It's Not Only Words That Constitute Conversation - Analyzing a Collaboration Process While Reflecting

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Abstract: 12 learners were observed, while they were reflecting collaboratively three times in regular chemistry classroom practice, supported either by the method of computer-based concept mapping or a portfolio method. Both methods serve to help students making their thinking visible and communicable. While discussing their own ideas the students use verbal communication as well as non-verbal interaction. First results indicate differences in verbal and non-verbal communication that can be traced back to the different reflection methods.

Introduction

In order to support effective learning processes Land and Zembal-Saul (2003) describe perspectives to progressively deepen and refine meaning through a continually revision and reflection on their understanding. Therefore the students need methods or tools that help them with making their thoughts visible and communicable. Additionally, this process can be supported through collaborative learning phases as students discuss and compare their ideas (e.g. Havu-Nuutinen, 2005). We tested computer-based concept mapping (CM) as an alternative to a portfolio method called monitoring worksheet (MW). This study ties in with the research study conducted by Grüß-Niehaus (2010). He compared quantitatively the influence of constructing a CM and answering a MW combined with the variable students working in pairs or working alone. The results show a) both methods (CM and MW) positively influence the development of students' understanding and b) regarding the groups „working in pairs" no differences could be found comparing the CM and MW method. Nevertheless, further analysis of b) showed great variations. Until now the causes for the learning differences within these groups have been neglected. Consequently the focus of this study is on the following general research question: How do students learn while working collaboratively with the computer-based concept mapping method compared to those working with the monitoring worksheet?

Comparing international programs argumentation in classes is actually one popular research area. While articulating their ideas argumentatively, verbal communication as well as non-verbal interaction is essential for successful collaboration (e.g. Kumpulainen & Mutanen, 1999; Roth & Welzel, 2001). Accordingly, the focus for analyzing collaborative processes will be on subsequent question: How do differences in relation to the structure of verbal and non-verbal communication between the two groups (CM, MW) provide an indication of the diverse learning processes?

Methodology

Design and participants: The research design is based on the „case study research" method by Yin (2003). The sample of this study originates from one grade seven chemistry course in Hanover (Germany) and consists of 12 students, six using the CM method (3 groups) and six the MW method (3 groups). The students were observed during regular chemistry classroom practice. The teaching unit comprised about 20 lessons and was divided up into three phases. After every phase the students reflected 45 minutes on the dissolution concept in order to decontextualise the concept, as it was mediated within the context *investigating chocolate and its ingredients*. In the second and third reflection phase they got their first reflection to expand or correct it.

Data collection and instruments: In order to measure the learning progress the German version of the solution concept test (Uzuntiryaki & Geban, 2005) was used. At the end of the investigation the students were interviewed about the dissolution concept (cf. Ebenezer & Gaskell, 1995). During the reflection phases the students interactions were audio- and videotaped. Additional questionnaires controlled variables like academic self-concept or motivation.

Analysis and Results

Analysis: Yin (2003) postulates two divergent steps for an analysis. Within a deductive oriented way a simple definition of the term „discussion" was developed from literature in order to verify whether the students argue as predicted. For an inductive oriented way the transcripts have been analyzed independently from these findings. Furthermore, the coded statements of each learner were arrayed chronologically within a flow pattern. Typical patterns of a conversation were categorized (fig. 1) and compared between the groups. As students do not only communicate verbally, the videos were analyzed according to the students' interaction.

Results: Comparing the communication time it is remarkable that the CM-groups had 81% on-topic conversation, whereas the MW-groups only had 54% of their collaborative reflection time on-topic talks. There

were some longer silent periods 35% when reflecting with MW (CM: 13%). In total the on-topic conversation time was 33 min 42sec per CM-group compared to 13min 22sec per MW-group.

The students do not argue as expected from the literature (deductive step). Argumentation structures like claim-argument-example-counterclaim-counterargument-counterexample could not be found. However, analyzing the data inductively reveals that the students use different conversation elements like claims, explanations or questions. Most frequently the element monologue was used. The CM-groups also often used confirmative elements whereas the MW-groups more often used explanatory elements. In the CM-groups the students more often refer to previous parts of the conversation (interrelation between patterns). The students were checking and resuming the links between the propositions and when revising their maps, they also made sure that their additions were correct. That was not the case in the MW groups.

With regard to their non-verbal interaction clear differences can be stated as well: students using the CM method usually supported their explanations or confirmations by pointing with the finger or mouse whereas the students using the MW in general just watch at each others MW or listened to the explanations without even looking at any of the artifacts.

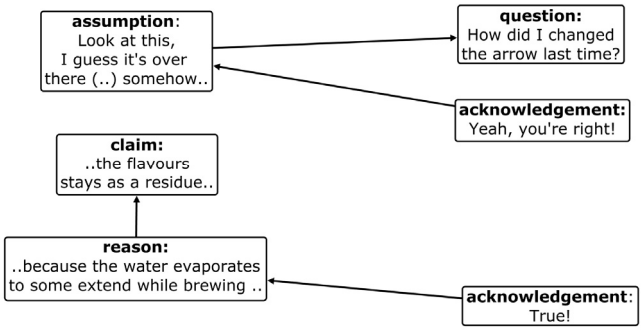

Figure 1. Extract of the Flow Pattern; Pattern of Conversation.

Discussion and Implications

With regard to the subsequent research questions structural differences of (non-)verbal interaction referring to the two groups (CM, MW) can be observed. CMs seem to facilitate the comprehension of a partners‘ map by reason of a multiplicity of links. However, the CM method bears the risk that students tend to accept concepts unreflectively. Debates concerning MW-texts seem to be more involving since there were more explanatory parts. Concerning the non-verbal interaction a CM is integrated more often as the students use their finger or mouse for clarifying purpose.

In general, individual learning processes can be supported by progressive reflection methods. Computer-supported and collaborating settings are promising to foster and improve students’ conceptual understanding. But for making use of the beneficial features of the settings, more guidance is necessary. E.g. measures should support peer-interaction when reflecting a coherent text. Highlighting important propositions of the text could be one possible measure. On the other way support is needed that assure more reflection on the partners’ propositions in the CM-groups. We expect more information when analyzing the changes made in the artifacts and correlating these changes with the conversation. Results of this study serve to promote this area of research.

References

Ebenezer, J. V., & Gaskell, P. J. (1995). Relational conceptual change in solution chemistry. Science Education, 79(1), 1-17.

Grüß-Niehaus, T. (2010). Zum Verständnis des Löslichkeitskonzeptes im Chemieunterricht - der Effekt von Methoden progressiver und kollaborativer Reflexion (Vol. 102). Berlin: Logos Verlag.

Havu-Nuutinen, S. (2005). Examing young children‘s conceptual change in floating and sinking a social constructivist perspective. International Journal of Science Education, 27(3), 259-279.

Kumpulainen, K., & Mutanen, M. (1999). The situated dynamics of peer group interaction: an introduction to an analytic framework. Learning and Instruction, 9(5), 449-473.

Land, S., & Zembal-Saul, C. (2003). Scaffolding reflection and articulation of scientific explanations in a data-rich, project-based learning environment: An investigation of progress portfolio. Educational Technology Research and Development, 51(4), 65-84.

Roth, W. M., & Welzel, M. (2001). From activity to gestures and scientific language. JRST, 38(1), 103-136.

Uzuntiryaki, E., & Geban, Ö. (2005). Effect of conceptual change approach accompanied with concept mapping on understanding of solution concepts. Instructional Science, 33(4), 311-339.

Yin, R. K. (2003). