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Reflection and questioning in classrooms in different cultural settings

Mandy Hommel¹ and David Clarke²

1 TU Dresden, Faculty of Economics, Chair of Business Education and Management Training, Dresden, Germany,

mandy.hommel@tu-dresden.de

2 University of Melbourne, Melbourne, Australia, d.clarke@unimelb.edu.au

Reflection in classroom learning leads to a deeper understanding and helps to connect knowledge with application situations. Socially initiated reflection can be observed as a lesson event embedded in Review, Elaboration, and Summarization. Questions constitute a primary catalyst for stimulating reflection, particularly in classroom settings. This study¹ investigates reflection events and related questioning behaviour of students and teachers by undertaking a comparative analysis of video data from the Learner's Perspective Study (LPS; Clarke, Keitel, & Shimizu 2006) in classrooms in Australia, Germany, Japan, and the USA.

Keywords: Reflection, questions, patterns of question sequences.

INTRODUCTION

Already Dewey has pointed out, that reflective thought "... alone is truly educative in value..." (1910, p. 2). The importance of reflection in facilitating and shaping learning processes is broadly accepted. Reflection creates the conditions for the utilisation of new information in several types of action situations. One key function of reflection is the connection, integration or synthesis of existing knowledge. Without reflection, an individual's newly constructed concepts might remain abstract and isolated. If there is no connection to prior knowledge and to ways of action, new knowledge is useless, lacking either conceptual foundation or the connection to contexts in which it might be employed.

Processes of reflection in classrooms are frequently initiated by questions (White, 1995). Questions typically communicate a specific purpose related to identified content and context, and are usually intended to elicit an answer. But additionally, a question also conveys a more general indirect request (Searle, 1969). This indirect request implies: Think about it! That is, reflection can be triggered through the use of questions. An individual's response to the attempted initiation of reflection depends on situational factors and individual conditions, such as prior experiences and knowledge. With the help of questions, teachers can invite students to follow and even participate in the teacher's externalised way of thinking and thereby model both reasoning and reflection (Walsh & Sattes, 2011, p. 69), approaches to solving a problem, and the generation of insight by the elaboration of information. Nevertheless, recognising the individual character of reflection as a cognitive process (function), it has to be supposed, that students' respond differently to attempts to stimulate reflection in classroom learning situations. Classrooms all over the world are embedded in different cultural settings and it has been shown that teaching and learning are influenced profoundly by culture (Clarke, Emanuelsson, Jablonka, & Mok, 2006; Stigler & Hiebert, 1999, p. 87). It is certainly possible that cultural influences might have an effect upon both questioning and reflection, leading to similarities and differences in the performance of both in classrooms.

To get more insight into reflection in classroom learning, this investigation focused on observable indicators and patterns for such processes in classrooms. In addition to the consideration of questions as initiators of reflection, observable phenomena related to conducting reflection in classrooms (methodical forms like question-answer processes between stu-

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dents and/or between teacher and students, a mind-map, or a task situated in a real-world context) have to be documented. Importantly, reflection phenomena must be studied in classrooms in different countries in order to know about the role of reflection in classroom learning in different cultural settings. That is, in undertaking cross-cultural comparison of reflection as a socially-initiated process in classrooms, it is important to attend to both the form and the function of reflection in the different cultural settings.

