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Pedagogical rubrics: an instrument of continuous assessment in the teaching of Physics[+*]

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Abstract

This paper discusses the importance of formative and continuous assessment in the teaching-learning process in high school Physics classes, presenting pedagogical rubrics as instruments that, based on objectives, criteria and categories, make it possible to highlight what the teacher expects from students , in addition to identifying their learning on content or tasks and promoting self-assessment. The pedagogical rubrics were built and implemented in a 3rd year high school class, in Physics classes, based on a sequence of activities developed for a significant critical learning that sought to teach about energy and its transformations. The research of these activities followed a qualitative approach and the assessment instruments were the pedagogical rubrics, developed by the teacher-researcher. The analyzes by analytical pedagogical rubrics showed that new knowledge acquired new meanings for students and previous knowledge acquired greater cognitive stability, that is, the activities were important to re-elaborate the sub-subsectors, to differentiate and integrate them, as proposed by the theory of critical significant learning.

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I. Introduction

Teachers are very concerned with teaching in a potentially meaningful manner, and thus use different methodologies to provide better learning conditions to the students. However, oftentimes assessments are done only at the end of the teaching-learning process, causing the loss of important records during the process. When we talk about assessment in Physics classes, "the great majority of teachers make use of the traditional summative tests, with questions based essentially in the resolution of algebraic problems."(ROSA; DARROZ; MARCANTE, 2012, p. 42).

This work proposes the creation and use of analytic pedagogical rubrics as instruments of continuous formative assessment of learning to allow the teacher to better track the progress of students throughout the process. The analytic pedagogical rubrics presented in this work were built from the referential of Meaningful Critical Learning (MCL) of Moreira (2005), which is based on the Meaningful Learning theory of David Ausubel, among other works. In classrooms with many students, in which the traditional means of assessment are exams and questionnaires, which can be classificatory and excluding (HOFFMANN, 2009; LUCKESI, 2006; GÕNI, 2000), the use of analytic pedagogical rubrics allows the continuous and individualised assessment of learning.

Analytic pedagogical rubrics, as an assessment instrument, serve to aid the teacher in building more transparent and coherent criteria for evaluation regarding teaching-learning objectives (ANASTASIOU; ALVES, 2012), previously determined, presented and agreed upon with the students. They work as an instrument of formative assessment, allowing the involvement of students in the process of learning and evaluation.

Continuous assessment in the teaching-learning process is very important, as it monitors the development of the student. This conception is shared by authors such as Hoffmann (2009), with mediating assessment, Luckesi (2006), with the assessment of learning in school and Goñi (2000), by discussing inclusive assessment, agreeing with the need for its presence throughout the teaching-learning process. In this sense, we must be careful when choosing an instrument of assessment that may be excluding, seeing as we know that students have their particularities when learning. In other words, people learn in different ways and should not be evaluated in only one way.

According to Hoffmann (2009), we must aim for an assessment model based on the communication and approximation between the teacher and the student; furthermore, the teacher should rethink their teaching-learning practices and adapt them to the daily life of their students. Under the perspective of a mediating assessment, mistakes are considered a part of the process in the construction of knowledge, and not something that demands punishment. Furthermore, under this manner of assessment, it is suggested that the teacher be

capable of creating challenging situations that favour reflection and action from the students, making learning more meaningful. For, Hoffmann (2009), unlike the manner mentioned above, classificatory assessment is vague, in the sense that it only highlights failures in the process without revealing the true difficulties of students and teachers, and without proposing any solutions for the problems in teaching-learning, because it discriminates and selects before anything else. Furthermore, the author says that evaluation should stop being a terminal moment of the educational process (as it often is today), to transform itself in the search for a broader understanding of the difficulties faced by students, promoting new learning opportunities.

