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Preparing and debriefing geography fieldwork: a scenario for open classroom dialogue around a core curriculum

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Abstract

Over the last decades empirical findings have shown the positive impact of fieldwork on students' geography learning. This study focuses on the design and evaluation of a scenario for fieldwork that supports geography teachers to structurally integrate it into their lessons. The scenario helps teachers to build up an open classroom dialogue during the preparation and debriefing of a fieldwork home assignment, by using a mind map as the central platform. First evaluations are promising, indicating the relevance, practicality and validity of the scenario.

Keywords: Classroom Dialogue, Core Curriculum, Debriefing, Fieldwork in Geography, Mind Map, Preparation

1. Introduction

Over the years, empirical findings support the positive impact of fieldwork on geography learning (e.g. Ballantyne and Packer, 2002; Boyle et al., 2007; Cook, 2008; Fisher and Norman, 2000; Fuller, 2006; Kwan and So, 2008; Mackenzie and White, 1982; Scott, Fuller and Gaskin, 2006). Researchers have claimed that well performed geography fieldwork fosters cognitive learning, attitudinal, interpersonal and social outcomes, that mutually reinforce each other (Foskett, 1999; Nundy, 1999, 2001). Kinder (2013) however, brings in a critical note, by stating that the evidence supporting the supposed benefits of fieldwork, especially the actual cognitive gains, is not very elaborate and tends to emphasize affective benefits.

In general, geography fieldwork can be defined as a learning activity consisting of three phases – preparation, work outside the classroom and debriefing – in which students actively enquire into geographical phenomena in the real world (e.g. Caton, 2006a; Caton, 2006b; Foskett, 1997; Hill and Woodland, 2002; Job, Day and Smyth, 1999; Schmidinger, Molin and Brandt, 2014; Scott et al., 2006). The central aim of engaging students in fieldwork is to help them connect geographical theory to real world practices, whereby real world practice is feeding classroom theory and vice versa. For example,

most students have seen the effects of an earthquake in a documentary or on the news. In combination with the actual observation of a fault-line in the field, students get the opportunity to give personal meaning to the geographical concepts "fault" and "earthquake".

Because of its benefits, it is argued that fieldwork needs to be structurally integrated in the geography curriculum. The integration of fieldwork can be viewed on three levels or scales. On a large scale it could become a mandatory part of national programs, syllabi or school curricula. On a middle scale it should to be done with a certain frequency during the school year to overcome the exceptional outing that does not structurally add to the learning process. And on a small scale it should be carefully embedded in the lesson plan, so that the fieldwork subject and activity is logically related to the geography subject at hand, and preparation, work outside the classroom and debriefing are closely connected (Foskett, 1997; Job et al., 1999; Kent, Gilbertson and Hunt, 1997; McLoughlin, 2004). Since teachers play a pivotal role in the structural integration of fieldwork, at least on a middle and small scale, it seems necessary that they have the knowledge and tools to design and implement fieldwork structurally into their geography lessons.

Research in the Netherlands and other countries, however, shows that the structural integration of fieldwork barely comes about. Although geography teachers find fieldwork important, they do not perform it frequently and often as a rather isolated activity. According to many teachers one of the main reasons for this is a lack of time, but they also mention a lack of confidence and expertise (e.g. Munday, 2008; Oost, De Vries and van der Schee, 2011; Rickinson et al., 2004; Santi and Purboningrum, 2004; Zhang, 1999). The aim of this study is to design and evaluate a scenario that helps teachers in secondary education to structurally integrate fieldwork into their geography lessons. With a scenario a script with which teachers can design and implement fieldwork is meant. It provides a lesson structure to which teachers can add their own content. The main question is: Does the scenario help geography teachers to structurally integrate fieldwork into their lessons? In the next section, the theoretical background of such a scenario is explored.

2. Theoretical background

Constructivist theory assumes that knowledge is constructed by students as they attempt to make sense of new information and experiences. Students actively make meaning of the world surrounding them, integrating new information into what they already know. In this process of making meaning their prior knowledge influences the way they view new information and their subsequent construction of mental models (Kneppers, Van Boxtel and Van Hout-Wolters, 2009). Prior knowledge can be defined as all that students know or believe, "whether positive or negative, accurate or inaccurate, real or imagined, verifiable or non-verifiable" (Alexander, 2006, p. 72). This means that prior knowledge has to do with domain content (theory), as well as with experiences, interests and valuations concerning this domain content (practice). For example, a student may know the definition of precipitation as a concept (theory), but he also may have the experience of riding his bike in the rain (practice).

In constructivist learning environments, students need freedom to further explore and question their prior knowledge, by processing new information and creating new meaning. At the same time, students are novices in the domain, and therefore need structure and support to distinguish central and accurate domain knowledge from peripheral and inaccurate information (Alexander, 2003).

