

## THE CONCEPT OF AFIM FUNCTION IN THE SCOPE OF ETHNOMATHEMATICS INVOLVING PROGRESSIVE DIFFERENTIATION AND INTEGRATING RECONCILIATION<sup>1</sup>

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**Abstract:** Efforts aimed at improving the quality of teaching by researchers and professors are as varied as possible. In this study, the potentiality of the contextualized formulation in the form of a support text is investigated, taking into account cultural aspects shared by a certain social group. It is expected that the exploration of the concept of 1st degree polynomial function, involving the contextualization of energy consumption within the scope of ethnomathematics and Ausubelian processes that favor meaningful learning, will help to characterize that teaching mathematics can be less formal and more dynamic.

**Keywords:** Ethnomathematics, progressive differentiation and integrative reconciliation, 1st degree polynomial function.

## INTRODUCTION

In the last sixty-five years, many attempts have been made with the intention of providing impactful reformulations in the teaching of mathematics. To allude to these attempts, it is enough to register the emergence of related areas such as: ethnomathematics, modeling, new technologies, etc. At the present time, despite advances in this direction, such investments in teaching in a comprehensive way still transit between forms with an emphasis on content and those that focus on the formation of citizens in their complexity.

With this, it is not difficult to conceive that teaching and student tasks also increase in terms of complexities. In this study, in order to deal with teaching that promotes both the formation of citizenship and the adequate acquisition of mathematical knowledge, ethnomathematics was chosen as a research field in mathematics education.

Among several aspects, in this investigative field of the classroom, the teacher can verify the existence of multiple

possibilities to plan activities that allow the construction of meanings of various contents, exploring sociocultural aspects. In the literature, there are already studies that corroborate these previous arguments, for example, just observe what Cunha (2005, p.12) states:

[...] Ethnomathematics can be used to provide theoretical support and practical ingredients to simultaneously solve the problem of student demotivation and low performance, who could start to feel culturally valued and encouraged.

Given the information presented so far, the teaching aimed at in this study must be characterized in order to promote the acquisition of mathematical and social meanings supported pedagogically in the context of meaningful learning (AUSUBEL, 2002). Therefore, investments are made in the planning of didactic resources of the type of support text, exploring a given context of the group that will experience the text produced.

In this context, it must be noted that the mathematical subject addressed, a function of the 1st grade, needs to awaken interests in the group of students investigated both mathematically and in personal issues of their experiences as citizens. For this reason, the option was made to explore the content based on the planning of a support text, articulating it with the consumption of electricity in the lives of citizens.

## THEORETICAL FRAMEWORK

In this part, an attempt is made to summarize certain aspects of ethnomathematics and meaningful learning that will be used in this study.

## RELATIONSHIP OF STUDY WITH ETHNOMATHEMATICS

Human survival, as a living being, happened precisely through its interaction

with the environment in search of protection and nutrition, as pointed out by D'Ambrósio (2011). And he complements by arguing that, by increasingly seeking independence from time, man was able to develop techniques, ways of obtaining the necessary elements from nature without depending on time.

In a simple way, it illustrates that, through these techniques in tasks such as counting time, measuring area, etc., man was able to organize mathematical knowledge and also be able to observe events that occurred in the sky. The acquisitions, when shared between the groups, originated the so-called culture which, according to D'Ambrósio (2011, p. 35-36): “[...] is the set of compatible behaviors and shared knowledge, it includes values. In the same culture, individuals give the same explanations and use the same material and intellectual instruments in their daily lives”.

However, it is necessary to present, among the multiple conceptualizations of culture, one that is relevant in the case of this study. For Marconi (1998), a subculture can be understood as something constituted by values, beliefs, norms and standards of behavior that can be shared by part of the population of a society and, relying on Ralph Linton, characterizes culture as an aggregate of subcultures.

In this respect, as Horton & Hunt (1980) argue, “Subcultures are important because each complex society has, not a single culture, but a common core of traits and complexes, an assortment of subcultures”. (p.45). Such idealization serves as a basis to show that as each environment becomes different, the knowledge produced by a given social group when sharing it also becomes different from the others.

