

New strategies for learning geography: a tool for teachers' professional development in England and The Netherlands

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Following a constructivist view on learning and based on the work of Adey and Shayer a group of teachers and lecturers in geographical education from north-east England developed some successful strategies to stimulate pupils' thinking skills. At the start of this century the ideas reached The Netherlands. This article presents the results of a survey among Dutch geography teachers who participated in an in-service training about thinking skills strategies for geography. Did these teachers really use the strategies in their classrooms after the in-service training? What kind of impact had it on their opinions about the usability of the strategies, their beliefs about students' learning and about their own teaching? This study shows that, in line with experiences in England, most Dutch geography teachers appreciate the thinking skills strategies as a good way to stimulate students' and their own learning.

Animés d'une vision constructiviste de l'enseignement et de l'apprentissage, et sur la base des travaux d'Adey et Shayer, un groupe d'enseignants et de chargés de cours du Nord-Est de l'Angleterre dont la discipline est la géographie ont mis au point plusieurs stratégies efficaces pour stimuler les aptitudes de réflexion des élèves. Au début des années 2000, leurs théories sont parvenues jusqu'aux Pays-Bas. Le présent article présente les résultats d'une étude menée auprès de professeurs de géographie néerlandais qui ont suivi une formation 'in-service' sur les stratégies de développement des aptitudes de réflexion pour la géographie. Les professeurs ont-ils réellement utilisés les stratégies dans leurs classes à l'issue de la formation? Quel type d'impact cette dernière a-t-elle eu sur leur opinion quant à l'utilité des stratégies? Cette étude révèle que la plupart des professeurs de géographie apprécient les stratégies de développement des aptitudes de réflexion et qu'elles constituent un bon moyen de stimuler les élèves et leur apprentissage de cette discipline.

Siguiendo un punto de vista constructivista del aprendizaje y basándose en la obra de Adey y Shayer, un grupo de maestros y profesores de educación geográfica del noreste de Inglaterra desarrolló con éxito algunas estrategias para estimular las habilidades de pensamiento de los alumnos. A principios de este siglo, estas ideas llegaron a los Países Bajos. El presente artículo

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ofrece los resultados de un estudio realizado entre profesores de geografía holandeses que participaron en un curso de formación durante el trabajo sobre estrategias para estimular las habilidades de pensamiento para la geografía. ¿Utilizaron estos profesores realmente las estrategias en sus clases una vez finalizada la formación? ¿Cómo influyó ésta en sus opiniones sobre la aprovechabilidad de las estrategias? El presente estudio demuestra que la mayoría de los profesores de geografía consideran que las estrategias dirigidas a las habilidades de pensamiento son una buena manera para estimular tanto el aprendizaje de los alumnos como su propio aprendizaje.

Nach einer konstruktiven Untersuchung im Unterrichtsbereich und unter Zugrundelegung des Werkes von Adey und Shayer entwickelte eine aus Geografie-Lehrern und -Lehrbeauftragten bestehende Gruppe aus Nordostengland erfolgreiche Strategien, um die Denkfähigkeiten der Schüler und Schülerinnen anzuregen. Zu Beginn dieses Jahrhunderts erreichten die Ideen die Niederlande. In diesem Artikel werden die Ergebnisse einer Untersuchung bei niederländischen Geografielehrern dargelegt, die an einem Lehrerfortbildungskurs über Denkfähigkeitsstrategien für den Geografieunterricht teilnahmen. Haben diese Lehrer wirklich die Strategien in ihren Klassenräumen nach dem Fortbildungskurs genutzt? Wie wirkte sich dieser Kurs auf ihre Meinungsbildung zur Brauchbarkeit der Strategien aus? Diese Studie zeigt, dass die meisten Geografielehrer die Denkfähigkeitsstrategien als gutes Mittel zur Anregung des Lernens der Schüler- und Schülerinnen und ihres eigenen Lernens schätzen.

