The Road to Transfer: Concept and Context Approaches to the Subject of Economics in Secondary School

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Abstract

In this study we investigated the effects of two forms of instruction: strengthening concepts and strengthening the ability to connect context with concepts. Although students may have acquired a reasonable amount of conceptual knowledge as a result of economics courses, two obstacles may prevent them from achieving transfer. One obstacle is a lack of a rich conceptual network; another is the inability to make connections between the conceptual network and realistic problems. The aim of this study was to find out what contributes most to the ability to transfer: strengthening conceptual knowledge *or* strengthening the making of connections. Some 139 students of the pre-final year of pre-university education participated in an experiment with two conditions and with a pre-test and a post-test. All students performed significantly better on the post-test in which conceptual knowledge was measured compared to the pre-test. No significant differences were measured between the two instructions on the post-test on transfer. We concluded that making connections is a difficult skill for students to learn. Context directed instruction definitively supports student's knowledge of concepts.

1.   Introduction

The aim of economics education in secondary schools is shifting from a predominantly academic approach towards more emphasis on teaching that meets the needs of students in their current and future lives. From this perspective, education in economics should enable students to use economic knowledge in daily life, even in contexts that are different from those in which they originally acquired this knowledge.

When students can apply acquired knowledge in a more or less novel situation, they have achieved transfer (Marini and Genereux, 1995). Stark *et al.* (1999) concluded that it can be useful to distinguish middle transfer as well as near transfer and far transfer. We consider three transfer stages in this study but we use the terms: near transfer, semi-far transfer and far transfer. We are talking about near transfer if concepts and context are the same as in the instruction; semi-far transfer if concepts are the same but the context is different; and far transfer if both concepts and context are different from (but related to) those in the instruction setting. We can explain this with an example.

In her model of domain learning, Alexander (2003) considers transfer as an ability of experts. She describes the long road to expertise in three stages: *acclimation*, *competence* (*early, middle* and *late*) and *proficiency*. Each of these stages is characterised by a certain amount of domain knowledge, interest and types of strategies used. Figure 1 shows how the development works in the three stages.

Figure 1: Knowledge interest and use of strategies in different stages (Alexander, 2005)
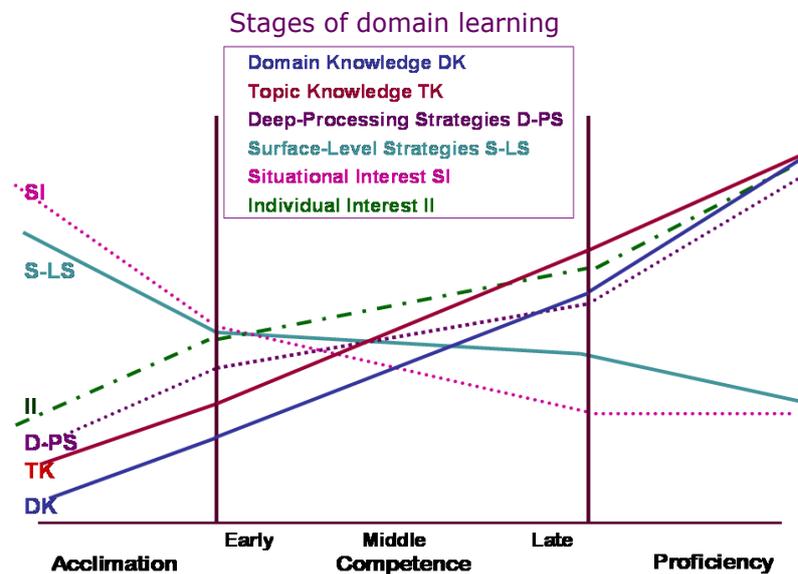
Students in secondary education are beginners in economic studies. They belong to the first stage: *acclimation*. They do not have much individual interest in the domain of economics (II), but what they do possess is situational interest (SI). Entering the second stage – *early competence* – individual interest is increasing as well as domain knowledge (DK) and knowledge of economic topics (TK).

In secondary education students often start with learning concepts. Although in the upper levels of secondary education students may have acquired a reasonable amount of conceptual knowledge as a result of economic courses, two obstacles may prevent them from achieving transfer. One possible hindrance is the lack of a rich and coherent conceptual network, whereas deeply understood and well organised domain knowledge is viewed as a prerequisite for achieving transfer (Mayer, 2004; Sternberg, 2003). The conceptual network attained by students after instruction often shows gaps. Concepts are missing or relations between the concepts are not well defined. This kind of obstacle is normally the effect of students studying for a knowledge-oriented achievement test. They study with the aim of reproducing knowledge in the exam but not with the aim of thoroughly understanding it.

It may be sufficient for near transfer if the context is very similar to the studied problem, but it will be failing for far transfer where the context is different from the studied problem. An example of near transfer is when the concept of risk aversion is used in the context of assurance in both construction and the transfer task. Transfer is semi-far when in the instruction the concept of risk aversion is used in the context of assurance, whereas in the transfer task the concept of risk aversion is used in the context of investments. Far transfer occurs when in the instruction the concept of risk aversion is used in the context of assurance, whereas in the transfer task the concept of own risk (related to risk aversion) is used in the context of a venture.

A second possible obstacle for achieving transfer is that students are hardly able to make connections between the acquired conceptual network and realistic social problems that can be looked at from an economic perspective. Conversely, they are unable to connect real life situations they encounter with the appropriate conceptual network they have in mind, that matches with the practical phenomena (Becker, 2004; Hansen *et al.*, 2002).

The two kinds of obstacles are visualised in Figure 2.

