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## MEANINGFUL MATHEMATICS LEARNING

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### *Adriane Wentz Hammarstron Soares*

Teacher at the Municipal Network, with a degree in Mathematics by: Unijuí - Universidade Regional do Noroeste do Estado do Rio Grande do Sul.

Postgraduate in Mathematics Education by: Universidade Cândido Mendes

### *Ingelburg Maria Weth*

Teacher at the Municipal Network, with a degree in Mathematics by: Unijuí – Universidade Regional do Noroeste do Estado do Rio Grande do Sul. Postgraduate in Mathematics Education from: Unijuí – Universidade Regional do Noroeste do Estado do Rio Grande do Sul Ijuí-RS

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**Abstract:** The article presents the synthesis of a project developed in first-year high school classes by teachers of the Mathematics subject linked to the Physical Education subject, which aims to demonstrate that interdisciplinarity in the teaching-learning process in Mathematics favors assimilation and contextualization of the concepts studied.

Throughout the project's application period, we sought to rescue the interdisciplinarity proposal from the resumption and expansion of concepts through the use of data collected during the development of activities provided in the Physical Education discipline.

As a result, it became visible that the exchange of information and ideas between teachers and students provided significant learning within the context studied and possible re-application in other contexts.

**Keywords:** Mathematics. Interdisciplinarity. Meaningful learning.

## INTRODUCTION

With the challenges posed by the contemporary world, we need to consider more complex conceptions regarding the construction of knowledge, as it is necessary to have coherent methodologies, which overcome the mechanical and isolated transmission of concepts, with a view to forming an ethical subject, reflective and humanized. Knowledge needs to develop skills in an integrated way, thus resulting in interdisciplinarity. Based on this thought, it is clear that in many situations' students do not connect the contents worked on between different areas, nor do they apply them in their daily lives. In this project, the aim is to develop activities that provide connections between the disciplines, as the moment we seek to exchange information between the disciplines, we begin to develop skills and abilities in an interdisciplinary way, thus bringing, a connection that provides a logical organization that helps the student

understand and allows them to link concepts to their reality.

This project was developed with the First Years of High School classes, involving the subjects of Physical Education and Mathematics, with the aim of relating them in an interdisciplinary way. According to Aurélio (2002), the word interdisciplinary means a process that establishes relationships between two or more disciplines or branches of knowledge. From this concept, we resort to Fazenda (2003) who defends the need for attitude and interdisciplinary thinking because, with the project we do not teach, nor do we learn, but we live and exercise learning, so the educator uses the student's life experiences and relates knowledge from different disciplines. In this process, the educator modifies and is modified by the exchange of experiences and knowledge. The learning that takes place through a project modifies the educator's classroom practice, because as questions arise, teaching stops being linear and begins to go back and forth, relating and connecting the studies that permeate it, until the learning happens.

According to Moreira (2019), meaningful learning is characterized by the interaction between prior knowledge and new knowledge, and that this interaction is non-literal and non-arbitrary. In this way, new knowledge has meaning for students, as it establishes meaning to their previous knowledge. Thus, it can be said that knowledge is connected to the experiences that students permeate, as they learn by participating, socializing their reasoning and acting in the face of new concepts and finding solutions to the problems proposed. The idea would not be to create a language common to all, nor to propose the use of a unified concept, but to show that there is the possibility of interdependence between disciplines. According to Silva (2008), in his article Concept, History and Obstacles

for its Implementation at School, it is very important that each individual involved in an interdisciplinary project understands the conceptual specificities that are posed. Therefore, starting through exposure and mutual agreement between the teachers involved, it is possible to apply the project, seeking to develop activities that provide connections between the aforementioned disciplines, relating them to the school's generating theme, helping the student to develop cognitive skills preparing you to present your ideas and identify a problem from different points of view, creating hypotheses and relating knowledge to ultimately solve it.

## METHODOLOGY

Throughout the development of content about functions in the mathematics discipline, we identified the lack of connection that students saw with everyday practices, facing difficulties in applicability to the concepts studied.

Observing one of the practices carried out by Physical Education teachers, we saw the opportunity to apply the concepts studied and, from this, there was dialogue between teachers with the aim of linking the practice developed to these concepts.