Introduction

It is increasingly asserted that in an information economy with rapidly changing technologies, continuous re-skilling will be essential. Current educational practice centred on the mastery of fixed bodies of knowledge appears to be increasingly out of step with such needs. Today's society requires an education system in which pupils are prepared for this new environment. This means that development as a learner is as important as mastering knowledge. Pupils need to undertake assignments in order to develop learning capability whilst developing foundation knowledge in subject disciplines. They are expected to be active and critical learners rather than passive consumers of knowledge. However, curriculum change is not easy to enact (Anderson, 1995; Black & Atkin, 1996). New ideas do not always work very well in the classroom. Without motivation pupils will not necessarily engage with new tasks, teachers may struggle to adapt their pedagogy to make change a reality and schools can be very conservative places.

Within this context it is instructive to consider the impact of an approach to teaching thinking skills which started in England. In the 1990s a group of academic geographers and geography teachers from north-east England developed some teaching thinking strategies to tackle the problem of pupil engagement. *Thinking through geography* (Leat, 1998) and *More thinking through geography* (Nichols & Kinninment, 2001) were written expressing the desire that geography should be a more challenging subject that helps pupils to become better learners. *Thinking through primary teaching* (Higgins & Baumfield, 2001), *Thinking through history* (Fisher & Wilkinson, 2002), *Thinking through religious education* (Baumfield, 2002)

and *Thinking through modern foreign languages* (Lin & Mackay, 2004) have been published using the same principles.

It is difficult to quantify the number of teachers using the strategies (it is substantial), but the impact can be judged by the fact that many are now included in materials to be distributed to all secondary schools in England as part of government reforms (Department for Education and Skills [DfES], 2004c). Thus, many teachers in England have used the strategies to start the process of personal and professional development focusing on pupils' learning capacity. The approach pioneered in *Thinking through geography* (TTG) of using teaching thinking strategies fits with the requirements of the National Curriculum in England (Department for Education and Employment & Qualifications and Curriculum Authority, 1999), where information processing skills, enquiry skills, creative thinking skills, reasoning skills and evaluation skills should be taught as part of normal teaching. It is thus more than an optional extra for teachers. In reviewing the spread and impact of these strategies Leat and Higgins (2002) termed them powerful pedagogical strategies because of their capacity to initiate a process of professional change in teachers that transcends curriculum subjects. A number of research reviews have summarized the positive impact of teaching thinking skills on pupil attainment.

Fascinated by the work of their English colleagues, Dutch teacher trainers started to translate the ideas for geography teachers in The Netherlands (Vankan & Van der Schee, 2004). Hundreds of Dutch geography teachers followed in-service training courses to be introduced to the TTG strategies. The in-service training started with some simple and short strategies. The more complex and longer strategies were introduced at the end. The reactions of almost all teachers participating in these courses were positive. However, intriguing questions were raised concerning whether Dutch teachers that participated in these in-service training sessions would use the TTG strategies in their classrooms and whether or not classroom implementation would change their knowledge and beliefs. Organizing in-service meetings is the most widely used method of professionalizing teachers. There is a common view that a high proportion of in-service training in the past had little effect on teaching and learning in practice because it was too far removed from the teacher's everyday environment (Organisation for Economic Co-operation and Development, 1998) and the impediments to change were very significant. In an extensive review of attempts at curriculum innovation in a wide variety of countries, Black and Atkin (1996) provided detailed accounts of many of the issues facing such reform. These included the importance of a key person to drive an innovation, leadership, culture and organization of schools, changing teachers' conceptions of teaching and of students' capabilities and teachers' anxiety about change. However, there are some more fine-grained reasons why teachers find the accommodation of reform ideas so hard. Fullan (1999) pinpointed the difficulty of the subtleties of reform being lost when they are packaged as a product. He argued that it is the tacit knowledge of practitioners that is so important but not easily conveyed. A similar point was made by Black and Wiliam (1998), that teachers will not take up research-based ideas if they are presented as general principles only, as they have to translate