Figure 2: The two kinds of deficits that may prevent students from achieving transfer
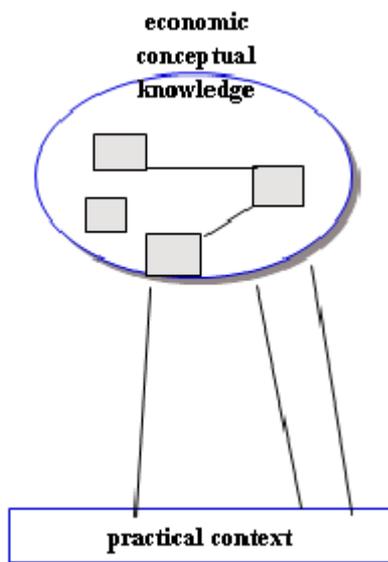
In the upper part of this figure the oval represents the conceptual knowledge of complex domain knowledge. Complex domain knowledge exists if a network of concepts relate to one another. Bransford *et al.*, (1999) describe *conceptual networks* as 'knowledge organised around important ideas or concepts of a domain'.

The squares in the oval represent the economic concepts and the interconnecting lines represent the relationships between the concepts. The oval represents the larger economic concept to which these concepts belong. The number of squares is small and some squares in the oval are interconnected, whereas others are not. This indicates that the conceptual knowledge is relatively poor for a complex concept. As discussed above, we suppose that students have acquired a collection of concepts (with the aim of passing economic tests at the end of the course) rather than a solid conceptual network preparing them for approaching and analysing social problems in an economic way. In the lower part of Figure 2 the ability to make connections between the conceptual knowledge and practical contexts is represented by the lines linking the oval to the practical context. The small number of links in the figure indicates that we suppose students can make only a few links between conceptual knowledge and practical contexts that might be approached from an economic perspective.

2. Learning for transfer in school

We have noticed the two different obstacles for achieving transfer. The ability to transfer, however, is a necessity for students looking at real life problems as an economist would. Perkins (1992) wrote:

> 'Consequently, the ends of education are not achieved unless transfer occurs. Transfer is all the more important in that it can not be taken for granted. Abundant evidence shows that very often the hoped-for transfer from learning experiences does not occur… Thus the prospects and conditions of transfer are crucial educational issues.'[1]

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[1] Perkins, D. N., 1992, p.3

The lack of a rich and coherent conceptual network of knowledge is a condition for transfer, but it does not lead to transfer in itself. The ability to connect context with concepts is another condition, but it does not lead to transfer in itself either, because besides the knowledge of the context, the student must possess conceptual knowledge to be able to connect the two. Both conditions are necessary.

The question can be asked: what contributes most to the ability of transfer when students have learnt the concepts in their economics course before – strengthening their conceptual knowledge (the concept road) or strengthening their ability to connect context with concepts (the context road)? The first approach corresponds with Bloom's taxonomy (1968). The original taxonomy consists of a cumulative hierarchy of three processes necessary to reach meaningful learning and transfer of knowledge: memorising, comprehending and applying in a context. Mayer (2002), Krathwohl (2002) and Anderson (2002) decided not to consider the hierarchy: students can come to an understanding of a concept *while* applying it in a context.

The question then arises as to what contributes most to the ability of transfer: strengthening conceptual knowledge *or* strengthening the making of connections between contexts and concepts? In other words, are we following the concept road or the context road to transfer?

The concept road to transfer

In literature about transfer, for example Gelman and Greeno (1989),and Salomon and Perkins (1989), there is an agreement that a basis of deeply understood or processed knowledge is a condition for transfer. Such a body of knowledge requires meaningful learning. Novak (2002) stated that meaningful learning is defined by a conscious choice of integrating new knowledge into existed knowledge. Existing mental models, however, can hinder the forming of the conceptual models required for the domain knowledge. This is the case when students possess conceptions that differ from formal domain conceptions. These alternative conceptions or misconceptions are well known in the science domain, but they also exist in economics. In the case of misconceptions it is necessary when acquiring formal domain knowledge that *conceptual change* takes place. Chinn and Brewer (1993) and Vosniadou (1994) described conceptual change as a process of accretion, refining, constructing and reconstructing of mental models. Students must have sufficient time to construct and reconstruct their mental models to develop a *well organised body of knowledge* to achieve transfer. In the concept road to transfer, the main focus is on the economic concepts and emphasis is put on the development of a rich and coherent network of related concepts. The idea is that such a network enables transfer.

The context road to transfer

The context road originated from a theory of learning, mostly referred to as 'situated learning' but also as 'situated cognition' or 'situated action' (Brown *et al.* 1989; Engeström *et al.*, 1999). This theory emphasises that all knowledge is situated in a particular time and place, and is a part of a culture in which the knowledge has been developed and used. This has many consequences for learning at school. The context at school is very different from that in real life, so it is not surprising that students do not connect economic concepts to practical contexts. They possess mainly inert knowledge that will sink in for no longer than is necessary for them to sit exams. They hardly ever get the opportunity to see the world as a historian (Whitehead, 1957) or, in our case, as an economist. That is why the out-of-school situation in which students function must be understood well:

> 'This is not to suggest that all students of math or history must be expected to become professional mathematicians or historians, but to claim that in order to learn these subjects (and not just learn about them) students need much more than abstract concepts and self-contained examples. They need to be exposed to the use of a domain's conceptual tools in authentic activity to teachers acting as practitioners and using these tools in wrestling with problems of the world. Such activity can tease out the way a mathematician or historian looks at the world and solves emergent problems.'[2]

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[2] Brown, A. L., Collins, A. and Duguid, P. (1989), p. 36

Theories of situated cognition emphasise that students need to be exposed to the use of domain specific concepts, methods in authentic activity and to 'problems of the world' (e.g. Brown *et al.*, 1989; Gorodetsky *et al.*, 2003). Where it is not possible to join a community out of school for situated learning, 'the world' has to be brought into the school. School has to become a 'community of learners', where students are able to struggle with the problems of the world.

By context we understand (practical) situations, concerning economic phenomenon that are recognisable for students. These are recognisable, authentic situations in the roles that students have in their daily life and on which they have to make decisions. The starting point is that they form a well-organised knowledge base while working on contexts. Students reach deep understanding of concepts *while* using those concepts in a context, because they need these concepts to analyse the context problem.

