

Communications

A "Novel" Approach to Texts

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Some parts of the educational scene are so deeply entrenched and so taken for granted that we fail to entertain the possibility of alternatives. It is difficult, for example, to imagine schooling anywhere in the world in the absence of lessons, class periods, school buildings and even vacations. Embedded within that terrain is the ubiquitous textbook. Although we tend not even to conceive of the possibility of alternatives, there have been several efforts in that direction in recent years [1]. In order to convey the flavor of an alternative style—the novel—we have created our own brief scenario, one which involves mathematical content. Against this scenario as a backdrop, we will then unearth various assumptions about knowledge, inquiry, research and learning embedded in the traditional text.

An example of "novel" format

Amy was doodling on her pad next to the telephone as she was talking with Joanne about how the world began.

"Don't you believe really that God created the world and everything in it?" Joanne asked.

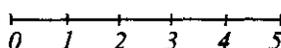
"I don't know really what I believe," said Amy. "My father has always told me that things have causes, and we have to find those causes if we really want to understand them. But then he tells me that it's important to go to church, and I can't really get him to talk about why it's so important. Do you think he can really believe in God?" said Amy.

"What do you mean?" asked Joanne.

"Like, do you think he believes that God was always there? Like, if God was always there, who created God, and what was the first thing he did?..." Amy began sucking on her long blond hair. She noticed that while talking she had been drawing something resembling the picture below:



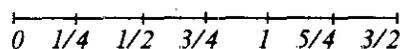
Why had she drawn that? At first it reminded her of a part of a barbed wire fence. She was pondering the question of whether or not everything has a beginning, when it occurred to her that the picture looked like a number line that her math teacher had drawn in class the day before. She found herself putting numbers beneath the line:



She thought of herself walking along that line, and realized that if 0 was her starting point, then 1 would be the first number she would hit: 2 would be the second one, 3 the third one, and so forth.

Then she thought of herself as a bee and the numbers on the line were flowers from which she gathered nectar to make her honey. She looked forward to arriving at each flower with great joy. She would tell the second flower what the nectar was like from the first flower: she would tell the third flower about some fellow bees she met at the second flower. She no longer heard what Joanne was saying at the other end, but she said "Um hum" every so often just to keep the conversation going.

As she thought of the number line, she remembered that her math teacher had recently been telling them about fractions. She decided to put some of these fractions on her number line:



She became a bee again and asked herself what would be the first number she would touch as she moved along the line from 0. That seemed easy, 1/4. But then her mind jumped to another thought: many numbers were missing from her number line. She placed 1/8 in between 0 and 1/4, and decided to include 1/8 spacing all along the line. But that wasn't enough... She found herself asking what was the first fraction after 0 that she'd hit if she were a tiny organism crawling along the number line. She was very upset by the question. She could not answer it because every time she found a small fraction she was able to find a smaller one.

Then Amy became frightened—in a way that she remembered becoming frightened as a little child—lying in bed at night, and wondering what would happen if she were floating around in the universe and she suddenly came to the end. Maybe there was no end. She didn't know which of the two possibilities was more frightening. Was this like the question about the beginning of the world? she wondered. Was the question a good question? She wondered about that too. What was a good question? ... All of a sudden she heard a click at the other end. Oh, no! Now she wanted to talk to Joanne, her closest friend, more than ever. Would Joanne be upset with her? She hoped not, but she realized it hadn't been nice of her to forget about Joanne completely, however interesting her thoughts... She should call Joanne back immediately, and explain. After all Joanne was a friend and she would understand.

Analysis of differences between textbooks and novels as forms of exposition

In order to better analyze the essential differences between these two forms of exposition, we have identified and used a number of categories:

- 1) emotional involvement of the reader
- 2) motivation to read the book
- 3) characteristics and organization of the information
- 4) conception of truth
- 5) kind of learning produced in the reader

For convenience, they will be analyzed separately although there is considerable overlapping and interaction among them.

Emotional involvement of the reader

One of the main differences between a novel and a textbook seems to lie in the different value, role and importance given to feelings and emotions in the two styles.

Any novel, to a certain extent, deals with the feelings of the characters in the story and conveys the implicit message that they are actually the "stuff" of the novel. There is also the underlying assumption that as human beings we can share some of the feelings of the characters in the story. Usually a sort of identification process goes on between the reader and some characters. A good novel will make one feel part of the story, so that one is interested in what is happening and spontaneously desires to know more about the situation and what is going to come next.

On the other hand, textbooks explicitly remove emotions and feelings in their exposition, for the sake of presenting the "facts." Furthermore, there is rarely allusion to the reader's prior and on-going experience. It is as if the reader does not exist outside of the context of the course. Is it possible that this impersonal character of textbooks might play a part in some students' "mathophobia"?

Motivation in reading the book

Traditionally, a novel is written with the assumption that the reader will approach it and pursue its reading only by virtue of the intrinsic interest of the novel. The introduction of "suspense," of an element of curiosity for what is going on and what will happen next, are therefore essential ingredients for a successful novel. The sort of identification previously mentioned also plays a role here. A novel has the potential to transport us to a different state of awareness, so that we may suspend reality and our personal problems for a while.

On the other hand, a reader will approach a textbook with quite different motivations and expectations. We rarely expect a textbook to amuse us, and we read it primarily because it is assigned or to gather some information we need.

We often read a good novel a second or third time, and in doing so we may notice and assimilate new elements and ideas. If on the other hand, we have gone through a textbook carefully and successfully the first time, there is little expectation that something fresh will be gained by a second look. Even when we do review a text, it is because of our

inefficiency—such as forgetting something we previously learned—not because we may discover fresh nuances in subsequent readings.