them into practice and they are too busy. In their words, they require 'a variety of living examples of implementation, by teachers with whom they can identify and from whom they can both derive conviction and confidence' (p. 16). However there are also studies that indicate that in-service training can be successful. Schober (1984), for instance, found that in-service training in economics improved the achievement scores of participating teachers and their students. In addition, as their achievement scores improved, both teachers and students developed more positive opinions about economics. So although a literature review on in-service training shows conflicting evidence, most research projects support the idea that in-service training can stimulate the implementation of curriculum innovations (Snippe, 1991, p. 23). Within the context of world wide attempts at reform it is important to be able to identify the variables that are critical to the success or failure of innovation, especially where there are indications that the agent of change will travel not only across subjects but also across national cultures.

The initial questions of this article therefore were as follows.

1. Do geography teachers that were trained in TTG during in-service training in The Netherlands use the TTG strategies in their teaching?
2. Do those teachers that use TTG strategies in their teaching notice a change in their professional development?

This article reports the results of a survey among Dutch geography teachers about the TTG project. We present an outline of the research design and research results after some background information about the theoretical basis of the TTG project, TTG materials and the Dutch educational context. The last section of this article discusses some issues about implementing thinking skills.

Background

The teachers and teacher trainers in the TTG group believed that in many geography lessons there is not enough concern with the intellectual development of pupils. Encouraged by the Cognitive Acceleration in Science Education (CASE) project (Adey & Shayer, 1994), the TTG group developed geography lessons that contained open-ended tasks, required collaborative group work from pupils and focused significantly on how tasks had been tackled. Based on theories of motivation, strategies were structured to make lessons more interesting and to make pupils more excited (Slater, 2003, p. 292). TTG has three broad aims (Leat, 1997, p. 145):

- to devise adaptable strategies and curriculum materials that make geography lessons more stimulating and challenging;
- to help pupils understand some fundamental concepts and develop some important cognitive skills in geography in an explicit way so that these can be transferred to new contexts;
- to aid the intellectual development of pupils so that they can handle more complex information and achieve greater academic success.

TTG has developed more than 20 strategies and a number of curriculum units (Leat, 1998; Nichols & Kinninment, 2001) and, in the process, identified and clarified a number of principles for curriculum design and teaching. The books with teaching materials each contain eight pedagogical strategies with three examples of their use in varied geography teaching contexts. They include, based on the classroom trials:

- background information on the strategies;
- the classroom materials used;
- advice on planning;
- introducing the tasks in the classroom;
- managing the group work;
- debriefing the learning outcomes;
- suggestions for follow-up work;
- afterthoughts on the significance of the strategy to pupils' learning and teachers' teaching.

An important but pedagogically difficult characteristic of thinking skills activities is the debriefing episode, in which the students are encouraged to reflect upon their own thinking, and the transfer of their reasoning to new situations. Figure 1 gives an outline of one of the strategies. Pupils are put into groups of around four and told that they have to decide what Pedro will take on his journey to California. (The resources mentioned in Figure 1 are not included in this article.)

On the basis of interviews with pupils, classroom observation and analysis of video recordings of lessons (Leat & Lin, 2003), the strategies can be said to have the following characteristics:

- pupils are challenged and made to think hard;
- there are multi-layered learning outcomes ranging from subject learning to social learning, literacy, learning skills and metacognitive learning;
- there is high quality whole class discussion in which pupils are prompted to give reasons for their thinking, share procedures and give each other feedback;
- connections are made from the subject context to other subjects and frequently to everyday, topical contexts;

