a larger amount of beans, such as an egg carton" (Student Portfolio 3, our translation).

At the end of the analysis of the excerpts, a survey was conducted of the most frequently occurring words in the selected passages with FAI, using WebQDA software. The results are presented in the figure below.

**Figure 2** – 50 Most Frequent Words in Passages Selected as Containing Formative Assessment Identification



Source: Prepared by the authors, constructed with the aid of WebQDA software (2023).

Many students viewed the deepening of the reflective records in the portfolio as a catalyst for personal development and the construction of future perspectives. This can be observed in the following student reflections: "It will be like a preparation for completing the work and assignments that a college or university requires" (Student Portfolio 1, our translation) or "To help choose the field I intend to pursue" (A30, our translation).

Additionally, some students noted that the portfolio allowed them to continue or revisit their research in the future: "However, I stopped here, and it is clear that this is a work that can continue" (Student Portfolio 4, our translation); "For future research done by me or someone else, I leave here the idea of the first project, which can reach more people" (Student Portfolio 5, our translation).

Among the main limitations highlighted were the limited time available for the implementation and completion of formative itineraries in high school, which sometimes compromised the execution of the portfolio, especially in recording and reflecting on data. Other difficulties included a lack of financial resources, low engagement, and some students' unfamiliarity with portfolios, as well as the challenge faced by the researcher teacher, who was using this assessment tool for the first time. The most frequent suggestion from students was the need for more classroom time to complete activities and reflections in various formats, as well as to interact with peers and the teacher.

## Final considerations

This research investigated an assessment tool applied to the Biology Formative Itinerary of the New High School Curriculum. The aim was to select a tool aligned with the development of skills proposed by the National Common Curriculum Base (BNCC) and the São Paulo Curriculum, as well as to foster the ability to analyze, solve problems, develop critical understanding, and engage in reflective positioning towards knowledge. In other words, the goal was to develop students' metacognition, autonomy, and self-regulation. To achieve these outcomes, it was necessary to design a tool that reflected a formative perspective in assessment.

Testing the Portfolio as an assessment tool revealed that it exhibits characteristics of formative assessment, promoting the development of metacognition, self-regulation, critical thinking, and student autonomy. This process allowed for didactic variability and the development of the skills proposed for the itinerary. By offering various didactic possibilities within a single tool, the Portfolio enabled the activation of different skills and, in some cases, even the integration of other areas of knowledge.

Students were able to reflect on their interest in specific aspects of the Natural Sciences, as well as on the pursuit and consolidation of their future professional paths. The portfolio chapters reflect the stages of the scientific process, which were analyzed and recorded in a reflective and gradual manner.

Despite limitations such as reduced time, lack of financial resources, teaching inexperience in implementation, and the challenge of engaging students with reflective portfolios, the Reflective Portfolio allowed for the development of the skills proposed for the Formative Itinerary in High School. The implementation of the Reflective Portfolio stages generated possibilities for enhancing the assessment tool, including: i) prior discussion about the elements that will compose the Portfolio, with appropriate timing and management of reflective time; ii) execution and completion of the Reflective Portfolio. It is recommended that future studies expand this analysis to other contexts within Brazilian High School education.

As a follow-up to this research, it is recommended that further investigations be conducted on the use of the Reflective Portfolio in High School education. The aim would be to encourage dialogue and contributions between studies on the assessment of learning within this educational segment. This exploration will allow teachers and students to explore new possibilities in the field of Natural Sciences.

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