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METADISCOURSE MARKERS IN SCIENCE SCHOOLBOOKS AS
FACILITATORS FOR METACOGNITIVE REGULATION OF
LEARNING

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Abstract

The level of competence students has for the metacognitive control and regulation of own learning is constantly associated in recent literature with the effectiveness of their learning. The strategic learning and metacognitive control skills can be acquired in the school specific mediated learning situations given the adequate support from the teacher. The present paper underlines the importance of supporting students' metacognitive regulation of learning through specific prompts and signs that can be used in the construction of the teaching discourse. In the study, we conducted we focused on the written didactic discourse of the school text books which we considered a source of knowledge and a specific form of didactic discourse. We analyzed the metadiscourse markers in two sets of secondary school Science textbooks in terms of types and frequencies of their occurrence and their implications for supporting the metacognitive regulation of students' learning. Generally, the literature states the importance of metadiscourse elements as features of rhetorical writing that support the reader in constructing the meaning of the message conveyed. Yet, there is little research that analyses the role of the metadiscourse markers included in didactic texts for creating a supportive connection between the author of the text and the students and for helping learners to strategically approach the contents included in the schoolbook. Our exploratory study aims at identifying principles according to which the metadiscourse components can be employed into the written didactic texts in order to support students' autonomous and metacognitive learning.

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Keywords: Metadiscourse markers, metacognition, science learning.



1. Introduction

1.1. Training of metacognitive regulation skills

During the last four decades, since Flavell firstly defined the concept of metacognition, the metacognitive regulation of learning was adopted as an educational principle and was instrumented with relevant educational approaches that are increasingly present in school life and culture.

This tendency is strongly justified by research and important educational policy measures. Thus metacognition is one of the fields of competence frequently stated in the recent literature as a key of effective school learning. As mastering of metacognitive strategies is considered one of the main features of the expert learner (Mih, 2010) their training increasingly becomes an objective on different specialties teachers' agenda (Tanner, 2012).

In a larger perspective, learning how to learn represents one of the eight main fields of training listed by the European Commission as essential for preparing students to become lifelong learners (*Recommendation 2006/962/EC*) and in this context the training of students' metacognitive awareness and regulation skills is an essential educational approach.

The fact that metacognitive regulation can be trained in the school environment and within the school programme is a commonly shared idea in recent pedagogical literature. Specific data argues in favour of certain educational conditions that must be considered in metacognitive training. While specific strategies that encourage self-awareness and self-monitoring are presented (e.g. guided think-aloud strategies, apprenticeship strategies, reflective thinking strategies as general approaches or planning reading, predicting meanings before reading, monitoring comprehension while reading, – for reading tasks), it is agreed that teaching strategies itself is not enough. Research data support the idea that undertaking the responsibility for own learning can be encouraged through modelling of learning behaviours and thinking processes, peer teaching, class discussions and differentiated guiding approaches (Bransford, Brown & Cocking, 2002). In other words, the contextualization of the specific metacognitive strategies must take place. Namely, specific learning situations that are integrated into subject matters must be designed where students to be offered relevant opportunities to externalize, monitor and regulate their thinking (Zohar & David, 2009). It is what Tanner (2012, p.116) refers at as “a classroom culture grounded on metacognition”, that is a classroom environment where students' current understanding state and learning needs are acknowledged and addressed, active learning, self-questioning and reflection are encouraged and teaching goes beyond informing and towards facilitating students' autonomous learning. This type of learning environment can be designed through curricular decisions that are taken in relation with the guiding curricular documents as well as in relation with different daily expressions of the applied curriculum which are the current relations and educational roles, learning situations or learning materials. The present paper explores a category of means that define the school culture that supports the metacognitive training that of schoolbooks and school books contents and discourse.

1.2. School book as a learning material that support metacognitive regulation

One of the means through which learners can be directed towards metacognitive regulation of learning is through teaching materials (Rajabi, 2012). Cognitive organizers and metacognitive prompts

existing in school learning materials are reported in the field literature as means for scaffolding learning (Rajabi, 2012) that facilitates involvement of students in taking micro decisions related to own learning planning, monitoring and regulation (Bransford, Brown & Cocking, 2000).

Schoolbooks are the particular type of learning support materials and texts that we are focused on in the present paper as they usually are accessible to all students and traditionally represent a main piece of curriculum product that teachers refer at as an additional information and applications source. Moreover, school textbooks are designed as supports for home learning. Independent use of schoolbook contents almost permanently requires metacognitive regulation in relation with topics such as: anticipating the quality and importance of contents and prioritizing their reading, differentiated allocation of effort and attention for different types of stimuli in function of their relevance for the preset objectives, deciding on the order materials will be followed through and on the significance, they are given by the reader. These decisions may be facilitated by construction of schoolbook contents that are saturated in textual and metatextual elements which orient users' attention and reading effort such as well-placed titles and subtitles, emphasized keywords, marked syntheses of information, underlined correlations and connections between ideas and parts of the text, visual representations of contents (schemes, figures, images), repetitive patterns of content structure and textual elements of metadiscourse. These elements may be used to create an interactive mode of school contents delivery that seems to facilitate metacognitively self-regulated learning (Rajabi, 2012; Hyland, 1999).