Goñi (2000) explains that inclusive assessment values the pedagogical function, that is, the use of evaluations to better the teaching-learning activities regarding their social function. A characteristic of an inclusive assessment is acting as a regulatory instrument for teaching-learning processes, in a more broad manner than the traditional way, which is of external control of the performance of the students. According to the author, the suggestions are different forms of assessment, combined with an investigation of the previous knowledge of students, which will serve as a base to better approach the process, building upon what is already known, which can improve the assessment process. For the author, assessment is beyond regulatory instruments. A process that makes the student the protagonist of their learning process, progressive, in which students can plan their actions, with the possibility of correcting their mistakes. An inclusive assessment must be linked with a change in the method of teaching, with teachers who reflect upon their practices and are willing to prepare meaningful and contextualized lessons for their students.

According to Luckesi (2006), assessment in school is based on the concept of verifying or gauging the knowledge of the student. The author says that the act of verifying ends with obtaining data or information, whereas assessment implies taking a stance "In short, [...] gauging how much the students learned in school is used, in almost all cases, to classify the students as passing or non-passing" (LUCKESI, 2006, p. 91). The author affirms that, in other words, "assessment is a value judgement on relevant manifestations of reality, intending to make a decision" (LUCKESI, 2006, p. 33). In this sense, we can see that the ideas of the three authors, Hoffmann (2009), Luckesi (2006) and Goñi (2000), converge, as they disagree with assessment in a classificatory manner, but think that assessment should be emancipatory. Thus, assessment is understood as a process that starts with diagnosing the students to verify their previous knowledge, followed by the construction of new knowledge, a continuous process that should be part of the decisions of teachers in the teaching-learning process. This idea considers that assessment is one of the steps of the teaching-learning process and not its end. According to these authors, assessment must be present at every moment of the construction of knowledge, to notice changes in the students about the content.

To create a model of assessment under this perspective, clarity of purpose is needed, that is, it is necessary to think of the process as a whole, to create a project that defines what

the student should learn and for what end, thus building diverse assessment tools throughout the process.

In the same sense as the aforementioned ideas, analytic pedagogical rubrics are presented as an instrument of formative and continuous assessment that allows for the identification of the knowledge acquired by students about a specific subject or task, favouring self-assessment and making the evaluation criteria clear.

In this work, we propose analytic pedagogical rubrics as an instrument to assess the acquisition of knowledge on subjects of Physics. The intent is to communicate with teachers to provide reflections on assessment practices, looking to move away from excluding and classificatory evaluations, focusing on a formative and continuous assessment, to contribute to the teaching-learning process.

From the socialization of the results of research conducted in the realm of professional masters in the teaching of sciences (OLIVEIRA, 2018), we sought to understand energy and its transformations with class in the last year of high school, of a public school in the city of Alegrete-RS/Brazil, in a contextualized manner, through continuous evaluation, using analytic pedagogical rubrics.

II. Analytic pedagogical rubrics as instruments of assessment

Analytic pedagogical rubrics still see little use as instruments of assessment in Brazil. According to Biagiotti (2005), "their use in Brazil is still very restricted, although they already are constantly used in some first world countries". In this context, we highlight what Lüdke (2003), Roque, Elia e Motta (2004), Biagiotti (2005), Cruz e Nunes (2009), Lobato et al. (2009), Corrêa (2017) and Fernandes (2021), have been saying about the use of rubrics as instruments of assessment. According to Lüdke (2003, p. 74), "Rubrics are based on criteria established specifically for each course, program or task to be executed by students, which are evaluated concerning those criteria".

Analytic pedagogical rubrics can be used in many ways: as an instrument of assessment for teachers, regarding subjects or a task; as self-assessment of students, to make clear which criteria will be evaluated and for the evaluation of the performance of the teacher, by the students. According to Biagiotti (2005, p. 5)

> *With rubrics, students become capable of evaluating their work before it is turned in to the teacher. If the rubrics are well-made and well-detailed, the students find it easy to verify if the requirements and expectations of the teacher have been met. The more detailed they are, the less space for subjectivity will exist in this process.*

Roque, Elia and Motta (2004) point out the importance of the assessment of learning, and especially the importance of the participation of students regarding their learning. This participation can be done through pedagogical rubrics. Cruz and Nunes (2009. p. 4) state, "Rubrics instruct the students to take responsibility for their learning, moving them to

participate in activities and manage their trajectories":

> *Despite all the resources that new technologies offer, the teacher must be alert and record the movements of students and activities throughout the course so they can be used in the assessment of learning in a meaningful way without making mistakes or committing injustices* (CRUZ; NUNES, 2009, p. 4).

