THE ICT IN THE SECONDARY LEVEL CURRICULUM: AN MATHEMATICS TEXTBOOKS ANALYSIS
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Abstract
This communication is within the framework of a PhD project\(^1\), where one of the objectives is to develop a comparative analysis of how the syllabus for Mathematics A and for Professionals Courses (CP) integrate the technologies and how these technologies are discussed in school textbooks.

Attempts to characterize the language used in different types of textbooks, with a view to developing an analytical tool, presents here a part of review of literature on the Theory of Social Activity, which is rather directed to the analysis of textbooks.

The issues of language, particularly the language of mathematics, are second Dowling (1998) a good starting point for a study. The aim is thus to characterize the different kinds of language according to its intended audience.

1. Introduction

Currently, school textbooks, in their different versions, continue to be privileged mediators for the teaching-learning process. With the increased stakes in vocational education, it is natural the appearance of textbooks dedicated to it addressing mathematical content in a way essentially more practical, making intensive use of ICT’s.

A textbook should lead to the establishment of a pedagogical relationship between its authors and its content with whom it is intended, its target audience. To be considered pedagogic, a text, according to Dowling (1998), must involve subjective relationship between two positions on the one side, that dominates what should be taught, and on the other, someone with little or no knowledge about it. Dowling calls this relationship a pedagogical relationship.

In a former study (Carvalho, 2006, 2009) I developed an apparatus that allowed me to analyze the type of mathematical tasks proposed in textbooks by level of use of the graphing calculator. In order to extend the study, to both syllabus, Mathematics A and for Professionals Courses (CP), I’ve studied the Paul Dowling’s Theory of Social Activity, looking, in a first stage, for and characterize the different kinds of language of school textbooks, used or should be used, according to its intended audience. In a second stage, look for significant differences in the mathematical tasks which requires ICT’s in both syllabus. After that stage I intend to be able to answer the questions proposed in my PhD project.

2. About discourse

The greater or lesser complexity of discourse adopted in school textbooks, which Dowling, (1998) calls discursive saturation, is closely related to the pedagogical action being developed. The discursive saturation is directly related to metonymy and metaphor. When one looks at the mathematical expressions as a series of mathematical symbols, ideally exemplified in a

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mathematical equation or a demonstration, mathematics should be seen as a metonymy, presenting a high discursive saturation. Moreover, if the school mathematics often involves references to objects and not mathematical relations, then seemed to have a metaphorical relationship, a low discursive saturation.

In any discourse, discourse as a form of communication, there is always an author and reader. This is what interprets the categories Dowling (1998) author and reader as the principles of text analysis. A pedagogical text is discourse within a context of a pedagogical relationship, which implies a pedagogical subject and one or more pedagogical objects.

According to Bernstein (1971, 2003) the discourse can be classified in two ways. One related to his specialization, which is to say, each discourse is itself a category having its own identity and boundary. Referring us to a school context of subjects, these borders make even more sense. The second point relates to the expression (language). A mathematical expression has symbolic connotations with Portuguese, but the connotation with the non-mathematician is short. If the expression is translated into regular Portuguese the content remains intact within the context of mathematics, but the mode of expression is less specialized.

3. The Social Activity Theory – a brief and short presentation

Activity is to be understood as the contextual basis of social practice, so any particular activity should specialize practices and an activity establishes one or more positions which may be occupied by individuals, and these positions, specialist positions.

The relationship between practices and positions associated with a particular activity is as follows: an activity regulates who can say, do or give meaning to what, i.e., the mathematics education builds a hierarchy of positions between teacher and students of different ages and abilities, this is achieved by the practices distribution of school mathematics (mathematical knowledge and pedagogy) through the hierarchy.