In Romania, the legislation which defines the methodologies for school books evaluation reflect an understanding of schoolbooks role as a support for effective learning. There are two main criteria that refer to the extent to which the evaluated schoolbook supports learning through coherent presentation of contents and active participation of learners in contents use, and through the quality and accessibility of language employed (OMEC, 2013). Yet, at this level, the references are general and do not include specific means that schoolbooks must illustrate for facilitating students' interaction with contents towards a more effective learning.

Nevertheless, the existing national research on the significances that secondary school teachers and students give to school manuals (Cuciureanu, 2011) emphasize that teachers mainly consider the present overloaded curriculum and manuals as unattractive, obsolete and as not helpful when trying to meet students' learning actual needs and interests and to motivate them for relevant learning. In their turn, students regard the schoolbooks as too much information focused and as too difficult. A real need for renewal of schoolbooks is obvious and the discussion of specific features school manuals must include to support effective learning becomes very relevant in this context.

In the international literature, Hyland (1999) refers to the status of textbooks as a curriculum genre that while including a classroom-based discourse, reflects textual features and knowledge conveying conventions that facilitate learners access to disciplinary communities. In this context, he emphasizes the importance of metadiscourse elements that writer uses in order to involve the user in an active use of the contents presented and to respond to their expectations, needs and prospected reactions in relation with the text.

1.3. Elements of metadiscourse. Metadiscourse in schoolbooks

Metadiscourse is a relatively new field of research, associated with the “discourse about discourse” general definition of Vande Kopple (1995, p. 83). It refers to elements of text writers use in order to explain the readers/users how the text must be received, to guide the reader in the interpretation and processing of the text (Graff & Birkenstein, 2015, Gholami, Tajalli, & Shokropour, 2014), to signal his awareness on the readers particularities and to create a relation with the virtual reader (Hyland & Tse, 2004), to influence users attitudes, motivations, involvement in the understanding of the text.

Intending to order and justify the various metadiscourse markers, Hyland categorized the metadiscourse features in two large groups:

Interactive – focused on giving a sense of the organization of information so that the reader will find “coherent and convincing” (Hyland & Tse, 2004, p. 168). According to the authors mentioned, this category includes: code glosses (rephrasing, illustrations, examples etc.), endophoric markers (references to other parts of the text), evidential, frame markers and transition markers.

Interactional – focused on involving the reader into the content and on creating a responsive connection with the user of the text (Hyland & Tse, 2004, p.168). The categories of interactional metadiscourse markers described by the above-mentioned researchers are: attitude markers, engagement markers, hedges, boosters, and self-mention (personal) markers.

Table 02 included in the data reporting section describes shortly each of the mentioned subcategories we have chosen to consider for our research. Existing research data support the correlations between use of metadiscourse markers and level of reading comprehension, quality of writing, quality of translations from English language, level of users’ manipulation etc. yet, there is little inquiry on the effect metadiscourse markers may have on supporting the students’ metacognitive regulation of their own learning.

2. Problem Statement

Existing research data support the correlations between the use of metadiscourse markers and level of reading comprehension, quality of writing, quality of translations from English language, level of users’ manipulation etc. Yet, there is little inquiry on the effect metadiscourse markers may have on supporting the students’ metacognitive regulation of their own learning. While such a correlation may well be anticipated, the reality of Romanian science schoolbooks illustrates very diverse uses of metadiscourse markers both in terms of their frequency and typology. Consequently, we focused in the present research on a preliminary analysis of the didactic discourse included in two sets of lower secondary chemistry school books from the perspective of their saturation in metadiscourse markers. We focused on identifying both different markers’ frequency and typology.

3. Research Questions

In studying the problem stated above, the following specific research questions were addressed:

What is the frequency and typology of the metadiscourse markers in the evaluated chemistry schoolbooks?

Are there differences in the frequency of metadiscourse markers used in two of the approved alternative schoolbooks produced for each of the two school years considered in the research (7th and 8th grade)?

Are there differences in the typology of metadiscourse markers used in two of the approved alternative schoolbooks produced for each of the two school years considered in the research (7th and 8th grade)?

4. Purpose of the Study

We conducted the study of typology and frequency of metadiscourse markers included in the two selected sets of secondary school chemistry textbooks with the intention of offering preliminary data that could emphasize the importance of these communication features for encouraging students' metacognitive regulation of own learning that has as the main support the school support materials.

5. Research Methods

The object of our study was the learning content of two sets of Educational Ministry approved alternative schoolbooks used in the Romanian educational system in the introductory years of teaching chemistry: 7th and 8th grade of gymnasium (Fătu, Stroe & Stroe, 2008a; 2008b; Gheorghiu, 2005a; 2005b). In Romania chemistry is structured as an independent school subject firstly thought in the terminal years of lower secondary school. While some elements of content imply elaboration of basic knowledge already acquired at primary school level (ex: basic knowledge on the main physical and chemical phenomena), most of the contents are new and regarded as complex and abstract by the students. Consequently, an important challenge that may be interesting to address is that of motivating secondary school students to engage in studying chemistry.