Thus, the methodological teaching proposals result from the use and observation of the existence of mathematics in their own contexts, however, as Bello (1996) points

out, according to Flemming (2005, p. 37) “Ethnomathematics must not be understood only as an existing mathematics in called ethnic groups or ethnic groups. This is the knowledge produced by identifiable sociocultural groups and which allows solving problems not solved by institutional knowledge”.

## **RELATIONSHIP BETWEEN STUDY AND MEANINGFUL LEARNING**

Meaningful learning, proposed by Ausubel (1982), demands the relationship between new information and some specific and relevant aspect existing in the individual's mind. It is an interactive relationship that does not happen in any way, but in a substantive and non-arbitrary way, in that order, that is, not literally and not with any previous idea, but with some specifically relevant knowledge already existing in the cognitive structure of the subject who learns. (MOREIRA, 2013).

The occurrence of learning, therefore, depends on the interaction between what will be added to the individual's cognitive (something new) and what the learner already knows (something pre-existing). To the existing knowledge in the individual's cognitive structure, Ausubel calls subsumer and informs that these allow the meaning of the new knowledge that is being presented and/or discovered.

These considerations are very evident from the following information from Moreira (2013, p.6): “Both by reception and by discovery, the attribution of meanings to new knowledge depends on the existence of previously relevant knowledge and the interaction with them”.

The acquisition of new information involves the structure of interrelated and hierarchically organized subsumers characterized by progressive differentiation and integrative reconciliation, which are two

processes that favor meaningful learning. Moreira (2011) points out that this first process has the principle of prioritizing the presentation of the most general and inclusive ideas followed by the detailing of these ideas; the second process deals with exploring relationships between existing ideas, that is, pointing out the important similarities and differences between concepts related in the search for a more general idea.

## **METHODOLOGY**

Methodologically, research can be quantitative, qualitative or mixed. What for Creswell (2010), are, respectively, means to test theories from the relationship between variables, means to understand the meanings that individuals and/or groups attribute to a certain social/human problem or an approach that associates the two previous. According to Silveira and Gerhardt (2009, p. 31) “Qualitative research is not concerned with numerical representation, but rather with deepening the understanding of a social group, an organization, etc”.

The methodology adopted for the preparation of this work has the purpose of enabling the understanding of the acquisition of the concept of affine function by a group of students in the ninth year of basic education, involving progressive differentiation and integrative reconciliation as processes that favor meaningful learning. The conceptualization will explore everyday activities that may be related to the consumption of electricity and will be carried out within the scope of ethnomathematics while researching Mathematics Education.

## **PROCEDURES AND INSTRUMENTS**

This work was planned to be developed in three stages. The first consists of applying the diagnostic questionnaire with the purpose of raising the previous conceptions of the

group of students about affine function and ethnomathematics in order, in addition to guiding teaching as recommended by Ausubel (2002), to plan a support text according to Silva (2006; 2011).

In the second stage, there will be an intervention that will have 2 moments. In the first one, students are introduced to basic notions about electricity with the intention of enabling conditions so that they can understand the process of measuring energy consumption from certain household appliances. The information obtained must be properly recorded, for example, listing the electronic devices that exist in the school, organizing the data (energy consumption) in charts and tables, accounting for the energy consumption of each device as well as calculating the weekly energy bill and school monthly.

In the second moment, in the collected information, the notions of correspondence, dependence, transformation or results of a movement will be worked on, which are ideas recommended by Lima et al (1998) in order not to make the definition of function too formal and static, as usually found in the school texts.

The third stage consists of applying the evaluative questionnaire to verify, together with the activities experienced throughout the intervention, whether there are implications due to the Ausubelian processes of progressive differentiation and integrative reconciliation in the context of ethnomathematics in learning the concept of affine function.

## **EXPECTATION**

In this work, after analyzing the data collected in the activities that make up the support text used in the intervention and, in particular, in the confrontation between the questionnaires versus learning assessment, the aim is to identify whether the exploration

of the concept of affine function in the context of consumption of energy enables a significant learning of this mathematical idealization, devoid of the exacerbated and static formalism highlighted by Lima et al (1998).

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