THEORY OF REFLECTION AND QUESTIONING

Referring to White (1995), reflection can be thought of as initiated by questions and this may occur both as self-interrogation by an individual as well as by means of a socially performed process. Skovsmose (2006, p. 327) emphasized the importance of questions as facilitator and initiator of reflection. In classroom learning these questions could be raised by teachers, but also by students themselves. The assumption is that questions can be employed as the first observable indicators of the occurrence of reflection. The use and the effects of questions in learning have been investigated in many studies. Previous research has shown that most questions in classrooms are asked by teachers (Wragg & Brown, 2001). "It is normal for students not to ask questions" (Dillon, 1988, p. 12). To change this state, it would be necessary to get more into a "habit of reflection" (Costa & Kallick, 2000, pp. 60 ff.; Walsh & Sattes, 2011). To get into such a habit of reflection would constitute a significant change not only for students but also for teachers and schooling in many school systems and cultural settings (Costa & Kallick, 2000). Thought-provoking teacher questions as well as student-generated questions can be utilised to initiate reflection. Because students may not be accustomed to generating questions, it could be necessary to scaffold them with the help of question stems (King, 1992; Hommel, 2012). Such guided student-generated questioning supports to higher level questioning (King, 1992). Extensive analyses by Clarke and his co-workers of video records of large numbers of mathematics lessons in China and Korea revealed a complete absence of student-initiated questions (Clarke, Xu, & Wan, 2013). Such a uniform absence suggests a well-established history of pedagogic practice wholly reliant on the teacher as the source of all classroom questions. It is possible that the contemporary dissatisfaction among Chinese and Korean educators with the capacity of school

graduates for innovation and novel problem solving may be a consequence of less well-developed habits of inquiry and reflection. Certainly, recent reforms in curriculum and pedagogy in both China and Korea seem directed towards more interactive and interrogative modes of classroom participation by students. Teacher questions promoting reflection, together with the opportunity for students to replicate such questioning in classroom interaction, may provide the means to realise not only contemporary Chinese and Korean educational aspirations, but also the aspirations of communities where student-initiated questions already occur, but are not promoted to best effect.

The concept reflection can be differentiated in content-oriented reflection and self-reflection. Beside self-reflection, Lengnink (2005) refers to different forms of content-oriented reflection: reflection of situation, reflection of sense, model-oriented and context-oriented reflection (p. 247). The focus of this study is socially-enacted, content-oriented reflection in classroom learning processes. That is, reflection as it is associated with the actual learning of content, application possibilities, and the further use of the learned content in the student's participation in various communities and contexts (Skovsmose, 2006, p. 328). Based upon the outline above, reflection can be defined as the process of further meaning-making and the deepening of an individual's understanding of their existing knowledge, drawing connections to other experiences and prior knowledge, as voluntary, conscious, systematic; embedded in social context, requiring attitudes of willingness, openness for novelty, interest, and the acceptance of responsibility for learning and for the outcomes of learning. Defined in this way, reflection in classroom learning is part of "student content engagement" (Mullis, Martin, Foy, & Arora, 2012 [TIMSS 2011]). The students' embodied "in-the-moment cognitive interaction with instructional content" (Mullis et al., 2012, p. 358) contains, beside other processes, precisely this "reflection in classroom learning." Without reflection, new information could remain disconnected from prior knowledge and ways of action.

RESEARCH QUESTION

Is there empirical evidence for the assumption that reflection processes in classroom learning are associated with questions? Are there commonalities and differences of observable reflection phenomena in

classrooms in different cultural settings? It seems reasonable to expect that the variable “culture” is also influencing the occurrence and nature of reflection. For this reason, this study analysed selected classrooms of different countries to obtain an indication of this kind of influence.

METHOD

This investigation is based upon video data drawn from the international comparative Learner’s Perspective Study (LPS). The LPS data set comprises lesson data from eighth grade mathematics classrooms in different countries (Clarke, Keitel, & Shimizu, 2006; Clarke, Emanuelsson, Jablonka, & Mok, 2006). The investigation reported here accessed data from classrooms in Australia, Germany, Japan, and the USA. All LPS teachers were recruited on the basis of their competence as judged by local criteria. Twelve lessons were selected. Three consecutive lessons for one teacher from each country were analysed². This sample provided both the opportunity to gauge consistency of practice for each teacher across the three lessons and a sufficient database to facilitate comparison of practice between the classrooms situated in the four countries. Selection of teachers for this analysis was based on the existence of a coherent three-lesson sequence addressing an identifiable sub-topic within the lesson sequence recorded.

