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Note-taking review – Practical value for learners

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Résumé
Revue de questions sur la prise de notes. Conséquences pratiques pour les apprenants.
Cette revue de la littérature sur la prise de notes et l'apprentissage poursuit trois objectifs: (1) analyser les modes de prise de notes spontanés des étudiants et leur impact sur la compréhension de textes, (2) repérer l'impact des conditions de réalisation de la tâche sur différentes activités de prise de notes et d'utilisation postérieure des notes, et (3) proposer des directives aux enseignants et aux étudiants pour rendre la prise de notes plus efficace. La relation entre prise de notes et activités impliquant l'utilisation des notes a été analysée à partir du contenu de notes prises par plus de 1200 étudiants et de textes produits à partir de ces notes. Deux résultats principaux ont été mis en évidence. Une reformulation du contenu est plus efficace que la simple recopie des informations d'un texte lu et la mise en œuvre, par les enseignants, de situations d'apprentissage diversifiées sollicitant des modes de prise de notes variés devrait rendre cette activité plus efficace.

Mots clés : Prise de notes, compréhension de textes, apprenant, enseignant, guide pédagogique.

Abstract
This review article aims (1) to determine what kind of spontaneously taken notes are effective in text comprehension, (2) to review the research findings about various conditions under which notes are taken and used, and (3) to suggest guidelines for learners and teachers for more effective note-taking. During our research project we have studied the notes of more than 1200 students in order to examine the relationship between the quality of note-taking and subsequent outcomes - as measured by the content and quality of essay-type answers. The results indicate that it may be useful for students to write notes by using their own words instead of copying information. The teachers should monitor the learning situations where various note-taking activities are beneficial.

Key Words: Note-taking, text comprehension, learner, teacher, guideline.

1. Introduction

It is crucial for students in higher education to learn effectively from text. In addition to acquiring conceptual knowledge, university students need to learn to use that knowledge in tasks relevant to their future profession. In medicine, for instance, physicians must learn to decide about patient management and treatment within a limited time. This means that students repeatedly encounter a large amount of text that includes new or confusing information. In order to cope with this, most students often engage in activities such as underlining, note-taking and concept mapping. Despite the general use of these activities, it is not yet certain why or when they help, nor it is clear that they always do help.

Two reasons are commonly provided to explain why students take notes. One is concerned with the *process* of note-taking and the other with the resulting *product*. Most students believe that the process of note-taking itself will somehow help their learning. They also believe that the product of their note-taking, that is their notes, will be useful for revision at a later date. Yet, an examination of empirical studies on a variety of study strategies reveals a lack of consistency in the data. Although some investigators have demonstrated superiority of one note-taking activity over another for a particular application (e.g., Benton, Kiewra, Whitfill, & Dennison, 1993; Hartley, Bartlett, & Branthwaite, 1980; Kiewra, DuBois, Christian, McShane, Meyerhoffer, & Roskelley, 1991), others have failed to obtain similar results (e.g., Kiewra, Benton, Kim, Risch, & Christensen, 1995; Kiewra, Mayer, DuBois, Christensen, Kim, & Risch, 1997). The inconsistent results of these and other studies may be due to methodological problems. For example, subjects have not always used study strategies on their own initiative, but have been instructed by researchers to take different kinds of notes, or use other strategies not necessarily typical for them (Lonka, Lindblom-Ylänne, & Maury, 1994).

Further, some previous studies have relied on short passages or only a couple of paragraphs (e.g., Gordón & Day, 1996; Thornton, Bohlmeyer, Dickson, & Kulhavy, 1990), and relatively easy narrative materials (e.g., Benton et al., 1993; Schraw, Wade, & Kardash, 1993). It is thus not surprising that the research literature on note-taking does not have a great deal to offer in terms of practical utility for learners. The aim of this article is to provide guidelines about how the efficiently of note-taking can be improved. To do so, we review the research results revealing various conditions under which note-taking activities are beneficial. In this article we concentrate on the effectiveness of spontaneous study strategies in text comprehension. During our research project we have studied the notes of more than 1200 students in order to examine the relationship between the quality of note-taking and subsequent learning outcomes - as measured by the content and quality of essay-type answers. In particular, our interest has been to determine whether review and process effects of note-taking are found when notes are taken spontaneously in real learning situations. Such settings have been provided us with Finnish university entrance examinations (Lonka, 1997; Slotte 1999; Slotte & Lonka, 2001).