The project was planned at the return of the school year and began implementation in April. It started with students passing the Physical Education subject by filling out the form with their basic data regarding name, age, height measurement and weighing. After filling in the data, the Mathematics subject introduced the concept of the Body Mass Index (BMI) and the internationally adopted mathematical function, which relates the person's mass in kilograms to the square of the height measurement in meters using the BMI formula  $=\text{weight}/h^2$ . Using the data collected, each student developed their calculation and classification, thus discovering whether they

were underweight, overweight or with some degree of obesity. At this time, it was also calculated how many kilos the student who was below or above the normal weight range had a difference and discussions were also held within the groups about eating habits.

In the next step, students were instructed on motor tests that are carried out in order to evaluate their physical resistance. One of these tests consists of the 12-minute Cooper Test.

To begin the practice, the dimensions of the school court were measured and this information was recorded on each student's individual spreadsheet. There was also a resumption of time records on cell phones or stopwatches (hour, minute and second). The students developed the activity in pairs, taking turns, that is, while one of the students practiced the race, the other student was responsible for recording the times. For this, the starting point was delimited on the court and, for each lap completed, times were marked (minutes and/or seconds per lap).

During the next meetings in the Mathematics discipline, the students transcribed the information collected during the Cooper Test practice into a table which requested information about the dimensions of the court, the number of laps completed, approximately the total distance covered, the time covered in each lap, the accumulated time for each lap and the total time at the end of the route. Throughout this process, the concepts of perimeter and area and time conversions between hours, minutes and seconds were revisited.

In the next step, students were taken to the school's technology laboratory and used the Excel application, which allows the creation and editing of spreadsheets. The collected data was transferred to the spreadsheet; features of formulas, configurations and creation of scatter plots using the thrown dice were taught. The data found was analyzed

and when this information was returned to the Physical Education discipline, descriptive records were made answering questions such as, for example, do you consider the number of laps performed to be satisfactory? Why? How many times a week do you do any physical activity? Do you think it influenced your performance? Why? Has your lap time remained continuous? For you, how important is physical activity in Quality of Life?

## **RESULTS AND DISCUSSIONS**

Education, in its main objective, consists of the development of human beings in terms of their skills and abilities, and the school must guarantee the existence of possibilities and paths for the appropriation of this teaching to all students, guaranteeing their integral development.

According to Skinner (1972), teaching is understood as an activity that must prepare the student for the future, enabling the development of skills and the acquisition of knowledge about the world and about themselves, necessary for their survival as a member of the species, as an individual and as a participant of a culture.

To contemplate the teaching/learning of students in a meaningful way, new concepts need to be related to concepts already worked on with students and/or created living situations in order to provide the student with exploration and experience, allowing them to integrate, resulting in a concrete construction, in order to learn to visualize concepts in their daily lives and allow analysis and decision-making within the needs that permeate their daily social reality, thus allowing the student to interact as a participating being, conscious and responsible in the development of citizenship.

The idea of developing dialogues between two or more disciplines arises to break teaching paradigms in an individual and

isolated format so that these students can actually build connections between theory and practice to actually develop them as a complete individual.

Throughout the development of the project, previous concepts could be revisited and deepened, in addition to the construction and understanding of new ideas such as, for example, area and perimeter of a flat figure, numerical value of an expression, operational calculations with rational numbers, representation of a function, analysis of dependent and independent variables, creation, reading and interpretation of tables and graphs. Questions regarding self-knowledge and self-esteem were also addressed, as some students expressed fear about sharing their classification on the Body Mass Index (BMI), in addition to guidance on the food pyramid and encouragement to practice physical activities. According to the Physical Education teacher's report, there was greater commitment from students throughout the development of physical activities, since the data collected would be used in another subject.

## **FINAL CONSIDERATIONS**

Throughout the implementation of the project, greater interest was observed on the part of students in relation to the activities, since it took place in an interdisciplinary way. It was visible that the exchange of ideas between teachers and the applicability of the project throughout classes involved students in relation to responsibility, data analysis, critical thinking, among others. Furthermore, it encourages teamwork, which results in greater understanding, creativity and communication between the people involved, achieving the success of interdisciplinary work and allowing them to become agents of their learning.

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