For the empirical identification and analysis of *reflection* in classroom learning, it has to be considered first, when and in which form reflection could occur. Reflection events can assumed to be embedded in different “lesson events” (Clarke, Emanuelsson, Jablonka, & Mok, 2006). The following stratified forms of reflection are assumed to be observable, in the order of their occurrence within the course of a lesson: Review, Elaboration, and Summarization. With ‘Review,’ Mesiti and Clarke (2006) describe one of the dominant components in the beginning of the lesson as reflection activities related to the content of prior lessons and also to the prior knowledge of students (p. 51). These activities could be whole class activities,

involving either review of previous lesson content in form of teacher led discussions, or question-answer situations for repetition of prior knowledge, or the comparison of student solutions to homework tasks. ‘Elaboration’ is a form of reflection, which can occur at the end of a lesson, but also during the whole lesson. It implies a deep processing, while a systematization and abstraction relating new concepts and existing knowledge takes place. During this further processing, facts and concepts will be clarified and corrected. The third form, ‘Summarization’, normally occurs at the end of a topic or a lesson. In Japanese classrooms, this lesson event is known as “Matome” (Shimizu, 2006). The core functions of Matome are highlighting and summarising the main point in the lesson, promoting students’ reflection on what they have done, setting the context for introducing a new mathematical concept or term based on previous experiences, and making connections between the current topic and previous one (Shimizu, 2006, p. 141). The authors’ experience of contemporary classrooms suggested the pessimistic hypothesis that Review and Summarization occur most frequently in classroom learning and that Elaboration, as the most desirable form of reflection on the basis of the depth of processing, would be the least frequent.

Following the assumed association between questions and reflection, questions need to be coded. To create an objective, comparable, and reproducible taxonomy, amenable to low inference empirical application, it should be useful to anchor the categories of *questions* to cognitive processes. The “Taxonomy for learning, teaching, and assessing” (Anderson & Krathwohl, 2001) offers a suitable frame. The developed category system consists of Rote (or Recall) questions (remember), Comprehension Questions (understanding), and Elaborative Questions (elaboration in the sense of apply, analyse, evaluate, and create) asked by teacher or students. Rote questions could be further distinguished into Single answer questions and Remembering questions. Single answer questions could be (theoretically) answered with ‘one’ word (e.g. yes, no) or the recipient is requested to name something. These kind of questions merely require a single (not a simple) and short answer. Single answer questions could be differentiated further into “organizational” (coded SAO) and “learning content” (SAC) regarding the content focus of the questions. Remembering Questions (REC) require an answer more than one word. In this case, the requested answer

2 Overview about the learning content: Australian lessons: area concept, area of a triangle, area of a rectangle; German lessons: binomial formulae; Japanese lessons: equations; U.S. lessons: positive and negative exponents, prime factorization. For details see (Shimizu, Kaur, Huang, & Clarke, 2010; Mesiti & Clarke, 2010).

exceeds only a single-word answer and consists of naming a concept, recalling a procedure or definition. Comprehension Questions (COQ) refer to eliciting a meaningful understanding of facts, concepts and procedures and thereby leading to broader learning than rote questions do. Students' need to have already understood the concepts and procedures the question is addressing in order to answer this kind of question. Elaborative questions (ELQ) are associated with a more deep and intensive form of processing than the previous question types. They refer, for example, to applying a procedure, analysing a relationship or explanation, or to evaluating or creating something. Irrelevant Questions do not have a conceptual connection either to the topic content nor the actual learning task. We decided to consider only questions which really required an answer. Utterances like rhetorical questions (e.g., "Isn't this great?", "We said that's a prime, right?"), in which the person who is asking the question does not actually expect a reply, explicit requests to students to do something, or questions which are answered immediately by the speaker himself, are not targeted.

The development of the coding system followed two steps. First, a deductive approach, based on a literature review and second, an inductive approach, within the coding progress, in discourse with other researchers. The validity of the coding system was proofed by means of intra-coder reliability (Kendall's Tau $\tau = .926, \alpha \leq .01$) and inter-coder reliability ($\tau = .875$). Reliability could be further improved by generating a detailed coding handbook with question examples as indicators for the different categories. For the purpose of this study the reliability was sufficient.