According to Fernandes (2021, p. 4), "rubrics can be excellent assistants to help both students and teachers to assess the quality of what needs to be learned and learning how to do it".

Furthermore, Lobato *et al*. (2009, p. 2), in our understanding, discuss the importance of the continuous assessment of learning, stating that:

> *Thus, we defend the need for the practice of an assessment based on the formative model, in which the teacher continuously evaluates the learning of the student. For this purpose, we use didactics that emphasise tasks with varying degrees of difficulty: lesser, gradual and sequential. In this manner, the teacher verifies the learning of the student, in several moments, and in a complementary manner, that is, values the previous knowledge of the student, contributing so that they become an active and critical individual.*

According to Fernandes (2021, p. 4), it is important to emphasise what Susan Brookhart[2] says regarding the nature of rubrics:

> *In truth, this author states that, although rubrics allow us to assess, they are descriptive and not evaluative in nature. Instead of judging performance, teachers and students verify which description is a better representation. Furthermore, rubrics allow for the development of an assessment with a criteria referential. This means that we are comparing what students know and are capable of doing in a given moment with one or more criteria and their descriptions, and not with an average or with a group, as is the case in assessment with a normative referential.*

For the creation of an analytic pedagogical rubric, according to Porto (2005, apud Biagiotti, 2005, p. 2), there are four important points to be considered: they must be based on the task that is intended to be evaluated; must describe levels of performance and competence in the realization of the task, observing a scale of evolution; the levels must describe any possible result on the performance of a student, and must determine expectations of performance. Fernandes (2021, p. 9) also brings up these points:

> *[...]an assessment rubric, in general, has four elements: a) the general description of the task being evaluated; b) the criteria; c) the levels for the description of performance (indicators, descriptors) for the different criteria; and d) the definition*

[2] Brookhart, S. (2013). How to create and use rubrics for formative assessment and grading. ASCD.

of a scale in which each number, letter or percentage corresponds to a specific performance indicator or descriptor.

According to Corrêa (2017), the rubric analyses the performance of the student throughout a specific activity, from development levels, and can have one of two types: global or analytic. In the global rubric, the performance is evaluated in a more general manner, that is, considers the general performance of the student, assigning a level to their development based on a criterion. In the analytic rubric, each criterion is evaluated separately, and different categories are created to better identify what the student already knows and what needs to be improved.

In short, pedagogical rubrics must have a direct relationship to the task being assessed and must be created with specific objectives. Rubrics provide an assessment of the development of the student's learning process, being an instrument that differs from those used in traditional evaluations.

In this work, the type of rubric used was analytic, and we sought to assess the development of each student based on observation criteria; an analytic pedagogical rubric was created for each task, to achieve a qualitative perspective on the development of individual students, resulting in a continuous formative assessment.

III. Creation of analytic pedagogical rubrics following MCL

Seeing the importance of analytic pedagogical rubrics as an instrument of assessment, we aim to explain how to create an analytic pedagogical rubric in this section. To create analytic pedagogical rubrics and assess the performance of each student, the first step is defining the teaching-learning objective, and establishing evaluation criteria based on it and on the chosen categories.

Recalling the four main points for the creation of an analytic pedagogical rubric, according to Porto (2005, *apud* BIAGIOTTI, 2005, p. 2) and Fernandes (2021), they must be based on the task that is intended to be evaluated; must describe levels of performance and competence in the realization of the task, observing a scale of evolution; the levels must describe any possible result on the performance of a student, and must determine expectations of performance.