This study

In this experimental study, we compare the effects of a concept road to transfer – strengthening/reconstruction of concepts – and a context road to transfer – making connections between the authentic, practical context and concepts. Each of these approaches focuses on one of the obstacles to transfer described above. In both types of instruction it is possible to make use of concept mapping as a learning tool. Later in this article we go deeper into concept mapping as an appropriate learning activity for both instructions.

3. Research question

Above we mentioned that meaningful learning – compared to root learning – occurs when students actively construct, reconstruct and apply the mental models they possess. The formation of a well-organised body of knowledge which is the result of that activity is expected to have a positive influence on the ability for transfer. Conceptual knowledge is built in a flexible way and can be applied in different situations to successfully solve problems (Mayer, 2002; Novak, 2002; Perkins, 1992). The concept road to transfer is characterised by the acquisition of this well-organised knowledge *before* applying it in a context. Above we mentioned that learning must take place in contexts where meaning has been given to concepts. The context road to transfer is characterised by the acquisition of this well-organised knowledge *while* applying it in an everyday context.

The research question of our study is: *Which instruction, added to the usual lessons of economics in the fifth grade of pre-university education, is more effective in obtaining transfer: an instruction aimed at strengthening knowledge of concepts and relations between concepts, or an instruction based on constructing relations between knowledge of economic concepts and daily reality?*

4. Method

Design

This study is an experiment with two experimental conditions, the concept-condition and the context-condition, with a pre-test and a post-test. The pre-test was administered to check that groups did not differ in prior economic knowledge. There is one independent variable: the form of instruction. The dependent variables are near transfer, semi-far transfer and far transfer.

Participants

Some 139 students between the ages of 16 and 18, from eight classes of the fifth grade of pre-university education, and from six different schools, participated in our study. They had all chosen the three year economics course. This research took place in the second year of the course. In all selected classes the economic subjects *The economic climate* and *Money circulation* – used in the research – were taught in the first year of the economics course. Links between these subjects had not been discussed so far. Because the concepts were not new to the students, we considered a two-hour-long instruction sufficient. Within each class, students were randomly assigned to one of the two conditions.

Instruction

The instruction for the concept condition consists of tasks which challenge students to reconstruct and consolidate their conceptual networks. The goal of this is that the first obstacle for transfer we mentioned – not enough concepts, wrongly understood concepts and incorrect relations between the concepts (see Figure 2) – is obviated completely or partially. The instruction for the context condition consists of tasks which challenge students to strengthen the connections between the conceptual framework and contexts, i.e. economic phenomena in the real world. This instruction corresponds with the second obstacle for transfer (see Figure 2).

Figure 3 below gives a schematic view of the aimed knowledge that is being acquired in the two conditions. The point of departure (in the upper part of the figure) is the same for the two conditions: the students have concept knowledge at their disposal (acquired in the school instruction), but the concept network is not complete and not all concepts are related to each other. Few connections can be seen between the conceptual network and the practical context. In the lower part of the figure our expectations after the instruction can be seen. The connections from the conceptual knowledge to the practical context are shown in the lines between the concepts and the practical situations. In the upper part of Figure 3 there are not many lines. The concept condition (bottom left) improves the conceptual network, and the context condition (bottom right) increases the number of connections between concept and practical context. It is possible that in the context condition, the conceptual network is also improved, since students will link these concepts to a concrete context, but we do not think students' conceptual network will reach the same quality as in the concept condition. We expected that an especially rich and coherent conceptual network would enable far transfer (see also our hypotheses below).

Figure 3: The desired changes in knowledge in concept and context conditions
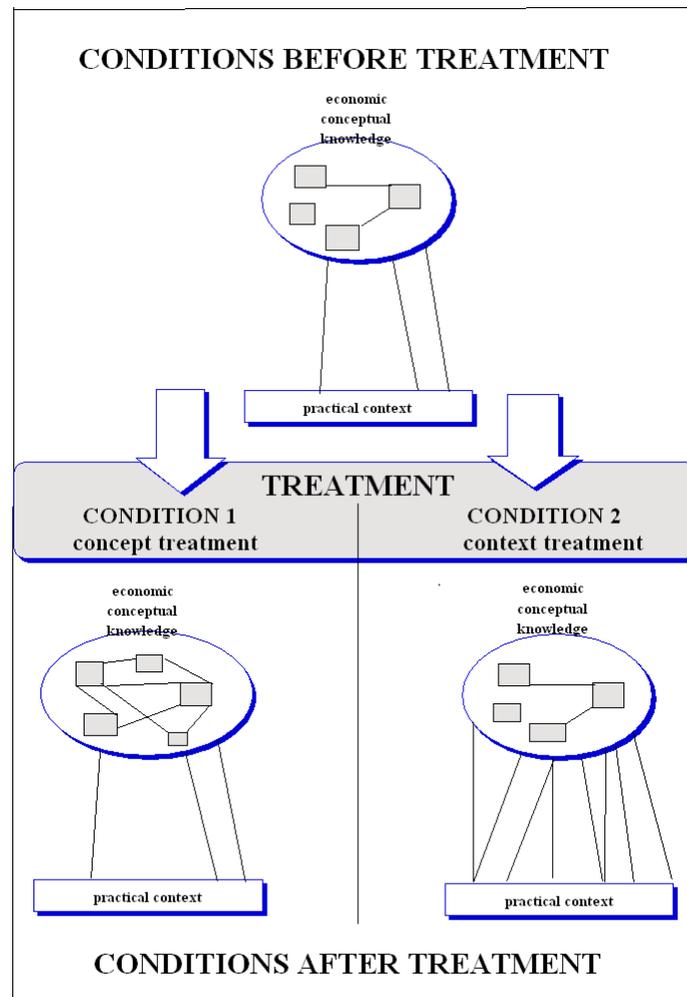
As mentioned, before the experiment, in their normal school programme, the students followed a course on money circulation and the economic climate. In the pre-test, students' knowledge about these concepts was measured. In both conditions students were constructing concept maps and instruction session took two lessons of 50 minutes each. The instructions and the test were part of the normal schedule at school. The total research period covered 2.5 weeks, five lessons altogether: two for instructions and three for pre- and post-tests (measures of near, semi-far and far transfer).