The investigation relies upon video-based observation. Of particular interest are observable reflection phenomena and the assumed association with questioning behaviour in classrooms. The unit of analysis for this investigation consists of "lesson events" (Clarke, 2003). "A Lesson Event is intended to connote a form of classroom interaction occurring within a lesson, but at a level of social complexity greater than just a statement or action taken by an individual" (Clarke, 2003, p. 10). Some regularity and recurrence are necessary to label a phenomenon as a lesson event. Reflection as *form* is assumed to be an identifiable recurrent phenomenon in the classroom. Lesson events involving reflection are related to a specific topic, task, problem or/and situation. As

an individual process, reflection has the *function* of deepening understanding and elaboration. Whether a student responds effectively to the offer provided by a reflection initiation depends on several situational and individual factors (like emotion, motivation, prior experiences and knowledge). Individual reflection can occur within the socially-performed instructional form of teacher-orchestrated reflection, but is, of its nature, individual and regrettably mostly non-observable during the lesson. Beside, being an individual process in each student's mind, reflection as a socially-performed instructional form occurs with sufficient regularity to be defined as a particular type of lesson event. Observable indicators for these events of further meaning-making, deepening understanding, and drawing connections are also associated with questioning. Questions and the following question-answer sequences can give insights into externalized processes of reflection.

For analysing the lessons, the following forms of research data were used: classroom videos providing different perspectives (teacher, students), videos and transcripts of the post-lesson interviews with several students, lesson tables providing an overview about time, progress, content, and social-interaction form within the lesson; transcripts (original language and transferred into English). The various forms of data were analysed with respect to the research questions, using the forms of reflection and question categories identified from the research literature. Within the coding process, all questions occurring within the selected lessons were coded and the lesson events involving reflection (in the form of review, elaboration, and summarization) were identified and the associated question behaviour identified and documented. The data analyses included quantitative and qualitative procedures.

RESULTS

Over the 12 lessons, 43 reflection events were identified (Table 1).

All reflection events belong to a specific task, content, relationship or procedure and were initiated by a first question. The reflection events showed 21 phenomena of review, 18 elaborations, and 4 events of summarization. The highest amount of reflection initiating questions (21) belonged to *Review* in the beginning of a lesson. Most of these (18) were rote questions (ROQ)

	Review	Elaboration	Summarization
Australia	7	3	0
Germany	3	4	0
Japan	3	3	3
USA	8	8	1
Sum	21	18	4

Table 1: Reflection events in Australian, German, Japanese, and USA-lessons

(Table 2). Events in this category of reflection events were only initiated by teachers, for example:

J1-L03 So, let’s take a look and try to remember what we did last time, and go over it before we go on. Um, do you all remember the equations, those we talked about in class yesterday, um, let’s share them with the class. What kind of equations we had? (REC)

Student questions were all at the elaborative level and consisted of three questions:

A1-L12 By that couldn’t a rectangle be a special kind of square? (EAN)

G1-L05 And what do you need... what’s the practical application? (EAP)

Elaboration events in sum were observed 18 times during the lesson (initiated 3 times by student questions and 15 times by teacher questions). Elaboration did not occur at the end but during the lesson. For the observed elaboration events, initiating teacher questions were found at every level of question. So, it could be suggested that the level of the first initiating question was not crucial for the elaboration pro-

gress itself. Rather the subsequent questions-answer process determined the progress of stimulating and scaffolding reflection in the classroom.

