5. HOW NATURAL, SITUATED AND SKILL-ORIENTED IS ANCHORED INSTRUCTION?

P. Robert-Jan Simons
Department of Educational Sciences
University of Nijmegen
The Netherlands

5.1 Introduction

Anchored instruction is analyzed in terms of four teaching models and their corresponding core problems discerned by Scardamalia and Bereiter (1989). The core problems are relating to prior knowledge, finding connections with relevant contexts of use and adding value to natural development. Anchored instruction offers compromise solutions to all of these problems. What is missing in the approach is especially how students should or could make the step from "learning as problem solving" to "learning through problem solving". Because learning is mainly controlled through problem control, it is unclear how and uncertain whether students will learn intentionally, controlling their learning themselves explicitly. It is concluded that anchored instruction forms an acceptable solution to the core problems, but that some additions seem necessary. Whether or not we want to introduce some kind of anchored instruction in education, is not depending on the answer to the question whether its results are better than those of other approaches, but to the question what we prefer as outcomes of education.

5.2 Three core problems of instruction

Scardamalia and Bereiter (1989) described four teaching models and their corresponding core problems. The first teaching model is the cultural transmission model according to which the main focus of instruction should be on the transmission of knowledge. The related core problem is how to get in touch with the prior knowledge of the students, especially when they have only a small knowledge base. The second teaching model, the skill training model, focuses on the practice of skills, like classification, analysis and writing. The core problem is finding connections of the skills with relevant contexts of their use. The third teaching model, the natural development model, emphasizes the

motivational powers of letting students find their own way and giving spontaneous development its chance. The core problem is how value can be added to natural development, or in other words how teaching can add value to what grows naturally. The final teaching model is the conceptual change model that gets much attention of late. It focuses on the role of teaching in changing students fundamental underlying conceptions and mental models. This is very difficult to realize, partly because it is a combination of the teaching models mentioned before with the consequence of having to deal with all three of the core teaching problems.

For all the core problems, suboptimal solutions exist, that beginning teachers tend to choose instead of fully solving the relevant core problem. Scardamalia and Bereiter (1989) describe seven of these suboptimal solutions (see for a summary Table 5.1).

Table 5.1 Teaching models, core problems and suboptimal solutions (adapted from Scardamalia and Bereiter, 1989).

Teaching model	*Core problems*	*Suboptimal solutions*
Knowledge transmission	Relating to prior knowledge	1. Covering the subject matter 2. Verbalism 3. Relevance
Skill training	Relation to context	4. Task goals only 5. Pseudo skills
Natural development	Adding value above natural development	6. Environmentally-driven 7. Primacy to interests
Conceptual change	the three above	all seven above

The prior knowledge problem is solved in three suboptimal ways. Sometimes, teachers are satisfied when they cover the subject matter instead of relating to the prior knowledge. Sometimes they are satisfied when students show a limited kind of understanding without grasping the real-world implications (verbalism). Sometimes teachers solve the prior knowledge problem by focusing on the topics that interest students. The context problem has two related suboptimal solutions: focusing on task goals instead of learning goals and teaching of pseudo-skills. In the first case, teachers tend to focus on task performance instead of learning. In the second case "there is temptation to convert other, more complex educational objectives to skill learning objectives. Thus, in place of difficult concept teaching, we may see training in "classification skills" or "reasoning skills". Although such skills may sound important,

there is often not much behind them except quite trivial exercises" (Scardamalia & Bereiter, 1989, p. 41). Finally, there are two suboptimal teaching strategies related to the natural development approach: environmentally driven teaching and giving primacy to activities and interests. In the first, teachers spend (too) much time in arranging the environmental context. In the second, they simplify teaching by narrowing the choice of topics to activities and interests of students with the risk of excluding important educational goals.

5.3 How anchored instruction solves the three core teaching problems

Although it is perfectly possible to make distinctions between the four teaching models theoretically, in practice most of the time there is a mixture of all models. Therefore, also all three core problems may play a role in complex teaching approaches like anchored instruction. Therefore, we will focus on the question how anchored instruction solves all three core problems.

Before answering this question, however, we will discuss the placement of anchored instruction within the classification of teaching models. It seems clear that it belongs to the category of skill-training models. It focuses on mathematical skills, business planning skills, research skills and trip planning skills. In addition, however, it also focuses on natural development, by trying to exploit the spontaneous motivation of students when solving problems in the out-of-school world. Knowledge transmission does not get a lot of attention in anchored instruction. Partly, some prior knowledge is taken for granted or expected. Partly, students are expected to find the necessary knowledge on their own. Finally, anchored instruction seems to strive for conceptual change: students are stimulated to think of natural phenomena in a mathematical way and to change their views.

How are the three core problems solved in anchored instruction? As has been said before, the core problem of finding connections to practical contexts is solved by integrating learning in a problem context, like finding the fastest way to save an eagle, calculating how much fuel an airplane needs, doing a research project and making a business plan. The transfer problem to practical situations is solved by integrating learning into a practical situation itself and by devicing decontextualization assignments, like the "what if" questions. Learning is situated because it takes place in a concrete situation.

The natural development problem (how to add value to development?) is solved by bringing the world outside of the school into the school. The motivation, pleasure and interest that are so characteristic of natural skill development are brought into the school

by simulating the real world. Value is added to natural development by sneaking in all kinds of mathematical and other skills in the problem situations. In this way, children learn skills they would perhaps not learn naturally.
The prior knowledge problem, finally, is solved by way of using videodiscs with clowns, music (even the Music TeleVision (MTV) style is used) and all other kinds of interest provoking techniques. Furthermore, the choice of the contents is such that one stimulates children to bring in existing prior knowledge.

5.4 Anchored instruction and natural development

A major idea underlying anchored instruction is to bring in the advantages of natural development in school. It may increase the intrinsic motivation, interest and pleasure of students by letting them solve problems in a kind of natural way. The embedded data in the videodisc take care of enough mathematics. Problems take care of a focus on application and stimulate students to try to solve them.
There could, however, be much more emphasis on natural development. We could instead of preparing artificial problems send students out to learn in the real world: "go out and learn". Then students would perhaps be even more enthusiastic and motivated. Candy (1991) describes a study in which students (of psychology) received the assignment to learn whatever they liked, under just one condition, namely that they should cooperate in the investigation. The results of this study illustrate the problems that arise in such totally free instruction. Students chose all kinds of skills like skying, ballet and art history having few relations with psychology. Studies in adult learning show (see Candy, 1991) that a great many adults are learning under conditions of total learner control. It is only the learner who decides what to learn and which route learning takes. In learning projects, as they are called in the adult literature, work or hobby problems determine the route that learning takes. Adults are working together with others without recognizing that they are learning. Incidents play an important role, causing a rather unpredictable learning route.
Why is it not possible to organize such learning projects in schools? One reason is that both teachers and designers of instruction have fears that go against these kinds of projects. Teachers fear that they are unprepared for helping their students. Instructional designers fear that learners will learn all kinds of things that are not of value. Another reason (also described by Candy, 1991) concerns a fundamental issue of rights and duties. Candy states that learner control is an all or none phenomenon, because it is unfair to divide control. It is not conceivable to give students control over some parts of learning and schools or teachers over another part. Because schools have certain responsibilities for the learning of students, for instance with respect to testing, learner control in schools

is impossible or undesirable. If this line of reasoning would be correct, however, anchored instruction would be impossible. It is an example of an instructional method in which students are motivated by giving them the idea that they are in control over learning, although in fact they are controlled by the problems in the video.

We do believe that it is possible to have a division of control of learning. Is there not always a division of control? It is impossible to force persons to learn, if they are excerting over some self-control (for example, in deciding to listen or read). In fact, we can see that recent new instructional methods, like problem-oriented learning, case-based learning and Leittext methods (see Simons, 1993) all have the same kind of division of tasks as is the case in anchored instruction. Students get the impression that they have more freedom than they in fact have, and this is enough to motivate them for learning. Moreover, the whole philosophical issue of learner control being an all or none phenomenon rests on a failure to distinguish between three kinds of control instead of two: learner control, problem control, and teacher control over learning. As is the case in adult learning projects (see above), problem control forms an alternative for teacher control, also in schools.

The main question of course is whether anchored instruction adds value to natural development. Because of the problem control with embedded data and evoking of mathematical thinking and problem solving skills, students will learn knowledge and skills that they would not learn otherwise. Also, because of the recent additions to anchored instruction aiming for transfer (for instance the "what if" questions), anchored instruction adds value to the natural development.

5.5 Anchored instruction and context

It may be clear that anchored instruction brings in a lot of context. But how situated is anchored instruction? Why should we simulate trip-planning and business-planning? Why should we confront students with an artificial research project instead of letting them organize a real investigation? The context could be much more authentic than through simulated videodisc situations. In this respect, anchored instruction forms a compromise satisfying practical needs and fears of designers and teachers. From a practical point of view, it is of course much easier to organize a simulated project than a real one. We know from the seventies that projects are difficult to organize and that they tend to go in unwanted directions. Furthermore, the fear of designers that there will be no projects when they do not design them or when they are not presented nicely as in an interactive video-format, is satisfied through the anchored instruction approach. Finally, fears of teachers are also prevented, namely that instruction becomes too complicated, that things

can not be controlled any more, etc. Thus, the context problem attracts a lot of attention in anchored instruction, but for mainly practical reasons simulated compromises are preferred above real contexts.

The main problem related to context in our view, however, is that no measures are taken to ensure that students and teachers are heading towards learning goals instead of task goals. The problems will be solved, but will all students learn something? Is learning checked and reviewed? Are students aware of learning goals and are they themselves striving for them or are they striving to solve the problems set? The great danger is that anchored instruction becomes a form of "learning as problem solving" instead of "learning through problem solving" (Bereiter & Scardamalia, 1989). In learning as problem solving, students are focusing on problem solving without attention for the learning part. In learning through problem solving, learning goals are more important than problem solving (or work goals). This distinction is related to the distinction made in the previous paragraph between teacher control, problem control, and learner control. Even in problem controlled learning (as anchored instruction is) some learner and teacher control of learning is necessary.

Finally, also the second suboptimal solution to the context problem (focusing on wrong kinds of skills) may play a role in anchored instruction. Is there enough emphasis on mathematical skills or are problem solving skills stressed more? And how about other skills like learning skills and skills related to conceptual change?

5.6 Anchored instruction and prior knowledge

As has been said before, anchored instruction capitalizes heavily on prior knowledge by way of the video-format, using comics and interesting or funny problems (like dumping teachers in a swimming pool). This may lead to the relevance problem discussed before. How far should we go in amusing students? Should a school become a kind of disco? Will students not become spoiled in the sense that they only want to learn when they are amused? Will they be able and ready to learn under less favourable conditions?

Another question relates to what is considered to be funny. The videodiscs are constructed in such a way that all kinds of students should find them attractive and funny. But is this possible? Are we not loosing many funny and interesting things because we have to design for the grey average? Many possible scenes might be insulting or offensive for certain groups. The only person who is allowed to play the role of clown or comic is the white male. It seems to be very difficult to find situations that are funny and interesting for everyone. Perhaps we need more differentiation?

A related question refers to the cultural aspect. Is the Jasper series usable in other cultures? My students of psychology thought that the stories were "so American", and it was very hard to convince them to pay attention.
What about the solution that anchored instruction offers to prior knowledge? The design is such that prior knowledge can be used, but is not necessary to continue. But will students bring in their prior knowledge automatically? Will they use their mathematical knowledge and their mathematical way of thinking? Here, much depends on the teacher or the learners themselves.

5.7 Final comments and conclusion

It may be concluded that anchored instruction offers good compromise solutions to the three instructional problems discussed. It is a good way to bring some natural development into schools and to connect to contexts in a practical and safe way that is feasible for teachers. The prior knowledge problem remains somewhat problematical. Also, the learning skills and conceptual change should get more attention.
Some final questions will end this discussion. First, it is unclear how teacher-proof anchored instruction is. How will teachers work with the materials when there is no support or observation from the outside? Will some of them not just solve the problems for the students? Second, the place in the curriculum is unclear. Could and should we build a whole curriculum in an anchored instruction way? Or is it just a (harmless) minor addition to existing curricula? Clearly, the additions to anchored instruction discussed by Pellegrino extend the place in the curriculum, but more clarification is needed. Finally, when we ask ourselves whether anchored instruction should be adopted on a larger scale, the answer of Weinert and Helmke (1993) might be the best one. They claimed that old-fashioned methods probably reach better factual knowledge and that new methods (like anchored instruction) will be better for conceptual understanding, practical skills and motivation. The question, thus, changes into another one. What do we prefer as outcomes of instruction: factual knowledge or conceptual understanding, skills and motivation?

REFERENCES

Bereiter, C., & Scardamalia, M. (1989). Intentional learning as a goal of instruction. In L.B. Resnick (Ed.), *Knowing, learning and instruction: Essays in honor of Robert Glaser* (pp. 361-392). Hillsdale: Erlbaum.

Candy, P.C. (1991). *Self-direction for life-long learning: A comprehensive guide to theory and practice.* San Francisco: Jossey-Bass.

Scardamalia, M., & Bereiter, C. (1989). Conceptions of teaching and approaches to core problems. In M.C. Reynolds (Ed.), *Knowledge base for the beginning teacher* (pp. 37-46). Oxford: Pergamon.

Simons, P.R.J. (1993). Constructive learning: the role of the learner. In T. Duffy, J. Lowyck, & D.H. Jonassen (Eds.), *Designing environments for constructive learning* (pp. 291-313). Berlin: Springer.

Weinert, F., & Helmke, A. (1993). *Learning from wise mother nature or big brother instruction: the wrong alternative for cognitive development.* Invited address presented at the fifth European Conference on Learning and Instruction, Aix en Provence (France), August 31 - September 5.