The learning materials: concept mapping tasks and information paper about the economic climate and money circulation

For both conditions we developed a concept mapping task on which students worked in pairs. Concept mapping is a learning activity that can be used in both the concept road and the context road (see Appendices 1 and 2 for the full instructions). Novak (1990) describes a concept map as a compilation of concepts connected by relations. O'Donell *et al.* (2002) use the word 'knowledge map' rather than 'concept map'. Besides concepts, they say that a knowledge map can include dynamic relations, static relations and elaborative relations that contain information. A concept map can contain relations between concepts and practical situations. It can also contain prior knowledge which is important to activate (Beyerbach and Smith, 1990) as well as conditional and situational knowledge (Alexander, 2006). When students are co-constructing a concept map, the interaction is strengthening the benefit

of concept mapping. The collaboration with peers is motivating students to (re)construct their conceptual network (Roth and Roychoudhury, 1992).

An example of a map in the concept condition is shown in Figure 4 and that in the context condition In Figure 5.

Figure 4: An example of a map in the concept condition
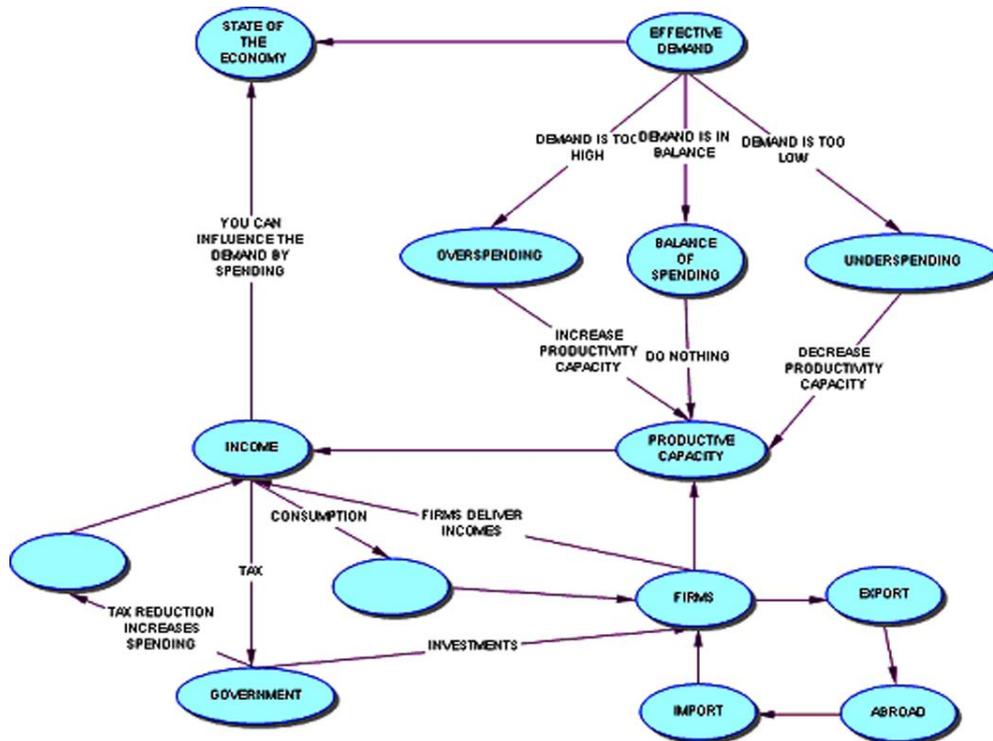
Figure 5: An example of a map in the context condition
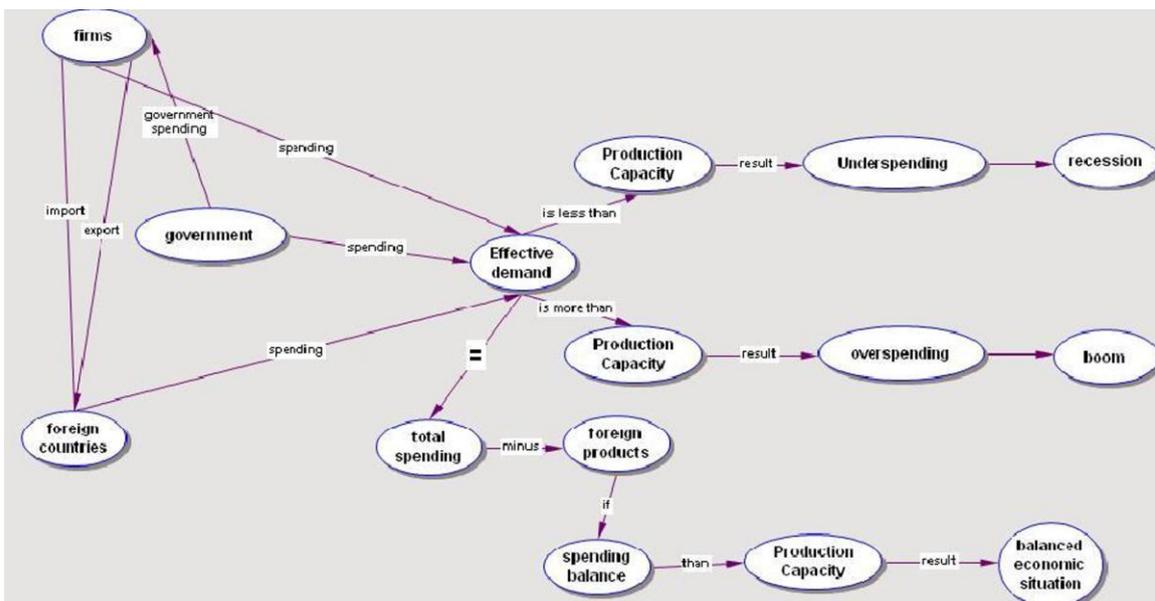
Students did not have experience with concept mapping. They worked in the first instruction lesson individually on a concept map using paper, Post-its and pencils. After that they worked in pairs, constructing one concept map on the computer (using a program called Inspiration, www.inspiration.com). We decided to form pairs to promote interaction. Because students had to construct a joint concept map, it was desirable to work with not more than two students. The pairs were composed by using the middle group method (Pijls *et al.*, 2003). The pairs had to have discussions to reach a consensus. Students were asked to write down the questions they encountered while working on the concept map on a form. In the second instruction lesson students received information on where they could find the answers to their questions. With this information they had to reconstruct their first jointly made concept map. The formulation of the questions was a stimulus for discussion while constructing the concept map and for searching for information.