One way to provide students with both structure and freedom is working with a core curriculum (Applebee, 1994). According to Applebee (1994) a core curriculum provides core concepts for classroom dialogue within a tradition of a discipline such as geography, languages or science. Core concepts in geography are for example plate tectonics, climate, globalization and urbanization. In the context of fieldwork, "core curriculum" can be translated into one or several central concepts, related subconcepts, examples and so on. This core curriculum could be expressed in for instance a mind map (Figure 1). The use of a core curriculum offers teachers and students a central platform to share and discuss geographical concepts.

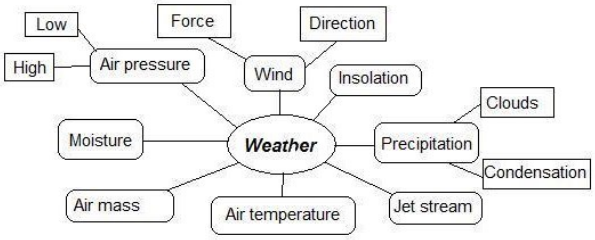

Figure 1. An example of a core curriculum for the core concept "weather".

In a classroom dialogue (or discourse), the purposeful use of language is essential for the building of new knowledge together (Wells, 2000). According to Burbules (1993, p. 8), dialogue is: "an activity directed toward discovery and new understanding, which stands to improve the knowledge, insight, or sensitivity of its participants". It can occur between two participants, but also in a small group or in a whole class. A good classroom dialogue fosters insight in the process of knowledge construction (Burbules, 1993; Collins and Stevens, 1982, 1983; Palincsar, 1986; Palincsar and Brown, 1984). In fieldwork, classroom dialogue could lead to improved knowledge about geographical phenomena as well as insight in how theory and practice can be related. Ideally, students give meaning to geographical facts, concepts and examples (theory) by linking these to experiences and valuations during fieldwork (practice). Therefore, linking theory and practice also needs to be the focus in the classroom dialogue. For example, during fieldwork students may observe clouds changing from day to day and they may note the day to day weather reports. These observations (practice) can be the starting point of a dialogue between teacher and students on the relationships between cloud types, weather characteristics and a frontal depression system (theory).

An often observed classroom dialogue sequence is the IRF-sequence, in which the I stands for Initiation, the R for Response and the F for Feedback (e.g. Sinclair and Coulthard, 1975). Walsh (2006) characterizes classroom discourse with a predomination of the IRF-pattern as a dialogue mode in which the teacher provides input about a topic and asks questions, elicits responses in relation to the material and checks, clarifies and evaluates answers. In this sequence, the students hardly interact with each other or ask questions. The teacher determines what is to be accepted as sound knowledge (Sinclair and Coulthard, 1975). Some researchers found that IRFs can serve useful and interesting purposes and achieve good levels of pupil involvement and learning (e.g. Alexander, 2000; Rojas-Drummond and Mercer, 2003; Wells, 1999). Other researchers, however, state that IRFs do not lead to students constructing and sharing their ideas in interaction (Mercer and Dawes, 2008). They have searched for a more constructivist way of dialogic learning, which offers students the opportunity to interact and share understandings. Wegerif and Dawes (2004) placed a Dialogue phase within the IRF-sequence, making it an IDRF-sequence. They originally applied the idea of IDRF to the situation of primary school children working together in groups at computers. In their research the D refers to small group discussions during a collaborate computer task. In the context of this study, IDRF is transferred to a secondary school classroom situation, in which the D stands for open dialogue between the teacher and students and students mutually. Walsh (2006) characterizes this classroom discourse as a dialogue mode in which the teacher enables learners to express themselves clearly, establishes a context for learners to express themselves and promotes dialogue and discussion. The teacher preferably uses open, referential questions (starting with "why", "how", "where"), that elicit longer and more detailed answers (Walsh, 2006). Especially this mode of dialogue, in which the teacher facilitates student contributions in extended learner turns, helping them to say what they mean, can support the linking of theory and practice during fieldwork.

The aim of this study is to design a scenario that helps teachers to structurally integrate fieldwork in their geography lessons so that students construct new meanings by linking theories to practices. From the literature discussed above, two design principles for this scenario emerge. The first design principle is working with a core curriculum, offering teachers and students the opportunity to share and discuss geographical concepts. The second design principle is open

dialogue, in which teachers let students talk with each other on the practical and theoretical understandings related to the topic at hand. These principles are worked out into the scenario characteristics.