2. Note-taking from different types of texts

Cognitive research on text comprehension has succeeded in demonstrating many of the active compositional processes within specific subject-matter domains. Our results (Slotte, 1999; Lahtinen, Lonka, & Lindblom-Ylänne, 1997) showed that half of all participants spontaneously applied some kind of note-taking activities during text reading. Slightly more of them wrote verbatim notes following the text order than summarized the text content in their own words. However, the number of students who wrote either verbatim or summary notes was clearly higher among those reading a philosophical text than among those reading a statistical one. Similarly, the number of subjects who drew concept maps while reading a philosophical text was 22%, whereas the corresponding proportion while reading a statistics text was only 7%. Interestingly, underlining was more common among those who read a statistics text than among those who read philosophical text (Lonka, Lahtinen, & Lindblom-Ylänne, 1996).

These results are of importance because students encounter various types of expository text in different educational and work settings. Yet, more research is needed to generalize other discourse types including the use of different media. Designers of non-linear hypertexts, for instance, hypothesise that such text makes reading easier by changing readers' roles in the sense that they must actively create their own context (e.g., Kumbruk, 1998). This may have positive effects even for less well-prepared students (Lehtinen & Rui, 1995).

It has been demonstrated that university students who read hypertext out-performed those reading a paper text in carrying out a multiple-concept task, but not in recalling a single fact (Slotte, Seppänen, Lonka, & Hakkarainen 1998). Moreover, there were no performance differences between the media groups in the tasks in which synthesizing of text information from different articles was needed. Indeed, the hypertext version was found to be significantly slower than the paper version in these learning tasks. Consistent with the ideas of Lawless and Brown (1997), it can thus be argued that technology is not effective learning in and of itself, but it merely provides a forum for learning from text.

With regard to different approaches to learning, we also found that students who normally adopted a surface and externally regulated learning approach expected more difficulties in finding information than the less surface- and externally-regulated students (Slotte, Seppänen, Lonka, & Hakkarainen, 1999). This was the case both when learning from a paper text and learning from hypertext. These results are compatible with the broad pattern of findings emphasising the role of independent responsibility for one's own deep-level learning (e.g., Marton & Säljö, 1984; Marton, Watkins, & Tang, 1997) what works for one student will not necessarily work for another. This poses challenges for teachers in creating new opportunities for enhancing the quality of learning.

3. The quality of note-taking

The effectiveness of spontaneous study strategies is based not only on the quantitative question 'How much is learned?' (Biggs, 1993; Peper & Mayer, 1986), but also on the quality of the learning outcomes. Our studies (Slotte, 1999, Slotte & Lonka, 1999) showed that generative study-strategies, such as summarising and concept mapping, were related to better learning outcomes than strategies less generative in nature. The latter included, for example verbatim note-taking, underlining or reading only. These results were consistent when the learning outcome was measured as concept defining, comparison tasks, and a task that required knowledge application in practice.

The results further revealed that, in addition to the quality of note-taking, the level of prior knowledge in mathematics and the interaction between these two variables were all related to learning from statistical text. Students, who had studied advanced mathematics, learned the content of the statistical text better than those who had only basic mathematics studies, regardless of what study strategies they used. Yet, in both mathematics groups (advanced and basic), the best performance was found among those who made summary notes or concept maps. In addition, it was found that less extensive school knowledge of mathematics required more generative study strategies in order to foster learning on the content's matter.

These results have important practical implications because in real learning situations, students need not only to apprehend and make sense of a topic, but also to go further and express the content in a coherent way. This kind of transforming process, by which students actively reworks their thoughts into the form of written text, is surely an important characteristic of effective learning (McCutchen, Covill, Hoyne, & Mildes, 1994; Scardamalia & Bereiter, 1991), and deserves more careful attention both from learners and from teachers.