In the task for the concept condition, students were asked to make a scheme of labels and links to show how money circulation is related to the state of the economy in a year, when the state of the economy is in balance. Students were given three concepts (labels) they had to use and they were encouraged to use concepts they knew from earlier instruction. The task for the context condition was oriented towards a complex social problem. In the Netherlands a supplementary duty (25 cents) was set by the government on the price of petrol to discourage motorised traffic. Some members of Parliament wanted to discard this supplement retrospectively. Students were to discuss the possible economic effects of this proposal for society. Thus, they had to apply conceptual knowledge to a concrete economic problem. Students received some examples of practical outcomes and the same three concepts and were asked to make a concept map. They were explicitly stimulated to think from the practical context to economical concepts and *vice versa*.

The information used in this experiment differed from the textbooks students used in class. Besides the economic concepts, there was a lot of practical information, so students had an example of how to use economic concepts in practical contexts.

Tests

All students took four tests:

(a) a *pre-test* to measure prior domain specific conceptual knowledge. This test consisted of 25 questions. The test was constructed using a computer test program ('Wintoets'). The minimum score was 0, the maximum score was 72. The item homogeneity was not very high, but we considered it as just sufficient: Cronbach's alpha was 0.60. Because it was considered a test with divergent questions, the construct we measured was heterogeneous in nature; that is influencing the alpha (De Vellis, 1991). We used the computer program 'Wintoets' (www.drp.nl) for scoring the closed questions. The open questions were scored using a correction scheme.

(b) a *far transfer test* to measure students' ability to connect *new* knowledge to existing knowledge in a *new* context. The test was labelled '*Five circumstances in difficult economic times*' (see Appendix 3 for the full task). It entailed writing five texts associated with five economic cartoons drawn for a newspaper. The students were informed that the editor accidentally threw away the original stories associated with the cartoons. The students' task was to write appropriate economic texts for the five cartoons. The texts were scored on the

amount of connections between *T* (conText) and *C* (conCept) – the context scoring – and on the economic correctness of the *C* pointed units – the concept scoring. The minimum score was 0 and there was no maximum. The definitive concept scoring was determined by dividing the correct *C* units by the total *C* units. The inter-judge reliability for the context score was good (Cohen's kappa 0.85) and reliability for the concept score was sufficient (Cohen's kappa 0.64). When laying down the codes it was first established how to judge for a *C* (conCept) or a *T* (conText). The texts were scored by two researchers. Researcher 1 divided the texts into scoring units. Both researchers scored the *C* units on *C* or *T* and on economic correctness (see the scoring method in Appendix 4). The validity is partly guaranteed by the fact that both reviewers were economists so they could determine adequately when the concepts were used in an economic way and when they were not.

(c) a *near-transfer/semi-far transfer test*. This test consists of two parts:

- a concept post-test to measure conceptual domain knowledge after the experiment (a near transfer test for the concept condition and a semi-far transfer test for the context condition). This test is the same as the pre-test. The item homogeneity of this post-test (Cronbach's alpha 0.72) was higher than that of the pre-test.

- a context post-test to measure the ability to make connections between concept and context (a near-transfer test for the context condition and a semi-far transfer test for the concept condition). This test consists of two open questions related to practical problems. One of the problems was 'abolition of the fiscal interest deduction for mortgages' that started from the practical context; the other was 'the economic climate in 2003', starting from the concept. Students were stimulated to make connections between context and concept and *vice versa*. Two independent researchers scored independently the connections between C and T in the students' texts. The minimum score was 0 and there was no maximum. The inter-judge reliability was good (Cohen's kappa 0.85).

Experimental procedure

Students were randomly assigned to one of the two conditions. The experiment was conducted within the school schedule of two lessons, distributed over the week. The tasks were self-directed. Explanations by the teacher, which could have been of influence on the performances of the students, were not necessary. The tasks and the tests were done via computer while students received all the information on paper. The instructions were presented by the same test leader in all groups.

Figure 6 represents the experimental procedure. The time schedule is indicated on the right. Each session lasted 50 minutes. In session 5 the concept and context tests were counter balanced. During the experiment sound recording took place by some of the pairs in both conditions. The researcher kept a logbook.

Figure 6: Course of the experiment for students in the concept condition and the context condition
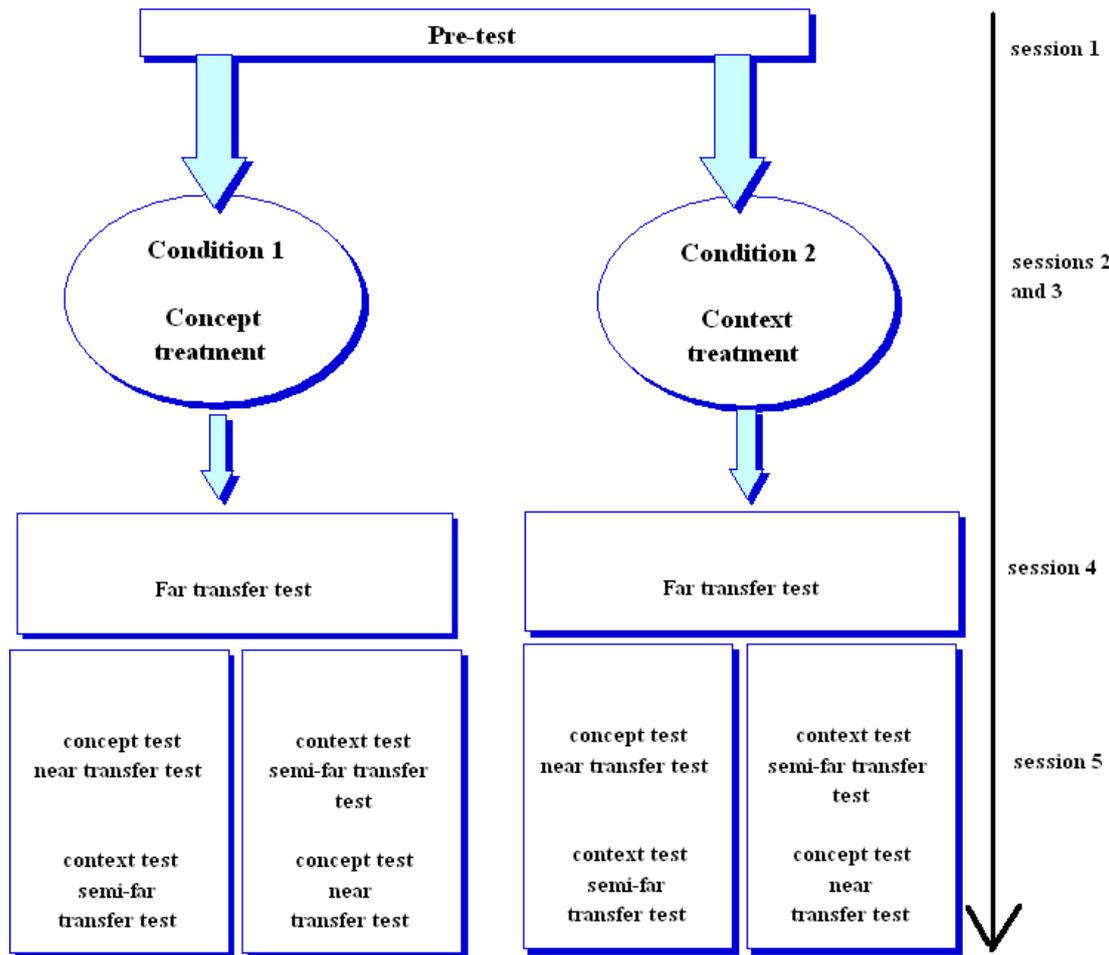
Hypotheses

We expected that students in the concept condition would perform better on the concept post-test (a near transfer test for them) than students from the context condition (a semi-far test for them). We expected that students in the context condition would perform better in connecting concept and context (context post-test, a near transfer test for them) than students in the concept condition (a semi-far test for them). Furthermore, we expected that the concept condition would be a better starting point for solving far transfer tasks than the context condition. This expectation is based upon two relevant points from literature about meaningful learning (Alexander, 1997; Gelman and Greeno, 1989; Salomon and Perkins, 1989). First, a solid, coherently organised conceptual framework is a condition for transfer. Second, as far as we know, there is no empirical evidence to expect that the ability to connect concepts and contexts alone, without a strong conceptual network, is a good basis for far transfer.

5. Results

At the start of the experiment there appeared to be no significant difference between the conditions in the school marks for economics ($t = -1.09$; $df = 1.34.5$; $p = 0.28$) as in the results of the pre-test ($t = -0.22$; $df = 138.1$; $p = 0.83$).

Table 1 shows the students' scores in the concept and the context condition.

Table 1: Scores for the concept and context condition: means and standard deviations (between the brackets)

	Concept condition		Context condition		Max. score	Highest score
	(N= 69)		(N=70)			
	Mean	(SD)	Mean	(SD)		
Pre-test concept	40.16	(6.46)	40.47	(7.33)	72	
Post-test concept near/semi-far transfer (is equal to pre-test)	41.93	(8.20)	42.42	(7.95)	72	
Post-test context near/semi-far transfer	4.34	(3.46)	4.18	(3.40)	*	12
Post-test concept far transfer	46.60	(22.55)	49.03	(25.44)	*	85

* No maximum score

The mean scores on the pre-test show that the knowledge students possess of the concepts of money circulation, the state of the economy with related concepts and the relationships between these concepts, is low.

We expected that students in the concept condition should perform better on the near transfer concept test than students in the context condition, but they did not, as was proved by the results of the covariance analysis (controlled by the pre-test score) ($F(3,132) = 0.059$; $p = 0.94$). We expected also that the context instruction should result in making more connections between context and concept than the concept condition. However, the differences were not significant ($F(3,129) = 0.356$; $p = 0.70$). Concerning the far transfer, it was not proved significant that the concept condition resulted in more conceptual knowledge ($F(3,136) = 0.213$; $p = 0.80$) and more connections, ($F(3,135) = 0.168$; $p = 85$), compared to the context condition. From Table 1 we see that the scores on the context part of the far-transfer test, compared to the scores on the concept test, are low in both conditions. We expected this for the concept condition, but we did not expect that there would be no difference with the context condition. The instruction for the context condition was directed to making the connections.

Because the pre-test concept was the same as the near/semi-far transfer test concept, it was possible to determine whether students made progress on conceptual knowledge. From a t-test for a paired-sampled test we learnt that on the concept post-test, the mean scores were significantly better than on the pre-test (M/SD pre-test = 40.41 (6.01), M/SD post-test = 42.23 (6.96) ($t = -2.663$; $df = 132$; $p = 0.009$). The students improved their knowledge.