3. Characteristics of the scenario

The first design principle is working with a core curriculum. To be able to give structure to the learning process, it is important for the teacher to have an overview of the fieldwork subject, its core concept and related theory. With this overview the teacher can create opportunities for students to share their understandings and experiences, help them link these to theory and get insight in possible misconceptions. By defining the core curriculum, the teacher prepares himself theoretically. The format in which the teacher defines the core curriculum should suit two purposes. First, it needs to give him an overview on the central concept and related concepts. Second, it needs to enable him to carry forward an open dialogue with students around those concepts and the students' prior knowledge.

A mind map, a visual schematic overview of interrelated geographical concepts, examples, experience and valuations, satisfies both purposes. That is why the design principle working with a core curriculum leads to the use of a mind map as a characteristic of the scenario. Mind maps, advanced organizers and concept maps are often used as tools to achieve comparable goals, such as helping students learn or negotiate meanings (Akinsanya and Williams, 2004; Ausubel, 1978; Buzan, 2011; Koopman, 2010; Mavers, Somekh and Restorick, 2002; Novak 2002; Novak and Gowan, 1984). Stokhof and Vries (2009) show that mind maps can serve four different purposes, namely getting an overview of a core curriculum, activate prior knowledge, support the process of knowledge construction and assessment. Mind maps are used worldwide and have been adopted in many educational fields such as biology, science and geography (e.g. Chang, 2007; Chatterjea, 2008; Kinchin, 2000; Mavers et al., 2002).

The second design principle is open dialogue. The mind map the teacher makes to define the core curriculum can be seen as an "expert" mind map. This theoretical structure helps the teacher to facilitate the open dialogue. In this open dialogue it is important to look at the intertwined role of theory and practice and the way it evolves: practice needs to enlighten and feed the discussion on theory and vice versa – they reinforce and inspire each other.

Although learning is an individual process, it can also be viewed as a joint activity and students as a community that works towards shared goals (Wells, 2000). In this sense, there is a need for collaboration. In a school setting it seems important that students test their own understandings against those of peers and teachers (Driscoll, 2005). For example, by listening to the explanations of peers and explaining to others what one thinks, the student verbalizes and formulates the concepts and processes under discussion (Van der Linden et al., 2000). This process can be stimulated in small groups, but also in a whole-class situation (e.g. Brown, 1994; Brown, Collins and Duguid, 1989; Renshaw and Brown, 1997; Van Boxtel, Van der Linden en Kanselaar, 2000a). Taking this into account, the design principle open dialogue leads to two characteristics of the scenario. First, to prepare students for participating in an open dialogue, and to stimulate the articulation and sharing of ideas and knowledge, it is important that there is an alternation between individual and group work and whole-class activities. Therefore, the scenario needs to contain not only stages with collaborate learning in a whole class setting, but also stages in which students work in small groups exchanging ideas (Kuhlthau, Maniotes and Caspari, 2007). Since a combination of individual preparation and a collaborative learning task seems to improve learning results and asking more questions (Van Boxtel, Van der Linden and Kanselaar, 2000b), there also needs to be room for individual, independent work, during which each students is challenged and activated. This independent work prepares them for participation in small group and whole-class open dialogue.

Second, the teacher needs conversational rules to facilitate open whole-class dialogue (Barnes, 2008; Burbules, 1993; Mercer, Wegerif and Dawes, 1999; Mercer et al., 2004). Thus, the scenario gives teachers explicit clues how to make a dialogue open. Those clues are: preferably use open-ended questioning, give students time to think of and formulate answers, encourage students to be active, and let students react on each others' answers. To help teachers think about what an open-ended dialogue and open-ended questioning means, examples of possible sentence starters could be given, such as "what do you imagine by", "what do you wonder about", "try to explain what", "what is the connection between" and "do you have the same idea as". These sentence starters could both focus on theory as well as practice.

Summarized, the scenario could benefit from three characteristics derived from the design principles: (1) use of a mind map to focus the domain and content of the field work and provide a shared platform for knowledge construction; (2) alternating moments for individual, small-group and whole class activities to build stepping stones for an open dialogue and promote the explication and exchange of ideas and insights; and (3) the use of clues and sentence starters to help the dialogue to become and remain open.

The scenario is a script with which teachers design and implement their own fieldwork. This means it is content free, so that teachers can adapt it to their own curricula and lesson plans. It structures the fieldwork in three phases: a preparation lesson, geographical enquiry outside the classroom and a debriefing lesson. In the preparation lesson, prior knowledge, experiences, examples and valuations concerning the fieldwork subject are activated and made explicit, using a mind map as a tool. Also, the students and the teacher engage in an open dialogue on the relation between the prior understandings of the students and the fieldwork subject. The geographical enquiry outside the classroom is an individual homework assignment, which is driven by a central question on the fieldwork subject that is provocative and that taps into the curiosity of the students. In this way, every student individually encounters geographical phenomena in the real world, acquires personal experiences and sees real examples of concepts that can be discussed in the classroom. In the debriefing lesson students collaboratively discuss what they discovered, experienced and learned in the field individually. The field findings feed and direct the discussion during debriefing. Especially in the debriefing the teacher can find out whether or not and how the students are searching for meaning and can discuss misconceptions and omissions (Foskett, 1997).