The most frequent instances of Summarization were observed in the Japanese Lessons, for example:

US1-L05 Let’s - quickly guys, let’s quickly do this. What would be, then, a good way to go ahead and sum up then what exactly is a composite? (REC)

Other than in the Japanese classroom, there was only one event of Summarization, which occurred at the end of one of the USA lessons. Summarizations during the lesson that might have been assumed to take place at the end of one topic were not observed. Summarization events were exclusively initiated by teacher questions at the level of rote questions. The distribution (Table 2) could indicate some support for the researchers’ initial hypothesis of a theoretically-based hierarchy of reflection, with summarization associated with the lowest (least sophisticated) form of reflection, below review, and with elaboration as the deepest (most sophisticated) form of reflection. The observed “reflection events” provide support for the assumption, that reflection processes are associated with questions. From a practical perspective,

Question Level	Review	Elaboration	Summarization
SAO	1	0	0
SAC	6	2	3
REC	11	0	1
COC	1	8	0
EAP	0	3	0
EAN	1	5	0
EEV	1	0	0
ECR	0	0	0

Table 2: Distribution of initiating questions for reflection events

questions provided the primary observable indicators of reflection.

Within the qualitative analysis of the reflection phenomena in the Australian classroom, intensive recap activities were observed in the beginning of the lesson. But the Australian classroom did not show recurrent reflection activities at the end of a lesson. Rather, the Australian teacher used the specific characteristics of a situation within the lesson, for example a student question, to foster reflection.

The first German lesson (new content: binomials) started without the typical recap activities for German lessons as reported by Stigler and Hiebert (1999, p. 81). Further, the new content was practiced in group work, followed by comparing solutions. Group work was the predominant social-interaction form in the three German lessons. In fact, group work provided the context in all three German lessons for the majority of student questions. Compared to the Australian, Japanese and USA-classrooms, the most student questions were observed in the German classroom.

In contrast with the German classroom, the low frequency of student questions in the Japanese classroom is remarkable. Student utterances were rarely self-initiated. Similarly, Kawanaka and Stigler describe a proportion of 90 per cent teacher spoken words compared to 88 per cent in the USA and 76 per cent in Germany (1999, p. 261). Mostly students only spoke in response to a teacher request.

The three USA lessons started with a few written tasks for the students to solve. A remarkable characteristic was the high frequency of teacher questions as well as question sequences. To understand the process, we added a qualitative analysis of question sequences. Question sequences related to a concrete situation provide a deeper insight into the process. In this analysis, question sequences were defined as three or more subsequent (but not instantaneous) questions

belonging to an interaction about a specific content in a delimited situation.

Observing reflection behaviour in the lessons, three particular patterns of question sequences (Table 3) were identified: sequences of questions belonging to an equal level of cognitive dimensions, sequences of alternating question levels. A third possibility, the funnel pattern (Bauersfeld, 1980): sequences of questions getting a more narrow range of required cognitive dimensions in progress, was not explicitly found in the data. Instead, we found the opposite: sequences of questions leading from a single answer level to an elaborative level (inverted funnel pattern).

CONCLUSION

The initial assumption of this study was that reflection in classrooms is facilitated by questions. The data support the association between questions and observable reflection processes. However, a student's reflection process can only be observed once it is externalized in some way. This form of externalization can frequently be associated with the occurrence of a question. The association between questions and reflection does not allow the conclusion that the externalized question is actually the first incident of an individual reflection. The question could reflect a student's sudden idea or cognizance, the result of a preceding internal (unobservable) process.

This investigation analysed reflection in classrooms in different cultural settings. But the observed phenomena also reflect the specific instructional behaviours of the teachers. Observed differences between the four different teachers might suggest cultural differences but cannot be generalized to represent cultural patterns. The different forms: Review, Elaboration, and Summarization were not observed in equal measures in the twelve classrooms. The reflection events of Review in Australian, Japanese and USA-classrooms, the Elaboration in the German and

	Review	Elaboration	Summarization
equal level	13 (5 AU, 3 GE, 3 JA)	3 (1 GE, 2 JA)	3 (2 JA, 1 US)
alternating levels	7 (2 AU, 1 GE, 4 US)	10 (2 AU, 8 US)	0
inverted funnel pattern	1 (US)	1 (GE)	0
	21	14	3

Table 3: Reflection events in Australian, German, Japanese, and USA-lessons

USA-classrooms, as well as the Summarization of the Japanese classrooms could be employed to increase reflection for supporting students' learning in classrooms all over the world.

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