6. Discussion

In this study we compared the effects of two roads of instruction to reach near transfer, semi-far transfer and far transfer. The ability to transfer is an important goal to reach in economic education. To be able to achieve transfer students must have a deep understanding of economic concepts *and* they must be able to make connections between contexts and economic concepts. We designed two instructions: for the concept condition, the concept road emphasising the strengthening of economic concepts and for the context condition, the context road emphasising connections between concepts and contexts. We tested on near transfer, semi-far transfer and far transfer.

We could not confirm that the concept condition performed better on the near concept test and that the context condition performed better on the near context test. Also, we could not confirm that the concept condition, due to the better organised knowledge base, performed better on the far transfer test. But the whole group of students significantly improved in conceptual knowledge. Students had more knowledge of economic concepts after the two lessons. We expected that students in the concept condition, because of better concept knowledge, should be able to perform better on the far transfer test and that they should score better on the context part of the test. This was not the case. Most likely, the ability to make connections between context and concept is a necessary skill for far transfer and this has to be developed besides the conceptual knowledge. But in this case we should expect that the context condition that improved in conceptual knowledge as much as the concept condition should perform better on the context part of the far transfer test. Students have had an instruction aimed at making connections between concepts and contexts. Students in the context condition have not learnt more than students in the concept condition. The conceptual learning was the same in both conditions, but the ability to make connections was difficult in both conditions. A reason for the inability of far transfer in both conditions can be that, despite the extra training, the conceptual knowledge in both conditions is still not sufficient to reach far transfer. How can we explain this? A possible answer is that two lessons of 50 minutes each were too short to reach the aims. Possibly, the result can also be explained by the fact that the students followed the instructions only partly. They were asked to write down questions they engaged in performing the task, but they did not know what to ask and did not use the information they had received. Perhaps they needed more feedback than we provided in this experiment. Bransford and Schwarz (1999) underline the importance of new information and feedback. Working with context tasks can stimulate students to ask for feedback and information.

In spite of the results, this study has given us more insight, especially with regards to the following points:

- Conceptual knowledge alone is not sufficient for transfer.

- The ability to make connections between practical situations and concepts is not being learnt easily by students. In any case, it is more time-consuming than two lessons.

- In context-directed economics education students learn as many concepts as in concept-directed economics education. Also, students learn concepts *while* working on contexts.

- Student motivation depends on the type of task. Audio tapes of pairs and logbook notations showed that students were very motivated for the lessons in this experiment. To the astonishment of their teachers, in both conditions the students worked together very intensively, were serious and performed all the tasks with pleasure. The computer program and the task to construct a concept map played important roles.

The results are raising questions too. One question, for example, is: 'Is it better to start right from the beginning with contexts in economic lessons?' The approach of first teaching concepts and then in the next lessons teaching how to apply them in contexts is perhaps not the most effective way. Perhaps it is better to start with students working on a context and then go deeper into using concepts. We were supported in this by Alexander's model of domain learning (2005) mentioned earlier. It is also possible that for some students, the concept road is effective – for example, for students already belonging to the *competence* stage – while for others the context road is more effective – for example, for students belonging to the *acclimation* stage.

One important point to mention is that we have to ask ourselves if far transfer is possible in secondary education. Studies, where transfer has been measured, showed that often transfer was not reached (Detterman and Sternberg, 1993). Bransford and Schwarz (1999) attribute this to the fact that in school expert behaviour of students is often required. However, as they call it, direct application (DA) of knowledge is too difficult for students. They place more emphasis on preparation for future learning (PFL) by setting the goals on how to tackle the problem, how to question the problem, etc. This does not go as far as DA; it is the first step in reaching transfer.

7.   Recommendations for future research

It is important that students can use their economic knowledge in daily life even when contexts are different from the contexts in which they have learnt the knowledge. Further research has to be done to find learning activities that lead to different forms of transfer, especially near and semi-far transfer. More research has to be done with respect to the use of the context road in economic education. In general, too little attention has been given to the linking of context to concepts, for which the context road can be a good method. In addition, it is motivating for students and it also helps them to develop conceptual knowledge. Perhaps alternating a focus on contexts with a focus on concepts is most effective. Future research could study such alternation or combination. Furthermore, more research needs to be done to determine which kinds of contexts are effective in the learning process and at which moments.

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Appendix 1: A concept treatment assignment

Today, you are going to make a drawing – a diagram – that shows how the circular flow of income and expenditure is connected to the state of the economy/market conditions.

You already know all the concepts that belong to this topic from the classes of the preceding years. But it is useful to refresh your memory and to find out what you remember about this topic.

1. Do you know what all those concepts mean?

2. Do you know what the connections between those concepts are?

3. Can you account for and explain those connections?

If you are having trouble with this, it will be difficult for you to make sense of what is being said and written about the development of the economy right now. And that is quite a lot!

By means of this assignment you will discover what you have understood from the classes about this topic and on which points you still have work.

In these sessions we will work towards a poster-exhibition. We will use the materials you are going to make in the sessions for this. Today we are going to make the first set of materials.

What are you supposed to do?

You are going to make a diagram, using a list of concepts, a sheet of A3 paper, Post-it notes and a marker.

How are you going to go about this?

1. You have 10 minutes to do this individually.

2. In front of you there is a sheet of A3 paper and a pad of Post-it notes. On page 2 you will find the list of concepts.

3. Write down each concept on one Post-it note.

4. Paste the Post-it notes with the concepts on them on the sheet of paper in such a way that the concepts that are closely connected to each other end up close to each other on the sheet. Put the other concepts further away.

5. Draw lines or arrows between the concepts that you think are connected to each other.

6. Write down near the lines or arrows what the nature of the relationship between the concepts is. Use the markers for this.

7. You do not have to use all of the concepts. If you decide not to use certain concepts, please explain your reasons for omitting them. Put these concepts at the bottom of the sheet and write down why you haven't used them.

8. You are allowed to add concepts. You have empty post-it notes at your disposal. Please explain and write down why you have decided to use additional concepts.