The main research question of this study is: Does the scenario help geography teachers to structurally integrate fieldwork in their lessons? The following sub-questions will be answered: (1) do teachers find the scenario relevant?; (2) do teachers find it practical and do they perform it as intended?; and, (3) is the scenario valid – does it help teachers to initiate and carry on an open dialogue in which prior knowledge, examples and experiences (practice) feed and enlighten the understanding of geographical concepts and facts (theory) and vice versa?

4. Method

This study is performed in the tradition of Educational Design Research (EDR) and involves prototyping in two iterative design and evaluation cycles. The scenario aims at supporting teachers to design and perform fieldwork on a subject of their own choice. In the first iterative cycle, teachers have chosen the subject themselves and designed the fieldwork materials. The first prototype was used to make the tentative design characteristics more concrete. The testing of this prototype can be considered a "work through" (compare with "walk through", Nieveen, 1999, p. 129), and an evaluation of the relevance and practicality. Subsequently, the second prototype is tested on its relevance, practicality and, most importantly, its validity. In this second iterative cycle the fieldworks' core concept is chosen by the researcher. The researcher also defined the core curriculum and prefabricated the expert mind

map and the homework assignment. This was done to simplify the comparing of different cases and to get distinct results related to the validity of the scenario.

In Table 1 an outline of the scenario of the second cycle is given. The fieldwork it aims for is small scale, and consists of one preparation lesson, an outdoor homework assignment and one debriefing lesson. During the preparation and debriefing, different activities are performed. In the preparation lesson, prior knowledge on the fieldwork subject is activated by an individual brainstorm and whole-class dialogue around a mind map. The aim of the work outside is to invite students to individually enquire their own neighborhood. During a period of five days the students take pictures of clouds, while at the same time measuring wind direction, precipitation and temperature. In debriefing, the exploration of the outdoor experiences in small groups consists of an assignment that leads to a dialogue between students on their findings and experiences to prepare them for a classroom mind mapping phase. The whole-class mind map made in the preparation lesson is used as a starting point for the dialogue in the debriefing lesson.

Scenario Phases	Activities in class and outside	Preparation teacher
Phase 0 Teacher mind map		Teacher orientates and prepares himself theoretically
Phase 1 Preparation	Introduction Individual brainstorm Whole-class dialogue around mind map Discuss fieldwork assignment	Teacher uses clues and sentence starters for making the dialogue more open
Phase 2 Work outside	Students perform homework assignment	
Phase 3 Debriefing	Introduction Assignment exploration of the outdoor experiences (small groups) Whole-class dialogue around mind map	Teacher uses clues and sentence starters for making the dialogue more open

Table 1. Outline of the scenario of the second cycle. Fieldwork central concept: the weather. Central enquiry question: What do clouds tell us about the weather?

4.1 Participants

Teachers are selected from the database of the HAN University of Applied Sciences on their willingness to learn about new ways to implement fieldwork and their enthusiasm for fieldwork. In cycle one five teachers participated, and in cycle two seven. Three of them participated in both evaluation cycles. The teachers work at five schools for prevocational secondary education situated in the Nijmegen Area. The study is performed at prevocational schools because in general those students profit from concrete examples and experiences to give meaning to geographical concepts. They are also more prone to be active, to do things. Two teachers participated with two classes in cycle one, one teacher participated with two classes in cycle two, the rest participated with one class. This means that cycle one consisted of seven cases and cycle two of eight cases. The average class size was 25 and the students were in the age of twelve to fifteen.

4.2 Procedure

First, the teachers were introduced to the scenario individually or in a group meeting. The scenario was presented and explained by the researcher, and questions and comments of the teachers were discussed to reach a shared understanding. Then the teachers used the scenario to design and prepare their fieldwork. Next, they performed the fieldwork with their class(es): after the preparation lesson, the students got one week to do the homework assignment, and then the debriefing lesson followed. After the performance the teachers shared their experiences of working with the scenario in a group meeting.

4.3 Data collection and analysis

During data collection, the focus was on the preparation and debriefing lessons and on the teacher perspective. A variation of data were

collected to measure the relevance, practicality and validity of the scenario: pre- and post-performance interviews with teachers, videos of the teacher group meetings, field notes during and videos of preparation and debriefing lessons and teacher and student materials (mind maps, fieldwork assignment and student products).

The pre- and post-performance interviews delivered information on the relevance and practicality of the scenario and an indication for its validity. The pre-performance interview was semi-structured and contained twelve questions with a focus on the experience of the teachers with (enquiry) fieldwork, the significance it has for them, and what they expect to learn from working with the scenario. The post-performance interview also was semi-structured, contained six questions that focused on the experiences working with the scenario, using the mind map, the clues for open dialogue and sentence starters, and if they will use it again.

Field notes were taken during open classroom observation. These data delivered a general description of the lessons and gave an indication for the relevance and practicality of the scenario and a first impression of the openness of the classroom dialogue. The timeframe of every lesson activity was noted. Per activity incidents were noted, as well as a general impression of the occurring dialogue considering the atmosphere, how much time students get to answer questions, the kind of questions the teacher asks, if during the dialogue students' prior knowledge is activated and explicated, if the teacher writes down items in the mind map on the white/smart board and refers to it or points at it, if field experiences are exchanged, and the way students contribute to the dialogue.

The teacher and student materials and the analysis of the transcription of the teacher group meetings gave information on the relevance and practicality of the scenario. The whole-class mind maps made in preparation and debriefing were analyzed, giving clues on the placement of items of theory and practice and links between them.

The videos of the preparation and debriefing lessons gave a detailed view of the role of the mind map and the openness of the classroom dialogue. These data gave information on the practicality and the validity of the scenario. The videos were analyzed in the following way. They were transcribed and the parts with classroom dialogue around the mind map, in which open dialogue is expected, were singled out. These were segmented and transcribed on the basis of content: each segment contains only one central item of content, for example a concept or an experience. A segment ends and a new segment starts at the moment this item of content is no longer central in the dialogue. The resulting number of segments vary in preparation from 9 to 25 per case (total of all cases 118) and in debriefing from 5 to 19 per case (total of all cases 67). For these segments the following indicators were described, namely the use of sentence starters by teachers, the type of questions asked, the way teacher and students contribute to the dialogue ("who does the talking"), how much time does the teacher give students to think of and formulate an answer, does the teacher encourage all students to be active, and does the teacher let students react on each others' answers. Also, the way concepts and facts (theory) and experiences, valuations and examples (practice) are apparent in the segments is described, as well as the relations between those items and their subsequent roles in the occurring dialogue.

5. Results

First, general experiences of the teachers with the scenario will be discussed to gain first insight in the relevance, practicality and validity of the scenario. Next the results focus on the design principles and characteristics of the scenario and describe the relevance, practicality and validity of the mind map as the representation of a core curriculum, and the relevance, practicality and validity of alternation and dialogue support for open dialogue. Finally the central aim of fieldwork is evaluated by describing the ways in which theory and practice get linked within the classroom dialogue.

5.1 Experiences with the scenario in general

The teachers showed excitement about fieldwork in general and were motivated to learn about it. They experienced working with the scenario as positive and found it challenging for themselves and activating for the students. Furthermore, it gave them confidence to perform fieldwork, as statements of two teachers show:

"Because I did this [work with scenario, ed.], I have more confidence to do other things with the students. […]..because when there had not been the push [of the research, ed.], I never would have done a small scale fieldwork".

"The scenario gave me new input to do fieldwork more easily with classes".

The teachers liked the set up of the fieldwork, with one preparation lesson, the work outside as a homework assignment and one debriefing lesson. For them, it was an eye opener that fieldwork could be done on this small a scale. They found it easy to integrate it into their lessons. The teachers reported the materials to be clear, concrete and easy to use, but also experienced students had to concentrate in a whole-class situation for too long. As a solution for this they would like to insert more group work and/or individual assignments. Overall, the teachers said they would like to use the scenario again.

The first prototype gave rise to overcrowded lessons and to teachers indicating feeling time pressure. It was observed that this went to the expense of the phase with the whole-class mind mapping and dialogue. An important reason for this was the time and effort it took to make an individual student mind map in preparation and debriefing. That is why in the second prototype the individual mind mapping was reduced to a five minute brainstorm in preparation. This resulted in a scenario that did not lead to time-pressure and could be well implemented within the given time.

5.2 Role of the mind map

From the interviews and group meetings afterwards, it became clear that the teachers valued making the expert mind map. It helped them to think sharply about the content and the goals of the fieldwork, and to make clear choices. It also helped them to capture the central concept and related concepts in a core curriculum (Figure 2). The analysis of the expert mind maps of the first cycle show that the teachers succeeded in defining a core curriculum for their fieldwork subject: the core concept was big enough to sustain a dialogue in two lessons, the number of other concepts was not too big or too small, and the concepts were all related.