The schoolbooks selected were edited by different editing houses and had different authors. Yet, we selected schoolbooks of the same authors for the 7th and 8th grade respectively and we were also interested to identify schoolbooks that were compatible and similar from the perspective of their obvious orientation on reflecting the logic of learning and on generally on being supportive for independent study. In the case of both school levels, the selected manuals respected the requirements of the core curriculum in terms of imposed topics. We decided to focus our analysis on the following topics existing in both sets of schoolbooks:

Table 01. Contents sample

School grade	Topics	General number of words I the selected texts	
		Schoolbook A	Schoolbook B
7th grade topics	Introductory chapter Structure of the substances. The atom. Structure of the atom. Periodic Table of Elements. Ions and Molecules	4748	3492

8 th grade topics	Introductory chapter Classification of chemical substances. Simple substances with practical utilities. Nonmetals (Hydrogen, Oxygen, Carbon). Metals (Aluminium, Iron, Copper)	3976	3649
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The data regarding the typology and the frequency of the metadiscourse markers was collected according to the typology of Hyland and Tse (2004) and was analyzed comparatively, yet distinctively for each of the two school levels.

6. Findings

The quantitative data shows that even though the total number of metadiscourse markers used by the authors of each of the two sets of texts are similar (when comparing schoolbooks of the same grade), there are clear differences in the occurrences of different subcategories.

Table 02. The frequency and type of metadiscourse markers in the studied schoolbooks

Metadiscourse markers	7th grade schoolbooks		8th grade schoolbooks		
	A	B	A	B	
Interactive	Transition markers (examples, causal relations, temporal structures)	36 (15.9%)	9 (4.6%)	21 (18.5%)	15 (10.4%)
	Frame markers (structure parts of the text, label stages of processes, announce targeted objectives)	67 (29.6%)	51 (26.4%)	35 (30.9%)	46 (31.9%)
	Endophoric markers (send reader to other parts of the text, focus reader's attention on previous contents)	14 (6.1%)	9 (4.6%)	9 (7.9%)	29 (20.1%)
	Evidentials (references to other sources)	16 (7.07%)	6 (3.1%)	6 (5.3%)	4 (2.7%)
	Code glosses (announce rephrasing, explanations, illustrations)	18 (7.96%)	6 (3.1%)	12 (10.6%)	6 (4.1%)
Total	66.8%	41.9%	73.4%	69.4%	
Interactional	Boosters (state certainty)	7 (3.09%)	2 (1.02%)	2 (1.7%)	4 (2.7%)
	Attitude markers (indicate writer's qualitative evaluation of a contents)	12 (5.3%)	13 (6.7%)	11 (9.7%)	9 (6.2%)
	Engagement markers (evoke readers in order to engage them into the contents)	52 (23%)	90 (46.6%)	14 (12.3%)	17 (11.8%)
	Self-mentions (authors refer to themselves as persons or authorities or makes personal procedural references)	4 (1.76%)	7 (3.6%)	3 (2.6%)	14 (9.7%)
	Total	33.1%	58.03%	26.5%	30.5%
GENERAL TOTALS	226	193	113	144	

Thus, in the 7th grade schoolbook which we may consider an introductory learning material for Chemistry, the total metadiscursive markers of textual, interactive type is sensibly different in the two texts. The schoolbook that includes ampler contents (according to the number of words analysed) also uses more organisational metadiscourse markers (66.8% in textbook A comparing with 41.9% in textbook

B) with a specially important difference on code blocks markers in favour of text A. In the same time, the second schoolbook is focused more on creating an interaction with the reader/user (58.03% in textbook B comparing with 33.1% in textbook A), an observation which is also supported by the larger number of engagement markers in text B (90 occurrences, comparing with 52 in text A). The presence of engagement and personal markers in the introductory schoolbooks insure a more personalised and direct voice of interaction between the epistemological authority (writer) and the students, a variable which is correlated in the literature with an increased motivation for study of sciences (Moreno & Mayer, 2004).

In the 8th grade schoolbooks the total number of metadiscourse markers decreases, as the texts are obviously more informative in the case of both of the compared texts. Yet, there is a significant difference in the case of transition markers in favour of text A which is saturated in connections with practical implication of presented knowledge (examples, illustrations, causal relationships: 18.5% comparing with 10.4%) and in the case of endophoric markers for the text B, which is very much focused on addressing directly to students and on activating their previously acquired context of learning (20.1%).

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7. Conclusion

The schoolbooks texts are sources of knowledge that is structured so it reflects not only the logic of science but also the logic of learning. While the discourse in school textbooks is very different according to its specialty and educational role, there can be identified certain patterns in the use of metadiscourse markers in order to guide students' metacognitive regulation of own learning. In this respect, not only the frequency of the interactional and interactive markers is important, but also their type as the prevalence of certain categories of markers give the general orientation of the discourse and encourage a certain level of responsible learning of the student.

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