Characteristics and organization of the information

The major purpose of texts being to organize already well received bodies of knowledge, most of them present the following features:

- 1) They have a sequence and order of material, usually from something perceived to be simple to something perceived to be more complex.
- 2) The content is subdivided into manageable "chunks" through chapters and subheadings.
- 3) They have numerous explanations and descriptions of correct ways of perceiving parts of the field.
- 4) They have something akin to solved problems for the purpose of applying abstractions.
- 5) They usually have exercises or unsolved problem sets which are sequenced throughout.

On the contrary, the idea itself that a novel conveys information may at first seem absurd. But if we look closely, it does so, even if the content and the format of the information may be different and even if conveying information is not the main goal of any successful novel. In an implicit but very effective way, the author always conveys messages regarding ideas, beliefs, feelings or interpretations. Also some "standard" kinds of content can be conveyed, as for example information about an historical period, a social environment, or even more academic topics, as shown by novels like "Harry Stottlemeier's Discovery," or "Flatland" [2]. While a textbook conveys content mainly by way of explanation, however, a novel does it in more subtle ways—through descriptions, dialogues, situations.

Whatever its content, however, the structure of the information is not so important in a novel, and not necessarily sequential. Themes and ideas are free to cross each other, to be dropped and forgotten, to be repeated at different times and in different forms. Although we tend to read a novel sequentially, we might also skip a chapter if it is too boring, or skim through the book in order to satisfy our curiosity. On the contrary, and in mathematics especially, we seem to operate as if each part of the textbook depends logically upon what precedes it. An exception in this sense, however, occurs when professionals use textbooks as reference sources.

Conception of truth

We generally assume objectivity and precision to be a main characteristic of a good textbook, and trust its author to be presenting us THE truth about the topic in question—especially in a scientific field. Not only do we rarely feel competent enough to challenge the knowledge, but more importantly the style of the exposition does not even suggest the possibility of alternative positions.

In a novel, on the other hand, contradictions and conflicts, as well as different points of view, are acceptable. The presence of different characters seems to provide a natural set-up for these aspects. It is also expected that each reader

will create different interpretations and judgments about facts and opinions reported in the story, although that does not necessarily imply neutrality on the part of the author

Kind of learning produced

The new knowledge gained after having gone through a textbook versus a novel will differ also with respect to the process of learning that brought about its acquisition.

As learning something was not an explicit goal of the reader of the novel, we may assume that the process of learning which occurred in this case must have been more natural and spontaneous. For these reasons, what we have learned may leave a stronger impression. On the other hand our knowledge may not be very organized and structured. It may be more difficult to justify and communicate it to others (perhaps even to apply it). As concepts are linked with their occurrence in specific situations, they may create more vivid, but also less general images in the reader.

The kind of understanding acquired in reading a novel versus a textbook is also quite different. Through a novel the reader can acquire a "sympathetic attitude" towards a certain topic or area, while textbooks, on the other hand, aim essentially at realizing in the reader the traditional interpretation of understanding, in terms of content [3] Partial understanding (both in terms of quantity and quality of information) is also perfectly acceptable in a novel. No verification of learning is enforced in a novel, while we are used to it in textbooks (in the form of questions, exercises, etc.). Having no obligation in terms of understanding and learning, the reader is free to pick some information and neglect some other, which may give considerably more opportunity in a novel for just wondering, pursuing related topics and generating one's own ideas.

Concluding observations

The previous analysis has pointed out several shortcomings of traditional textbooks, which could explain why textbooks have failed with so many students, and why it is necessary to challenge the privileged role maintained by this format in our schools.

First of all, we might gain by introducing alternative forms of exposition, as each could be especially suitable to

convey certain elements or aspects of a topic. This could provide a more complete picture of a subject, appeal to different kinds of students, and lead to a more robust conception of understanding and learning.

In addition to providing alternatives to texts we should reflect on how textbooks could be improved in light of the previous discussion. For example, textbook writers could be invited to give more consideration to their readers' previous experiences, feelings and beliefs (even false and mistaken ones); look for a closer relation with both physical and psychological reality; re-enact the genesis, personal anguish and development of ideas or topics; present alternative and even contrasting and paradoxical interpretations of a subject. Alternative ways of using textbooks, other than reading, understanding and recalling all of the content in the sequence given, could also be considered and evaluated.

The consequences of introducing new forms of exposition in classroom instruction could be deeper than what may appear at first. The kind of conversation taking place in a class after everyone has read part of a novel may in fact challenge and change quite radically the presently accepted conception of knowledge (enabling us all to better appreciate context rather than "right/wrongness"), the role of the learner as ignorant and submissive in relationship to the teacher, and most fundamentally the distorted notion that it is others rather than ourselves who are responsible for our making meaning out of chaos.

Footnotes

[1] There have been a small number of remarkable examples. Matthew Lipman and his collaborators have developed a whole series of philosophical novels following the well-known *Harry Stottlemeier's discovery* (Institute for the Advancement of Philosophy for Children, 1972). Frederique Papy has produced a collection of delightful stories dealing with mathematical content, for children of different ages (*Frederique's Stories*, CEMREL: Central Midwestern Regional laboratory). Knuth's novelette *Surreal numbers* (Addison-Wesley, 1974) also explores rather sophisticated mathematical topics using a dialogue format.

[2] E A Abbott, *Flatland*, Dover Publications, 1952 This novel is similar in spirit to the ones mentioned above, though it was not intended for academic purposes.

[3] Jane Martin identified and discussed these two different aspects of "understanding" in:

J Martin, *Explaining. understanding and teaching*. McGraw Hill, 1970

Any system of intellectual constructs which is espoused by the agents of secular power seems to generate its own metaphysical orthodoxy. Science fought its way free of government-sponsored religion only to threaten now to become the new established church.

Lawrence Slobodkin