Concerning the whole-class mind map, the teachers recognized its function as a platform for the dialogue. They experienced the whole-class mind mapping with the students as activating and they were surprised to see how much the students brought forward. It helped the students to think about the core concept and to bring forward their (prior) knowledge. They saw enthusiastic students, actively participating in the discussion and contributing to the whole-class mind map:

"I think you should give students the opportunity to contribute. Because these lessons depend on the students, for them to find out how things work. And at the end of the second lesson I told them, you actually did it all by yourself, didn't you. I could see in their faces that they were proud, thinking, yes, we did it ourselves. And those students are very active and fanatic making the assignments and contributing".

"….this really is activating. Why? Because all students are working and engaged. Every student makes a mind map and is thinking about what he or she has learned...[…]…everybody is involved, the whole class. No one can hide. That is really activating. The thinking process of students really gets trained".

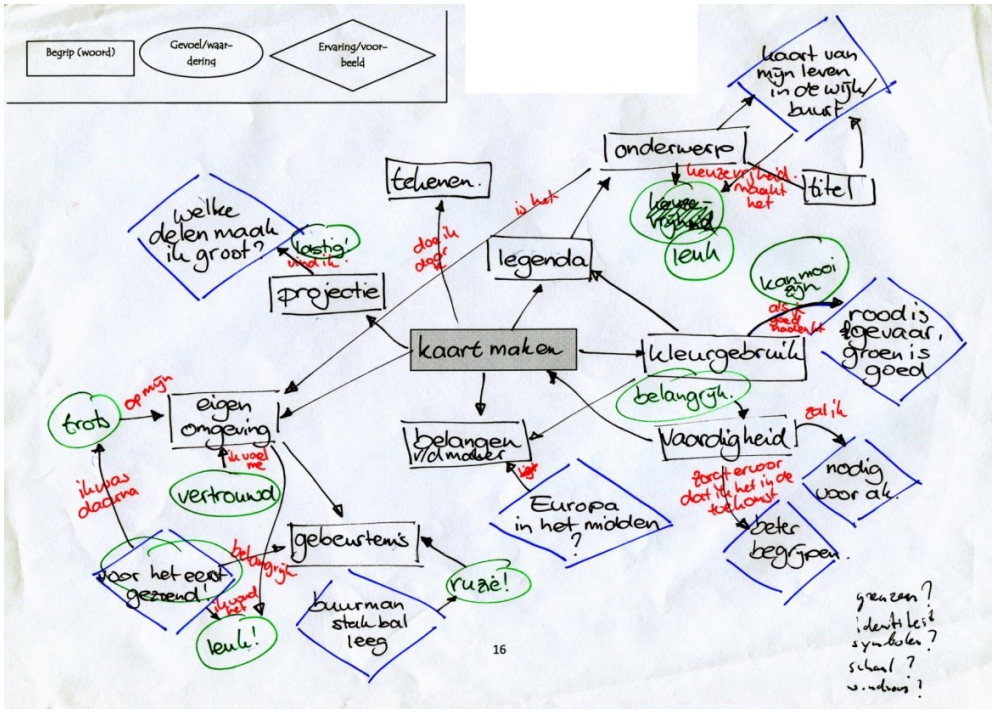

Figure 2. Expert mind map of a teacher collected in the first iterative cycle.

All the teachers liked working with the mind map, although they did not have the same amount of experience with it. The teachers with little or no experience reported more uncertainty and difficulties in working with the mind map. For example, some of them found it difficult to place the contributions of the students in the whole class mind map on the white/smart board, in a way that does justice to those contributions, but also in a way that clarifies theory. A reason for this can be the pressure those teachers felt to make the whole-class mind map look like the expert mind map as much as possible. This was more the case with the prefabricated expert mind map in the second cycle, indicating that teachers probably feel more freedom to use the expert mind map flexibly when making it themselves. On the other hand, most teachers stated that they felt the expert mind map helped them making the whole-class mind map together with the students, because it functioned as a compass giving direction to the dialogue.

During preparation and debriefing it was observed that all teachers referred to the mind map, talked about it, pointed to it and constructed it together with the students. In preparation, the brainstorm on prior knowledge led to a "summing up" of items that were put in the whole-class mind map. In debriefing the relations between the items in the mind map were more central in the dialogue.

It was observed that in general teachers wrote down more facts, examples and concepts, than experiences and valuations. Consequently, in the whole-class mind maps a relative focus on theory was visible. However, there are differences between cases. It was observed that the teachers who were inclined to explicitly ask for experiences and valuations, also seemed more inclined to write down (some of) those items in the mind map, especially in preparation. From the above it becomes clear that the mind map in general did help teachers to get an overview over the core curriculum and that it functioned as a platform for the dialogue on the core curriculum.