The first point for the creation of an analytic pedagogical rubric is that it must be based on the task/activity that it intends to evaluate, and for this purpose, the teaching-learning objective must be defined. It is necessary to know what is important to properly evaluate the evolution of the student throughout the task/activity and to allow them to gradually improve. For example: some assessment objectives, participation in group work, problem solving, and oral presentation.

For the second point, the levels of performance and competence in the realization of the task must be described, observing a scale of evolution. Categories can be created based on

the evolution of the students, and these categories can be quantitative, attributing values to their work, or qualitative. The descriptions of the performance levels or categories are usually defined from a high to a low level or vice-versa.

For the third point, the levels must describe a possible result of the performance of students, based on the teaching-learning objective, for each adopted category. At least three options of performance levels are required.

The fourth point determines the performance expectations for each category, defining what the student learned and developed throughout the activity. The development and evolution of the student must be clear for this point.

For the construction of an analytic pedagogical rubric, under the principles of MCL, the following characteristics are considered: previous knowledge of the students, social interactions and questioning, non-centralization of textbooks, students as preceptors/representatives, principle of knowledge as a language, semantic conscience, learning through mistakes, unlearning, uncertainty of knowledge, non-usage of the chalkboard and abandonment of the narrative (MOREIRA, 2005). Furthermore, the following fundamental concepts are also considered: identification of the subsumers (previous knowledge), progressive differentiation and integrative reconciliation.

In this sense, subsumers have previous knowledge relevant to learning new concepts; as for progressive differentiation, Moreira (2011) states that more broad ideas on the content being studied must be presented at the start and be progressively differentiated, which means that throughout progressive differentiation, we give new meanings to subsumers. The third fundamental concept is integrative reconciliation, which happens as new concepts are assimilated, in a way that already existing knowledge in the cognitive structure is reorganized, acquiring new meanings (MOREIRA, 2006).

Next, we present examples of analytic pedagogical rubrics, applied for the assessment of different activities/tasks, as well as results of a sequence of activities that were applied and investigated by the teacher-researcher (OLIVEIRA, 2018).

IV. Methodological procedures

In this work, we investigated if analytic pedagogical rubrics as instruments of continuous and formative assessment of learning allow the teacher to monitor the formative process of students with the goal of critical meaningful learning (MOREIRA, 2005), in the subject of the concept of Energy and its Transformations. For this purpose, a pedagogical intervention research was conducted (DAMIANI *et al*., 2013) in which 13 students of the last year of high school participated, in Physics Classes, of an integrated technical course in Informatics. According to Damiani *et al.* (2013) and Gil (2010), pedagogical intervention research is applied by nature and has the possibility of generating knowledge, communicating with theoretical referential, producing changes, and contributing to the resolution of a problem.

For data collection, we used tests, activity itineraries filled out by students, creation of questions by students, in addition to the notes taken by the teacher-researcher. The teacher-researcher, considering the expressions of the 13 students, which are identified by a number, codified this data. Research analysis followed a qualitative approach (GIL, 2008) and the instrument for data analysis was the pedagogical rubric, discussed in this paper. That is because, due to the procedural character of monitoring, analytic pedagogical rubrics – as instruments of assessment – can highlight new significant developments in knowledge, resulting from interactions between new knowledge and the subsumer, characterizing the learning process as meaningful. "In this process, new knowledge acquires meaning for the subject and previous knowledge acquires new meanings or greater cognitive stability". (MOREIRA, 2012, p. 2). Next, we will present the sequence of activities created and applied to the class and their respective rubrics.

V. Applying analytic pedagogical rubrics in the physics classroom

In this section, we present the sequence of activities and the instrument used to assess the learning of the concept of energy, its transformations, renewable and non-renewable sources and the consumption of electrical energy (OLIVEIRA, 2018). For this purpose, the sequence with eight activities was conducted with a class of last year's high school students, in a public school in the city of Alegrete-RS/Brazil and eight analytic pedagogical rubrics were developed and applied for these activities.