Appendix 2: A context treatment assignment

Today, you are going to work on a current economic problem. By making the assignments you will complement your knowledge and you will learn to use your economic knowledge. And in practice it is necessary that you are able to do this. How else will you be able to join in on conversations about economic developments? In these sessions we will work towards a poster-exhibition. We will use the materials you are going to make in the sessions for this. Today we are going to make the first set of materials.

What is the current economic problem you are going to work on?

In the period running from May 2002 until October 2002 the Dutch government consisted of a coalition of the political parties CDA, VVD and LPF. This was rather extraordinary, since the LPF was a new party. This party was bent on changing numerous aspects of (political) life in the Netherlands.

The minister of Economic Affairs of the LPF, minister Heinsbroek, wanted to have a number of measures implemented as soon as possible. For example, in the spirit of the late LPF-leader Pim Fortuyn, who was assassinated shortly before the 2002 Dutch parliamentary elections, Heinsbroek wanted to give 'the Kwartje van Kok' back to the people. This term refers to the raising of the price of petrol by means of a supplementary duty of 25 cents (in Dutch guilders) per litre. This was carried out by the Dutch government under prime-minister Kok in 1991 to discourage motorists from driving. The LPF not only wanted to abolish this supplementary duty, but they also wanted to give this money back to the people retroactively. This would mean that Dutch families receive a sum of money. At the same time this would cost the government a great deal of money.

Of course, minister Heinsbroek had read in the 'Macroeconomic Explorations' of the Dutch Central Planning Bureau that the economic growth had declined in 2002. It was a matter of underspending and he was very much aware of that. He also knew that in the following years the economic growth would remain limited or would potentially even decline further.

At that time many people were wondering: These plans of minister Heinsbroek, are they full of hot air, doomed to deflate sooner or later, or are these measures useful in the current economic depression?

You have been trained in economics. You understand that this question cannot be answered with a simple yes or no. What are the consequences of the repayment of the money for the Dutch families? How would that influence the economic situation of that time? And what are the consequences of the repayment of the money for the Dutch government? How would that influence the economic situation of that time? And how do these two factors work together? Will the repayment of 'the Kwartje van Kok' help to get out of the economic depression or will it only make things worse?

What is your answer when you are presented with this problem?

What are you supposed to do?

During a dinner-party with your friends the question explained above suddenly comes up!

These plans of minister Heinsbroek, are they full of hot air, doomed to deflate sooner or later, or are these measures useful in the current economic depression/slump?

And everyone is looking at you; after all, you are taking economics! You do not have much time to think about it. What are you going to answer?

Write down in the box below the answer you would have given in the situation just described.

Appendix 3: Five economic circumstances are indicating poor performance in the economy

The economic editor of the journal has written an article about five economic circumstances that together are indicating poor performance in the economy.

Each part of the article starts with a picture with a title. The five titles are:

1. Exports are going down…..

2. …*and* consumer confidence and producer confidence are collapsing…

3. …*so* economic growth is decreasing….

4. …*as a result of this* unemployment is increasing…

5. …*and* the budget deficit is growing.

With every image the editor had written a paragraph to explain to the newspaper readers *what influence the mentioned circumstances had for their daily lives*, why the circumstances developed and how they influence subsequent events. The words *and… so…..as a result…* show the causality.

But what happened? The editor has lost his writings and he has left for holiday to an unknown destination. What to do?

You will understand. The editor is convinced about your capacity to complete the article by writing the lacking parts. With the information you will find underneath, you will succeed!

Get to work as follows:

Write the texts, that go together with the images, for readers that not have much knowledge of the economy.

So write in your own words:

- what the image is showing

- why the image is in the position it is

- why the circumstance is proving that poor performance is expected and what consequences this has for the daily lives of the readers

Each text must have a minimum length of 100 words.

Good luck!

Appendix 4: Procedure for scoring connections between conceptual knowledge and practical context

Three steps were taken.

1. *Division into units.*

The answers of the students were broken up into the following meaningful units (scoring units).

Sentences
Example: *For most people the purchase of a house is an enormous expenditure they do not make overnight.*

Parts of sentences, if such a part contains a new point.
Example: *If they do not want to do this, houses will continue to be for sale and this will be the beginning of a depression.*

Conjoined sentences – when a statement in one particular sentence is explained in the next sentence.
Example: *This will also have an effect on the market conditions. These will start to decline because potential buyers of houses will start to lose faith in the economy.*

2. *Attribution of T- and C-scores for units that concerned 'practical context' and 'economic concepts' respectively.*

Code *T* is attributed:

- When a scoring unit renders a description/aspect of a context. For example: *When this is no longer possible, house owners may end up in a tight spot because they are no longer able to pay off the mortgage.* Or when a statement is given that is in itself economic, for example: *If this is the case the market conditions will enter a period of recession,* but that lacks any further explanation. In such a unit a student delivers a statement (*show**). A statement is often followed by an explanation and/or justification (**explain and justify*) (Dekker and Elshout-Mohr, 1996). An explanation can be recognised by the presence of words such as: *so, due to this, because of, as a consequence of, therefore,* etc. When the explanation is provided in a context this is scored *with* a *T*, for example: *Due to this, the market conditions will also start to decline again, because the person in question has to pay more (will have to pay more) (for a house) (explain and justify).*

- When economic concepts are used in the explanation, a *C* is attributed. For example: *This is bad for the economy. Because people will start to limit their expenditures.*

3. *Computation of the total score.*

The number of transitions a student made between context and concept or *vice versa* is added up.

Example: Peter's answer to one item of the Context-test is presented in italic; each unit (defined as unit by the experimenter) is presented at a separate line.

- ***T*** *consumer loses more money to mortgage*
- ***C*** *consumer's purchasing power declines*
- ***T*** *consumer moderates buying behaviour; buying is expensive*
- ***C*** *invests less and saves more*
- ***T*** *buys fewer products*

   C *producers' faith declines*
   C *production capacity is not fully exploited*

Peter makes 5 transitions (*T-C, C-T, T-C, C-T* and *T-C*) and obtains a score of 5.

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