5.3 Alternation of individual, group and whole class activities

The teachers felt the scenario helped them to let students give shape to the dialogue. During preparation and debriefing teachers felt students

were motivated and active. It was observed that students during the individual brainstorm phase in preparation actively wrote down concepts, examples, ideas and experiences. Teachers reported seeing students exchange outdoor experiences and discussing their findings actively in debriefing. During the exchange of fieldwork experiences in groups in debriefing students were observed actively discussing their field findings and conclusions. This way, the alternation between individual and group work helped them to prepare themselves for the whole class mind mapping phases and participation in the dialogue. The following statement underlines the general impact:

"What I noticed was that students are more aware of the subject [Fair Trade, ed.]. Accidentally, the newspapers paid a lot of attention to Fair Trade at the time, on chocolate. Well, the students noticed it and talked about it in class, even when the fieldwork was over".

5.4 Clues and sentence starters in the dialogue

After working with the first prototype, teachers indicated they did not fully grasp the idea of an open dialogue. This is supported by observations of the dialogue in the classroom. Although teachers did ask open questions, they did not give students much time to formulate an answer and almost never let students react on each others' answers. In the second prototype clues were given on how to keep the dialogue around the whole-class mind map more open, for example sentence starters. After working with the second prototype teachers indicated they were aware of making the dialogue more open-ended and tried to actively use the sentence starters. They stated that it helped them to prepare themselves for the dialogue. The following statements are from two teachers:

"Well, I read the scenario carefully before I started and thought about the kind of open questions one can ask. And I remembered some of the examples in the scenario, with the idea well, yes, those sentences I can use to make questions for the students. And, well, I think I did use them and I also took into account the idea of letting them think about each others' answers".

"I did ask students more frequently to complement each others' stories…[…]…I also thought more about giving students time to answer, because usually I explain things and say 'that is correct' or 'that is not correct', while they can think about that for themselves. But before [using the scenario, ed.] I did not give them enough time to do it".

The analysis of the dialogue segments shows that in preparation (being a brainstorm on the fieldwork subject) the most frequently used sentence starters are of the following nature: "Do you have any additions to the mind map?" and "Where shall we put this in the mind map?" Furthermore, teachers ask students follow-up questions (open and closed questions), like: "How is this connected to…?", "How does this work?" and "Why is this the case?". One teacher asked students what they have experienced concerning the fieldwork subject, whether they remember something about it, what they think about it and what they like about it.

In debriefing (being the phase in which connections are made between theory and practice and misconceptions are challenged) frequently used sentence starters are of the following nature: "What items need to stay in the mind map?", "What is the connection with….?", "What did you find out?" and "What else can you say about….?". Teachers asked students follow-up questions, like: "What can you tell about…?", "Why is this important?" and "What has this got to do with….?". Three teachers asked question about the field findings of students, like: "What were your temperatures like, when there were clouds?", "How did you observe this?" and "How was that on other days?".

Other clues for the dialogue to be more open concerned the encouragement of students to all be active, giving students enough time to answer and letting students react on each others' answers. In preparation and debriefing teachers are observed trying to involve all students in the dialogue by taking turns or raising hands. Teachers seem to find it difficult to wait and give time to students to think about and answer a question. In 21 of the 118 dialogue segments in preparation and in 6 of the 67 segments in debriefing the teachers give students only once

more than 5 seconds thinking and answering time. Teachers do ask students to react on each others' answers, mainly through questions like "Does anyone have an idea?", "Can someone else help…..explain?", "Who wants to react to this answer?", "Does anyone have an addition to this?" and "Do you agree with this answer?". Teachers sparingly also let students react on each other without intervening.

From the analysis of the dialogue segments it becomes clear that in preparation as well as in debriefing the teacher does the talking. In preparation the teacher uses on average 3.5 times as many words per segment than the students (variation per segment: 2.5 to 4.7 times as many). Teachers who give students relatively more space in the dialogue, score lower on this point. In debriefing the teacher uses on average 5.1 times as many words per segment than the students (variation per segment: 2.9 to 17.8 times as many). In debriefing all teachers tend to end up in the "expert" role, explaining things about weather and clouds. That is probably why they do most of the talking in de debriefing. In the post-performance interviews teachers describe that they are worried that students do not learn enough if the teacher does not explain things to them. In preparation the students get more time to talk because of the brainstorm nature and teachers ask more questions that lead to students explaining what they mean by their contribution to the mind map.