Imagine you are Pedro Morales. You are twenty years old and have decided to migrate to California in search of a well-paid job. You have talked with other Mexicans who have made the trip to California before and they told you about 4 different jobs. In the first resource you will find more information about the situation of Pedro Morales, in the second you will find information about the different jobs and in the third resource you see the items you may choose to take but limited by what you can carry. You have managed to save 40 dollars but this will have to buy the things you will need for your trip as well. You are faced with a choice of how to cross into California. You can swim across the Rio Grande or you can cut the wires. If you swim the Rio Grande you stand a 1:10 chance of being caught; if you go under the wire then you stand a 1:3 chance of being caught. If you are caught by the Immigration Officials you can pay them a bribe of 20 dollars and they will let you through. After you have decided how you will get into California, what you will take with you and what job you will do, you must write about your decisions.

Figure 1. A TTG strategy, packing for a journey (Nichols & Kinninment, 2001, p. 41)

- the purpose of learning is often clarified in terms of the value or potential use of the learning in other contexts;
- pupils are encouraged to ask questions;
- pupils feel that their reasoning rather than right answers is valued and that teachers support them in overcoming difficulties and obstacles.

The original use of TTG strategies was an example of bottom-up change, driven very much by motivated individuals and networks of teachers. Occasionally these teachers would be able to enlist the support of their school senior managers. However, since the use of these strategies has been advocated as part of a government reform initiative more systematic support for implementation has been available. They are included in Unit 16 of *Teaching and learning in secondary schools* (DfES, 2004b) and the *Leading in learning* (DfES, 2004c) initiative for 11–14 year olds. In these circumstances support for their use will be available through local education authority consultants, some money is available for planning and review and school senior managers are encouraged both to support the process and to learn from the impact on teachers and pupils. This creates conditions for a better balance between bottom-up and top-down processes, which is one of the critical issues in educational reform. Like other recent efforts for curriculum renewal, the TTG approach is founded on a social constructivist perspective. New information will be understood only if it can be interpreted through existing knowledge structures and this process is supported by exploratory talk. An important principle is to get pupils to access their existing knowledge or to provide concrete experiences that will serve as the framework for their understanding of an issue (Leat, 1997). The model of teacher beliefs, knowledge and practices developed during research into the effectiveness of primary numeracy teachers (Askew *et al.*, 1997) was applied to geography teaching by one geography teacher researching the impact of the strategies on her pupils and practice (Bright & Leat, 2000). She wrote (p. 7)

The main assumption of the model is that practice in the classroom is the most significant factor influencing learning outcomes, as the interaction between teacher and pupil is the most significant influence that a teacher has on pupil learning. Interacting with teacher practices are a set of beliefs about what it is to be good at geography, how pupils learn to be good geographers, and how best to teach geography. Also influencing practice is teacher's pedagogical content knowledge, geographical subject knowledge, knowledge of pupils and knowledge of teaching approaches. Pupils' responses also influence teachers' pedagogical content knowledge. Furthermore pupils' responses to changes in teachers' practices can influence whether the changes are reinforced or discouraged. The model shows that the relationships are not unidirectional and the strength of the relationship may vary.

To provide an example, suppose teachers go on a course and learn about new teaching approaches that they find appealing, they might, if conditions are favourable, use that approach in their teaching. In effect the teaching strategy has become part of their pedagogical content knowledge and influenced their practice. What determines what happens next is whether pupils respond to the change positively. If the answer is yes, there are potential feedback effects on pedagogical

content knowledge, classroom practice and beliefs as a process of ‘tinkering’ is initiated. If the answer is no, it is probable that they will reject the new strategy as unworkable. The TTG strategies offer the possibility to teachers, across cultural settings, of observing pupils working in a way that is highly revealing in terms of underlying cognitive processes.

The lever for teacher change is therefore provided by their perception of how pupils have responded to the teacher’s innovation. This is born out by geography teachers conducting action research using the strategies in Cheshire (Cheshire County Council, 2001). As these teachers talked on video, time and again they returned to the way pupils had responded:

I have done the Taboo (activity) and I have structured it very carefully and they have got engrossed in it very quickly ... and it has engaged them longer and from the point of view of literacy in the lesson, it has taken them one step further.