4. Using notes during essay-writing

With regard to note-taking, it's effectiveness is not only based on the activity of writing but also on it's product function, i.e., providing a written record of information that can be used

later (cf., DiVesta & Gray, 1972). The majority of studies have showed that the easier access to topic-relevant knowledge in the task environment enhances the production of topic-relevant ideas (Benton et al., 1993; Kiewra et al., 1991; Eigler, Jechle, Merziger, & Winter, 1991). Yet, it is not clear whether this is the case in all learning situations.

Our results showed that using notes while essay-writing was not always helpful, depending upon the type of writing task (Slotte & Lonka, 1998). When a task calls for detailed learning the presence of notes helped students to write lengthier, more coherent and cohesive essay-type answers. When a critical review of the text information was required, the presence of notes did not help the students to write better quality answers, nor did it enable them to generate their own ideas more extensively. In contrast, the absence of notes may have enabled the writers to distance themselves to some extent from the text material and therefore allowed them to "go beyond" the text information that is needed in critical reviewing (Bereiter & Scardamalia, 1987; Hidi & Anderson, 1986; Scardamalia & Bereiter, 1991).

We also found that using notes during writing increased the coherence of students' essays, independent of the length of the notes (Slotte & Lonka 1999). This indicates that even short notes may become an external aid for memory, presumably by containing key words from the text. Furthermore, the process of taking notes spontaneously even without reviewing them, did enhance better performance in the tasks that required drawing inferences across different parts of the text. This suggests that when asked to make one's own inferences, the "copy-paste" strategy (i.e., text information is copied as such during the reviewing activity) is presumably inadequate, if relations between the concepts and background knowledge are not formed (see, Kirby & Pedwell, 1991).

5. Guidelines for note-taking

Our extensive research on note-taking have important practical implications. It seems clear, though, that the relationship between note-taking and essay-writing is complicated. We may conclude that using notes during essay-writing reminded the writers of what information they needed to include and helped them to produce a well-argued essay. Yet, the mere activity of writing notes also proved to affect essay-writing positively. Learning to take notes effectively, therefore, can be an important in developing a successful career as a university student. For learners, there are many things they can do to improve their note-taking skills, the quality of notes and the likelihood of study success. Table 1 summarizes the main principles for this section; more detailed suggestions for teachers are discussed below.

Instructions designed to promote greater depth of processing should be based on the following activities the learners can do:

(1) paraphrasing main ideas
(2) reordering information
(3) integrating main ideas across paragraphs
(4) using connectives to explain relationships and
(5) presenting an overall global interpretation of the text.

These activities of deeper processing are more likely to appear when the texts and the learning tasks are meaningful to the students, not when they are presented as meaningless or decontextualized exercises (Kirby & Pedwell, 1991). Students should write down ideas that have personal meaning and give personal insights into the material. This can be done for example

adding synthesis and evaluation to the analysis. It would be helpful to the process of note-taking by students if teachers could arrange the learning situations so that these aspects as well as the written quality are taken into account.

Table 1. A summary of guidelines on note-taking

	Learner	**Learning situation**
Process	Increase awareness of different study strategies	Arrange the learning situations so that rote learning is not effective
	Transform knowledge into a coherent text by writing summaries	Encourage the learners to take notes and use varying study strategies
	Get to know when and under which conditions study strategies are effective	Provide feedback and models for effective note-taking activities
Product	Consolidate learning by improving and reviewing notes	Provide opportunities to both note-present and note-absent essay-writing
	Pay more attention to the quality of notes than to mere reviewing of them	Show how different styles of note-taking seem to be suitable to different situations
		Show interest in and approval of note-taking activities

Particularly in an examination situation, when time is limited and the writer is under pressure, learners may not always notice the importance of the quality of their written expression, and how easily poor quality can create problems between the writer and the reader. Only focusing on reproducing relevant material that answers the question posed by the teacher may be overemphasised at the cost of the clarity with which the ideas are expressed (Torrance, Thomas, & Robinson, 1994). Novice learners often believe that producing the content for an essay is a relatively straightforward task, whereas expert learners see writing as an active problem-solving process (Bereiter & Scardamalia, 1987). Thus when discussing the usefulness of notes, we should ask whether we are referring to the ability to only generate content or to also develop a coherent argument. In fact, writing calls for the interplay between content and rhetorics where knowledge and argument are being bound together (Scardamalia & Bereiter, 1991).