The activities conducted in the classroom were diversified to teach and assess the students considering their individuality. These were carried out during three months, in a total of 24 50-minute classes, with some activities requiring one class and others requiring multiple (OLIVEIRA, 2018). In Table 1, we show a summary of the sequence of activities conducted, the teaching-learning objective of each activity and each rubric applied following the principles of MCL.

Table 1 – Activities of each meeting with objectives and analytic pedagogical rubrics.

Activities	**Educational objective of the theoretical referential**	**Analytic pedagogical rubric created for each activity**
1. Initial testing	Identifying previous knowledge (subsumers)	Identification of previous knowledge
2. Simulations	Building previous organizers and restructuring subsumers	Development of itinerary Simulations
3. Schema 1	Developing the concept of energy and its transformations (progressive differentiation)	Creation of "schema 1" on the concepts

4. Creation of questions	Creating questions related to the studied concepts (progressive differentiation and integrative reconciliation)	Creation of questions
5. Schema 2	Understanding and concretely relating energy transformation (integrative reconciliation)	Creation of "schema 2"
6. Experiments	Demonstrating, with the help of didactic experiments, the transformation of wind and solar power (integrative reconciliation)	Assembly and presentation of experiments
7. "Energy Transformations" Game	Assessing understanding of the subject matter (integrative reconciliation)	In this stage, two rubrics were created: didactic game "energy and its transformations" (learning and assessment) and didactic game "energy and its transformations" (mobilization and learning)
8. Final exam	Assessing understanding of the subject matter (integrative reconciliation)	Final exam

Source: Authors, 2020.

In the researched sequence, one activity was conducted with the students and evaluated through the analytic pedagogical rubric, and from the obtained results, based on the teaching-learning objectives, the following activities and rubrics were built. To create an analytic pedagogical rubric, the first step is to define the desired teaching-learning objective, and from there, to establish evaluation criteria related to the adopted categories. Next, we present three examples of analytic pedagogical rubrics that were created, highlighting the construction process.

Activity 1, named Initial Testing (Table 1) was about investigating previous knowledge regarding the concepts of energy, kinetic energy, gravitational and elastic potential energy, mechanical energy, thermal energy, and energy transformations. For this activity, an analytic pedagogical rubric was created, as shown in Table 2. In it, the first point refers to the activity/task to be evaluated. The criteria for the identification of previous knowledge was also created, this being the teaching-learning objective being evaluated. The second point is the title of the rubric that refers to the performance levels of students, that is, the categories that were adopted. In the third point, four categories were created Great (O), Very Good (MB), Good (B) and Unsatisfactory (I), in which possible results were assigned following the proposed activity. These categories were used in all analytic pedagogical rubrics built to facilitate the perception of the students regarding their evolution in the teaching-learning process. The fourth point shows what is expected of the performance of the student in the

activity, in order to highlight what the student learned for each category and how much they evolved from the performed task

In the rubric of Table 2, the student classified as Great (O) understood the concept of energy, made elaborate connections and noticed its transformations. The Very Good (MB) student, understood the concept of energy, made some connections and noticed its transformations. Good (B) was assigned to the student who had difficulty understanding the concept of energy and didn't make connections but noticed some transformation, and Unsatisfactory (I) students were assigned to students who did not understand the concept of energy and did not notice any transformations. From the analysis of the analytic pedagogical rubric, the level of understanding of each student became clearer, and based on that, the next activities and rubrics were developed.

Table 2: Rubric created with the criteria established by the teacher-researcher.

Category (2nd Point)				
Analytic Pedagogical Rubric	Great (O) (3rd Point)	Very Good (MB) (3rd Point)	Good (B) (3rd Point)	Unsatisfactory (I) (3rd Point)
Identification of previous knowledge (1st Point)	Understands the concepts of energy, makes connections and notices its transformations (4th Point)	Understands the concept of energy, makes some connections and notices its transformations (4th Point)	Has difficulty understanding the concept of energy and does not make connections, but notices some transformations (4th Point)	Does not understand the concept of energy and does not notice any transformation (4th Point)

Source: Authors, 2020.