I have seen a difference in pupil response in terms of behaviour, enthusiasm and enjoyment and it’s easier to manage now, kids are on task for longer and they are more enthusiastic and motivated.

With a Year 11 class (15–16 year olds) I did a card sorting exercise (classification) with them on flooding and I was astounded by their response.

Further evidence for the impact on pupils and, as a consequence, on teachers is included in the evaluation of the pilot of the ‘Leading in learning initiative’ (DfES, 2004a).

Pupils across the ability range engaged with and responded positively to the teaching approaches, especially in collaborative group work. In the majority of lessons there was evidence of pupils adopting a new vocabulary to articulate their own thinking and reflect on their own learning. There was improved communication, coupled with constructive group talk Pupils behaviour was often improved as a result of their interest and engagement with the tasks.

This led to the following observed effect on teachers:

The pilot gained the commitment and enthusiasm of teachers. ... Teachers found the recommended range of teaching strategies useful for collaborative planning and for making connections across subjects. Teachers commented that involvement in the pilot encouraged them to raise the level of challenge in the classroom activities provided and to offer more open-ended tasks.

The TTG strategies seem to offer interesting opportunities for secondary schools in The Netherlands. As in England, the new curriculum for upper secondary general education in The Netherlands (Ankoné, 1996), called ‘Study House’ for short, aims at the introduction of a new methodology which emphasizes active and independent learning by pupils. In the geography curriculum, information processing, enquiry, reasoning and evaluation are important skills (Vankan, 1996). The term ‘Study House’ is used to indicate that learning by the pupil is the key factor not instruction by the teacher.

There will be a change in the role of the teacher which can be characterised as a shift from the dominant instruction-oriented role to the more organisation-oriented role directed towards the creation of a powerful learning environment for pupils. In order to

support teachers in their exploration of new didactic roles specific impulses are needed. Exemplary teaching materials in which the central ideas of the innovation have been worked out as concretely as possible are of great importance to teachers. (Van den Akker & Bergen, 2000, p. 125)

The TTG strategies seemed to offer motivating teaching materials that could support the shift in teaching role and reify the central ideas of the innovation.

Research design

In-service meetings were organized for geography teachers in The Netherlands to become familiar with the strategies developed by the TTG group of teachers and teacher educators in Newcastle. Strategy exemplars published in *Thinking through geography* (Leat, 1998) and *More thinking through geography* (Nichols & Kinninment, 2001) were translated into Dutch (Vankan & Van der Schee, 2004). Although some of the exemplars were adjusted to the practice of Dutch geography teaching, most workshop materials followed the original English version. Approximately 500 geography teachers participated in in-service training sessions between January 2002 and June 2004. The programme of each in-service training event consisted of an introduction, hands-on workshops using the TTG strategies and a debriefing. During the workshops the teachers assumed the role of students to experience the strategies, which was followed by a discussion at teacher level about the usability of each strategy for geography classes.

Between three and nine months after the in-service training 90 randomly selected teachers were sent a questionnaire by mail, to investigate whether they actually had used the strategies in their geography lessons and to get feedback on their response to the strategies. The questionnaire with 15 items contained four types of questions:

- multiple choice questions about teachers' personal characteristics;
- questions about teachers' use of TTG strategies in their geography classes;
- questions to obtain information on teachers' opinions about the usability of TTG strategies for their own classrooms;
- open questions to explore the teachers' perceptions of the influence of TTG strategies on teaching and learning.

Thirty-two geography teachers responded (36%), but it is probable that the more motivated individuals returned the questionnaire. Therefore, the effect of the TTG in-service training may be overstated and the conclusions must be viewed with caution.