6. Implications for teaching

The fact that the usefulness of essay-writing with and without notes differs depending on the nature of the task merits more attention from instructional designers. For example, McKeachie (1994) argues that teachers can have a tremendous impact on how their students can develop a useful repertoire of note-taking and other study strategies. One of the most powerful ways of teaching these strategies is through modeling. By introducing different types of note-taking activities in their teaching, teachers can expose students to a wide variety of strategies in different content areas (see also Wilkerson & Irby, 1998). Yet, as has been established here, it is necessary to teach students how to manage on their own when they are studying. It is also clear that students should be provided with opportunities over time to use and perhaps describe their uses of different study strategies. According to McKeachie (1994, p. 363) guided practice with feedback is one of the most important methods of teaching study strategies. Students need to have opportunities to

practice their newly developed study strategies, and to receive feedback so that they can polish their skills.

Given the importance of knowledge transformation during essay-writing (e.g., Bereiter & Scardamalia 1987), students should also be given many opportunities to write; both with and without their notes and drafts. Further, we agree with McCutchen et al., (1994) that measurable improvements in the quality of the written expression will most likely result when these activities are embedded in authentic writing situations.

The role of authentic situations and study skills are equally emphasised in Bullimore's (1998) book 'Study skills and tomorrow's doctor'. He argues that students need study strategies to cope with the modern medical course, which will further equip them with the lifelong learning skills that they will need throughout their future career. This is of particular importance because current medical courses are new, challenging and very different from those of ten or even five years ago (Bullimore, 1998). For example, the development and implementation of a problem-based curriculum requires new assumptions about the relationship between teacher and student, decisions regarding the extent to which students will be responsible for identifying and pursuing their own areas of interest, and the adoption of new teaching methods (Edmondson, 1995). This means that it is not only the students, but also the medical teachers who will need effective study skills to meet the new demands.

Björk and Räisänen (1996) have concluded that scientists and physicians, like most other professionals, have to learn to master two areas of expertise: knowledge of their field, and the ability to communicate that knowledge in written text. In every profession, those who write well are better understood and, for this reason alone, are often more likely to advance to prominence in their field (Ferrari, Bouffard & Rainville, 1998). Beyond the sheer pleasure of reading a well-written text, it would be hard to underestimate the practical advantages of good writing. In academic contexts, where competition in many cases is severe, clear and congruent writing presumably distinguishes between excellent and high-average grades. Moreover, the ability to write well has far-reaching consequences in terms of obtaining grants and getting research papers published.

7. Conclusions

Our results have important theoretical and pedagogical implications; since both these and the previous research showed that, the quality of spontaneously used learning activities determines the quality of mental representation formed of the materials to be learned (Lahtinen et al., 1997; Lonka, 1997; Slotte, 1999). Students should thus be encouraged to construct well-organized and extensive summaries and other records in a way that allows them to reconstruct the text information from their mental model rather than reproducing it.

Since the strategies students spontaneously use will presumably vary depending on the subject domain, difficulty, length, and the way the text has been written, further research should be conducted to explore the effectiveness of note-taking practices as a function of various learning situations and demands.

Finally, it is important to obtain information about students' spontaneous study activities in order to plan more successful study strategy training. Recent European research indicates that study skill training may be most effective when it is process-oriented and integrated with domain-specific instruction (Lonka & Ahola, 1995; Vermunt, 1995). It may be a waste of time to implement study skills courses that do not take into account students' natural ways of learning.

Research on real-life learning settings, where subjects are highly motivated, will help us to design new instructional innovations.

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