Table three shows the analytic pedagogical rubric built to evaluate the Creation of Questions activity (Table 1). In this activity, the students categorized as Great (O) were the ones who created questions with a high level of complexity and based on the concepts of energy and its transformations independently, without help from the teacher. The Very Good (MB) students, were the ones that created questions with a high level of complexity, based on the concepts of energy and its transformations, with help from the teacher. The students classified as Good (B) created questions with a certain level of complexity, based on the studied subject and needed some help from the teacher. The students classified as Unsatisfactory (I) did not create questions.

Table 3: Analytic Pedagogical Rubric of the "creating questions" activity, created by the teacher-researcher in her research process.

Category				
Analytic Pedagogical Rubric	Great (O)	Very Good (MB)	Good (B)	Unsatisfactory (I)
Creation of questions	Created questions with a high level of complexity based on the studied subject independently,	Created questions with a certain level of complexity based on the studied subject, needing some help.	Created questions with a low level of complexity, needing help.	Did not create questions.

Source: Authors, 2020.

The rubric presented in Table 4 was used to evaluate the last activity Final Exam (Table 1). In this activity, the students classified as Great (O) and Very Good (MB) were those that are on the path to critical meaningful learning (MOREIRA, 2005), as they positioned themselves and discussed the subject, making it clear they differentiate and integrate concepts (MOREIRA, 2011). The students classified as Good (B) were those who still have difficulties differentiating and integrating the content, and have difficulty taking a stance and discussing their learning process and questions regarding the subject. Unsatisfactory (I) students were those who were unable to differentiate and reconcile and did not take a stance on their learning process.

With the three presented analytic pedagogical rubrics, we sought to show how this instrument could help teachers identify the learning process of each student individually. The analytic pedagogical rubric can be modified throughout the teaching-learning process to adapt to the reality and evolution of the students.

As can be seen in excerpts taken from two activities, one at the start and the other at the end of the sequence, the students showed a change in the meanings attributed to the concept of Energy, as they dedicated themselves to the proposed activities, such as reading the suggested texts, and creating questions. When questioned on the meaning of Energy, Student 1 wrote "Energy is something in movement that always changes its form as the kinetic energy of the wind moves the blades (wind power), transforming into electrical energy" (Student 1). And, in the last activity, when answering the same question, the student responded with more developed meanings, which means the knowledge acquired greater cognitive stability (MOREIRA, 2012): "Energy presents itself in various ways, kinetic(movement), elastic(deformation) solar (luminous and thermal), and can transform into

other forms, it is conserved. One example is power generation plants, which use this concept of transformation to generate electricity for us" (Student 1).

Table 4: Analytic Pedagogical Rubric for the assessment of the final exam.

Category				
Analytic Pedagogical Rubric	Great (O)	Very Good (MB)	Good (B)	Unsatisfactory (I)
Criterion: Final Exam	Understands the concept of energy in a contextualized manner, makes connections, understands its transformations, understands the consumption of electrical energy and discusses/describes the concepts, taking a critical stance on their arguments.	Understands the concept of energy in a contextualized manner, makes some connections, understands some transformations, understands the consumption of electrical energy, and discusses/describes the concepts taking a critical stance on their arguments.	Understands the concept of energy in a contextualized manner with some difficulty, makes few connections, notices some transformations, understands the consumption of electrical energy with difficulty, and has difficulty discussing/describing the concepts critically.	Does not understand the concept of energy in a contextualized manner, does not notice any transformations, does not understand the consumption of electrical energy, and does not discuss/describe the concepts critically.

Source: Authors, 2020.

Another example in the same sense was in the writing of Student 2. The answer in the first activity on the concept of Energy was "The capacity for something to perform work". However, after they participated in the other activities, the answer was richer in meaning: "Energy is something that can generate work, which means, everybody that acquires energy generates work, and it transforms and conserves itself. One example is wind power, which generates electricity through the movement of wind (kinetic energy)" (Student 2).