Results

In response to our first research question 'Do geography teachers that were trained during the TTG in-service training in The Netherlands use the TTG strategies in their teaching?', all teachers except one that returned the questionnaire used one or more of the TTG strategies in their geography class. Table 1 shows the strategies which were exemplified during the in-service training. The general trend in Table 1

Table 1. Percentage of teachers that used the TTG strategy in their geography classes and percentage of teachers that used a self-made application of the TTG strategy

Strategy	Percentage using the strategy in their geography class ($n=32$)	Percentage using a self-made application of the strategy in their geography class ($n=32$)
1. Taboo	56	41
2. Odd one out	56	50
3. Maps from memory	44	31
4. Concept maps	22	19
5. Classification	13	0
6. Mystery	28	3
7. Making animals (planning)	25	3
8. Fact or opinion	9	3

is that teachers prefer to use the simple and short strategies in their classes, like 'Taboo' and 'Odd one out'. Table 1 also shows that many teachers adapted the more simple strategies to other content in their geography class but few adapted the more complex strategies like 'Concept maps', 'Classification', 'Making animals' and 'Fact or opinion'.

Our second research question was 'Do these teachers that use TTG strategies in their teaching notice a change in their professional development? When asked to give a mark between 1 (minimum) and 10 (maximum) for the usability of the strategies for geography teaching the average score of the 32 teachers was 7.7. No significant relation between these scores and personal characteristics could be found. One teacher was disappointed after working with the TTG strategies in his class, 38% (12 teachers) said working with the strategies in the class had a positive influence on their opinions about the usability of the strategies for geography teaching and 59% (19 teachers) reported that their opinion had not changed since the in-service meeting.

We asked the teachers to describe what effect the use of TTG strategies had on the learning processes of their pupils and on their teaching. The teachers reported two main effects of the strategies on the pupils:

- it motivates pupils (52% of teachers);
- it makes pupils think (48% of teachers).

Some teachers mentioned both effects. Other issues commented upon were 'it stimulates cooperation between pupils' and 'it is a challenge for active and independent learning'. These results are in line with earlier research on this subject (Van der Schee *et al.*, 2003).

The teachers' reactions were classified into four categories:

- personal motivation, typified by the response: 'It motivates me' (44% of teachers);
- stimulation to think about how pupils are learning, typified by the response: 'It makes me think about pupils' learning processes' (30% of teachers);

- encouragement to be creative, typified by the response: 'It stimulates me to be more creative' (15% of teachers);
- improvements in planning, typified by the response: 'It helps me to organize challenging lessons' (11% of teachers).

Although some teachers complained about the lack of time to use the strategies in their lessons, most reactions were positive:

It is a pleasure to see my classes so actively involved in geography and it gives me time to coach the slower learners better.

It is very stimulating and it enlarges my confidence in pupils.

Now I learn to think in a new way, but using these strategies you need to take time for reflection with the pupils, otherwise the effect is zero.

My didactical repertoire grows.

It motivates me although I do not have time to do this.

I learned that it is not important that pupils finish what I planned to do, but that they think and learn.

Summarizing the teachers' reactions two words catch the eye: enthusiasm and learning processes. The teachers are enthusiastic seeing that their pupils are working enthusiastically. Secondly, the teachers are more focused on learning processes than before, seeing that these strategies challenge pupils to think more than in other lessons. There are strong echoes here of the processes described earlier (Bright & Leat, 2000), in which teachers are stimulated into a developmental process by the response of their pupils.

Although the number of teachers is limited, this small research project shows that the TTG strategies presented here seem to effect several elements of the model of teachers' professional development. The strategies generate positive pupil responses, the teachers become more sensitized to how pupils learn, they further develop knowledge of specific teaching strategies and, in some instances, their beliefs about how best to teach geography is changing.

Due to the quite recent introduction of TTG strategies in The Netherlands there are as yet no independent published evaluations about the use and effect of TTG strategies in Dutch classrooms. Although one has to be cautious, the introduction of TTG in The Netherlands seems to be showing similar trends to those in England. Following in-service training many teachers are using the strategies, especially the less complex ones, to enrich their repertoire. As a further indication of the impact, all publishers of geography school books in The Netherlands have introduced TTG strategies into their new school books in 2004.