Practices and positions of an activity also take the form of text, a text is an utterance (linguistic and / or non-linguistic) or a set of sequences of speech made through the context of one or more activities. For Dowling, the empirical object of analysis is the scheme of school mathematics. Pedagogical texts build the authors as transmitters and readers to acquirers; the transmitter is in possession of the principles regulating the practice of activities that the purchasers will acquire. Transmitters and acquirers are textual constructions which are achievements textual positions. The instantiation of practices will be referred to as message, the instantiation of positions will be referred to as voices. Dowling assigns three levels to the Theory of Social Activity: The Structural, the Textual and the Resources.

3.1. The Structural level: Activity

3.1.1. Practices: Domain

The global semantics includes forms of expression and content relating to signifiers and signifieds. These are articulated as wholes that are relational activities, i.e., their practices and positions. Dowling says that the school mathematics specializing their practices and subjectivities enough to be referred to as activity. If the content and the expression is purely mathematical the text is classified within the Esoteric Domain. When the content is weak in a mathematical sense but strong as mathematical expression the text is classified in the Descriptive Domain. With a text exhibiting both weak mathematical expression and content is classified in the Public Domain. The Expressive Domain is the classification when the content is strong but the expression is weak. The domains of practice can be succinctly summarized in a table below.

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3.1.2. Practices: Discursive Saturation

Mathematics is a natural field for the emergence or existence of a discourse grounded in rigor and formal proof, and accepted that. Even the school mathematics has generally a high degree of discursive saturation compared with other school subjects.

The crucial distinction between practices exhibiting high discursive saturation (DS+) and low discursive saturation (DS-) are located at the level of principles of organization of discourse. That is, there is related to the fact that the practices (DS+) present at level of discourse, a highly complex organization and exhibit compared to a (DS-) practice a complete articulation.

3.1.3. Positions

Pedagogical activities such as school mathematics construct a hierarchy of positions, i.e. positions must build transmission and acquisition. There are dominating and subordinate positions. The most dominant positions exhaust the practice of an activity, which is the case that Dowling calls subject. The process of creating 'subject' is aptly referred to as apprenticeship. The figure below resumes the structural level

3.2. The textual level

Practices and positions corresponding to the structural level of activity, voices and messages correspond to textual level. Messages and voices are the direct product of the analysis of a certain text, i.e. the production of a text as text from a text to work. Dowling describes a pedagogic text, in the language of description, as an interweaving of textual strategies that position and distribute voice messages.
3.2.1. **Voices and positioning strategies**

Any text monological voice is a limit corresponding to a subset of positions built by the activity. It is hoped that the voice of the author of the text corresponds to the position of subject of activity. The text should be one or more voices of the readers to whom is assigned a greater or lesser degree of potential authority. The voices of the authors are dominant and the readers are subordinate, the latter can be arranged hierarchically.

3.2.2. **Message and distributing strategies**

The distribution of strategies can expand or limit the scope of the message. The expansion strategy by extending the message to be distributed to a given voice in scope (intensive and extensive) topics of esoteric domain and scenarios recontextualized (public domain). Limiting strategies affect the narrowing of the message in terms of topics and scenarios.

3.3. **Resources**

The production of textbooks can frame different kinds of verbal texts, literary styles, pictures of different types, different types of connections, etc. Thus, the textual strategies are carried out in educational tools through the implication of what will be referred to as resources. These resources are essentially semiotic, assuming as significant modes. Significant modes, describe how the relationship between expression and content which is implicated in the production of signs, refers to a particular repertoire of resources which are implicated in the localization and generalization of strategies.

Dowling lists three significant modes, iconic, symbolic and index, and establish a scale for them. That scale is directly related do text produced, the resource also helps in the construction of the reader.

4. **Conclusion**

Dowling's analysis points to the question: how does the textbook selects and distributes the mode of transmission of mathematical knowledge? Dowling wants to claim that any text pedagogical constructs both the message as the reader in a way that is consistent with the conditions about which it participates.

In this sense, the study on which this text falls, seeks to determine whether, in one hand, if different textbooks for the different syllabus help in the construction of different readers through the varying complexity of the discourse employed. In the other hand, if mathematical tasks relating to a content involving ICT's are presented in different ways using different programs.
References and Bibliography