The focus of the activities was to place the active student in the teaching-learning process, promoting situations that should, solve problems with discussion and creation of questions, collaboratively or in small groups, meeting the facilitating principles of MCL defined by Moreira (2005). From the activity in which the students had to create a question about Energy and its Transformations, it was verified that the students created new meanings for the concepts (MOREIRA, 2012). As can be seen in the example of the question created by

Student 3:

Renewable energy sources originate from natural resources, which are replenished naturally. One example of renewable energy is hydroelectric power. These work through the pressure that water applies on a turbine, which transforms potential energy into kinetic energy, and afterwards into electrical energy. However, there is some environmental impact caused by the implementation of these hydroelectric power plants. Some of these are:

a) Floods in large areas and atmospheric pollution.

b) Deepening of the riverbed.

c) Increase in the ocean level

d) Flash floods and flora and fauna instability.

e) Change in the natural course of the river. (Student 3)

According to Moreira (2005, p. 9) "When the student creates a relevant, appropriate and substantial question [...] when they learn to systematically create this type of question, there is evidence of meaningful critical learning." That is, the activities were important to create subsumers and differentiate and integrate them, as the MCL theory proposes, on the theme of Energy and its transformations.

VI. Final considerations

In the teaching-learning process, we realize that continuous assessment is of great importance, as it detects what the student learned or did not learn, and as it is progressive, new activities can be proposed or reinforce what was worked upon in the previous ones. In this understanding, the teaching-learning activities must be diversified and the instruments used for monitoring must possess a direct relationship with the activity, and be created with clear and specific objectives, criteria and categories; "rubrics can help the grading process to be more efficient, clear, objective, fair and reliable" (ANASTÁCIO, 2021). These objectives, criteria and categories must be transparent to the students and should be introduced and agreed upon on the day of the first class, for the students to know the expectations of the teacher and reflect upon their learning throughout the process, questioning and understanding what is being assessed in each activity.

In this sense, analytic pedagogical rubrics created from a didactic proposal based on MCL are an alternative instrument of assessment that allows for the continuous identification of the student's learning process on the studied subjects and tasks. Furthermore, by providing feedback, the messaging present in each category serves as a self-assessment strategy for the students (ANASTÁCIO, 2021; BLASS; IRALA, 2021).

By the principles of MCL, analytic pedagogical rubrics allowed for the assessment of the students individually, as the introduction of subjects and activities was done gradually from the identification of the subsumers (previous knowledge): it was possible to create

activities that promote progressive differentiation and finally, integrative reconciliation (MOREIRA, 2006). That is because, with the rubrics, we have an assessment of reference created from criteria established by the teacher, which means that we are comparing what the students know and are capable of doing in a given moment with one or more criteria and their descriptions, and not with an average or a group (FERNANDES, 2021; BLASS; IRALA, 2021).

The rubrics were also versatile instruments of assessment that allowed for the evaluation of the different activities proposed by the teacher-researcher; one was created for each activity, for the itineraries of computational simulations, creation of the schema of concepts, didactic games and tests, to be used in the assessment of the students, as they allowed for the descriptive evaluation of each of these activities.

As for the future perspectives, we intend to advance in the application and use of analytic pedagogical rubrics as instruments of continuous assessment. The challenge is ensuring that the complex creation process is done in conjunction with the students. In this sense, it is essential that the teacher, faced with this collective construction, creates strategies that mobilize pedagogical knowledge that allow for the established criteria to relate to the teaching objectives and the principles of assumed learning (AMORIM *et al*, 2022). This is a great challenge, seeing as the creation of an analytic pedagogical rubric that establishes clear criteria and levels of learning, collectively, demands time, and consequently, an improvement in the working conditions of teachers.

The realization of the research, partly socialized in this text, was important for the construction of the critical knowledge of the students about the world. It was found that analytic pedagogical rubrics as instruments of assessment, while still sparsely used, allowed the monitoring of changes in the learning process of students.

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