5.5 Theory and practice in the dialogue

In preparation, after initiating and presenting the central enquiry question "What do clouds have to do with the weather?", the teachers gave students five minutes to write down as many items as they could think of regarding this subject, individually. Next, the whole-class mind map was made in a brainstorm session, in which the prior knowledge of the students was activated. Students mainly mentioned concepts like precipitation, snow, lightning, wind direction, water vapor, shadow, rainbow, water cycle, high and low pressure and sea. Less often, students mentioned things like: "The clouds tell you what the weather will be like" or "I flew through the clouds in an airplane". Two teachers explicitly asked for personal experiences with clouds. Students then mentioned experiences like "I can see figures in the clouds" and "When there is a fog it feels like I'm Superman, you're walking on clouds". The whole-class brainstorm helped many students to think of more examples, concepts and facts than they had first noted down in the individual brainstorm. By asking follow-up questions, teachers stimulated students to link their concepts to other concepts and facts. During this process, misconceptions in the students' prior knowledge could come to light, for example: "temperature vaporizes water and than a cloud appears", "when it is very hot, clouds do not appear", "when a cloud gets to heavy, rain will fall out of it" and "when the wind blows harder, it might become colder". All teachers, in one way or another, showed the students that they could do research themselves to investigate these suppositions through the homework assignment. However, the suppositions were not noted in the mind map, and the teacher did not follow them up in the debriefing.

In debriefing, first the students discuss their field findings (homework assignment) in small groups, by means of an assignment. This assignment helped the students to formulate conclusions on the connection between their cloud pictures and their weather measurements. Next, two teachers first discussed this assignment and then started the whole-class mind mapping, the other five teachers immediately started the whole-class mind mapping. In general, the teachers first try to let students formulate what they have learned and what should be altered in the mind map from the preparation. In this respect, the mind map functions as a platform for the dialogue and it helps them to make connections between examples, field findings and concepts. One teacher explicitly asked for the field findings and what these mean in the light of the enquiry question. In the occurring dialogue, the wrestling for understanding becomes visible:

T: […] did anyone notice that the wind on a certain day did not come from the west, but from another direction?

S1: no…

T: no?

S2: Yes, I have got one from the south, one time from the southeast and one time from the west.

T: okay, when it came from the southeast, for example, or from the south, was there any precipitation?

S2: Uhm…..no.

T: So there was no precipitation. And what is the explanation for there being no precipitation?

S2: Uhm……because there is not a lot of water, yes, uhm…..there is no sea. And if there is no sea, then there cannot be a lot of precipitation.

T: That is right, indeed, yes. That is because there is only little water. […] Besides wind from the west, there is…..Anthony?

S3: well, for example when the wind came from the southwest, there came 7 mm precipitation.

T: So, when it came from the southwest, there was more precipitation. […] when the clouds come from the east, there is less precipitation….[…] Andrea?

S4: Well, in my case there fell a lot of snow when it was southeast.

T: You noticed that when the wind came from the southeast, there fell a lot of snow?

This example also shows how difficult it can be for teachers to help students think about their measurements and how they can lead to generalizations (or not). This is probably the reason for the observation that although the teachers in the beginning try to initiate a dialogue in which the students do the talking and explaining, eventually they all take on their expert role, explaining the theory behind the enquiry. In the post-performance interviews teachers said they were afraid the students would not learn enough if they did not explain the theory. However, the moment the teachers did give students space to talk about their field findings and what they mean, the whole class became active and wanted to participate in the dialogue.

6. Conclusion and discussion

The main question of this study is: Does the scenario help geography teachers to structurally integrate fieldwork in their lessons? The following sub-questions are answered. First, do teachers find the scenario relevant? Second, do teachers find it practical and do they perform it as intended? And, third, is the scenario valid – does it help teachers initiate and carry on an open dialogue in which prior knowledge, examples and experiences feed and enlighten the understanding of geographical concepts and facts and vice versa?

Teachers are enthusiastic about the scenario, like to use it and feel that their students are motivated by it. They all say they will use it again. The scenario is performed as intended and within the given time limits. In this sense, it is considered relevant as well as practical.

The results concerning the validity of the scenario are more difficult to interpret. The (expert) mind map helps teachers define the core curriculum of the fieldwork. The mind map successfully functions as a platform for the whole-class dialogue. Teacher and students activate their prior knowledge and link new information. The teachers were content with the way individual, group and whole-class activities alternated. They recognized the importance of individual and group work to prepare students for the whole-class dialogue and used sentence starters and open questions. However, teachers mainly focus on concepts, examples and facts (theory), and much less on experiences and valuations (practice). The other clues to make the dialogue more open, being the encouragement of students to all be active, giving students more time to think and answer questions and let students react on each others' answers, were only used sparingly. Especially in the debriefing, the teachers took on their role of experts and did most of the talking themselves. Teachers need to learn how to work with the scenario, especially with the mind map and the open dialogue, to create and sustain an open classroom dialogue.

The scenario seems helpful for teachers to integrate fieldwork in their geography lessons, and activate students to think as a geographer. Further research could focus on the structural use of the scenario by teachers so that they get more familiar with starting open classroom discussions around the core concepts of geography.

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