Discussion

Realistic teacher education starts from practical problems and the concerns experienced by teachers in real contexts (Korthagen, 2001, p.273). Motivating and challenging pupils is a real concern of many teachers. TTG is a teaching approach that can make learning more meaningful for pupils, improves

understanding, helps reveal misconceptions and helps teachers reinterpret their subject matter. Further, the use of such pedagogical strategies seems to have application in other subjects. However, TTG is no panacea for all geography lessons. It is clear that there are substantial barriers at teacher, school and government policy level to implement this alternative view (Leat, 1997). 'Normal' lessons are safer and more predictable and teachers generally prefer to make lessons predictable and routine (Carter & Doyle, 1987). Although a limited number of teachers were involved in this study the evidence suggests that powerful pedagogical strategies are a promising tool for professional development. They motivate teachers and pupils. However, it seems likely that if left unsupported there will be limits to the impact on pupils. The evaluation of the reforms in England for 11–14 years olds in the foundation subjects (Stoll *et al.*, 2003), which included teaching thinking skills using some of these strategies, expressed some doubt about the depth of change achieved by some teachers. Some of the change in teaching was suspected of being somewhat superficial and not fully supported by an understanding of principles.

However, this study highlights an aspect of appropriate support. One of the clear results is that the Dutch geography teachers adopted some powerful pedagogical strategies far more readily than others. This is a striking pattern. The strategies presented in the seminar, that were most commonly used by the teachers, 'Taboo' (56%), 'Odd one out' (56%) and 'Maps from memory' (44%), were also the strategies that were most readily adapted by teachers (41, 50 and 31%, respectively). On reflection, these strategies require least transformation of the subject matter, whilst strategies such as 'Mystery' and 'Making animals' require teachers to recast the subject matter substantially and potentially have the greatest diversity of outcomes in the sense that pupils can generate very diverse answers. Wilson *et al.* (1987) stressed the importance of pedagogical content knowledge to teaching. Pedagogical content knowledge is a complex formulation, but it includes how to teach the subject, how pupils learn the subject and how curricular materials achieve these ends. There are studies in mathematics teaching (Askew *et al.*, 1997; Boaler, 1997) that would suggest that teachers who see their subject in terms of how it relates to real world contexts are more successful as measured by pupil learning outcomes. It is highly probable that having difficulty in adapting the more complex strategies is an indication of a weakness in pedagogical content knowledge that has implications for the type of support that might be needed by teachers. This support might include:

- help with planning the use of more complex strategies;
- classroom support or coaching;
- assistance with developing understanding of the underlying concepts and modes of enquiry of the subject;
- support in developing analogies, stories and contemporary contexts which establish the transferable relevance of the subject.

To write a successful strategy like 'The journey of Pedro Morales' one has to transpose declarative knowledge about a topic into a human scenario, build a

storyline involving characters, weave in whatever social, economic, political and physical factors are implicated in causes and effects related to the context, design some 'red herrings' and maintain a degree of ambiguity in the overall data set. From observations from working groups of teachers and workshops many teachers find this extremely difficult. It demands a form of subject knowledge that many do not have available in their repertoire. 'The journey of Pedro Morales' is an example of the strategy 'Making animals' (see Table 1). The strategy 'Fact or opinion' asks different but equally difficult questions for teachers about the very nature of knowledge. Pupils are given disarmingly short sections of text, usually the views of individuals on an issue, and asked 'What parts of this are fact and what parts are opinion?' No attempt is made to define precisely what a fact or an opinion is, instead pupils are invited to generate other categories if they find 'fact' and 'opinion' too limited. Teachers who do not have a strong grounding in philosophy or epistemology may be unnerved by the open nature of this task. Further, they may doubt the importance of the potential outcomes when considered solely in terms of learning geography. Within this context sustained support systems are highly necessary. If Fullan (1999) was right, that the subtleties of reform are lost when they are packaged, then an approach which uses pedagogical strategies as building blocks can allow teachers to take ownership of reform, developing their tacit knowledge over time (which one hopes they can make explicit to some degree). However, such an organic approach to reform is unlikely to succeed without a change in the infrastructure of teachers' professional development.

However, the results from the Dutch geography teachers can be seen in a wider context still, especially as their response reflects that of many teachers in England. These teachers may be regarded as operating within an activity system (Engeström, 1999). In this analysis the actor, in this case the teacher, is highly constrained by the norms of the institution and culture within which their work is set. However, by adopting these strategies and therefore changing their actions, they are changing their purpose or object, from mastering of the subject and the smooth running of lessons to improving the learning capacity of their pupils. Nearly all the teachers quoted in this article had noticed something and they are struggling to make sense of it and to find how best to capitalize on it. It is our collective experience that many teachers do falter in taking full advantage of what the strategies offer, as the norms of their working context often do not support their efforts at change. They tend to reach a plateau in their capitalization of the learning potential. Many reach a point where they are ready to inquire into their teaching and pupils' learning, which accords with Dewey's (1933) notion of reflective thinking which begins with a situation which is ambiguous and presents a dilemma, but they cannot do it alone. Classroom enactment (Fishman *et al.*, 2003) therefore emerges as a critical concept as teachers' knowledge, beliefs and attitudes are developed interdependently as they try new teaching methods and materials. It is here that the type of support listed earlier is important.

However, the action in the classroom is set within the context of an activity system, in this case the school, which sets important constraints upon teachers.

Schools may be rated as having a high or low inquiry orientation. In 'high inquiry' schools, for example, teachers critically discuss issues of curriculum, instruction or student learning and address areas of disagreement (King, 2002). There are also a growing number of studies that point to key features of leadership in encouraging teachers to focus on teaching and learning (Muijs *et al.*, 2004). In many schools the wider activity system does not support change, which brings the discussion back to the factors limiting change listed by Black and Atkin (1996) in the introduction.

Nevertheless, the enthusiasm of Dutch teachers working with TTG in their classrooms is promising. It is important that geography teachers are open to this way of learning and that they are offered a chance to experiment in a safe environment. The perceived usability of new teaching and learning strategies is critical to the adoption process (Doyle & Ponder, 1977). It seems that Dutch geography teachers are willing to adopt some thinking skills strategies as they become familiar with them through a hands-on process and by the opportunity to discuss the pros and cons of each strategy with colleagues during in-service meetings. As teachers become more confident they begin to make connections with other educational agendas and they want to influence school policies. Somehow this process crystallizes their personal growth and helps them reflect on their change in their self-concept as an educator. Without the support of colleagues and school leaders these intentions decay and old routines may return. Providing such support is a critical role for education managers at all levels.

There is a general agreement by commentators that support is essential for any large-scale implementation of reform (Bodily, 1996; Adey *et al.*, 2004). So, for example, on the basis of studying nearly 20 multi-year, multi-site large-scale reform efforts over 15 years, Stringfield (2002) concluded:

Reforms require more resources over a longer period of time than either design teams or local educators realize. ... Support for reform must be a permanent feature in most contexts.

The experiences from The Netherlands and England reported here indicate that where teachers are excited by the change, much can be achieved through their motivation. However, much greater attention needs to be given to the type of support that is required to make the change lasting and deep rather than superficial. The first level of support has been indicated above; it is substantially face-to-face and practical. The second level of support is that offered by the school and wider system (the activity system) which sets the boundaries and norms of classroom action. At this level there is the need to encourage and understand the process of innovation teachers are embarking on, so that it becomes a process of collaborative action research where peers welcome new knowledge.

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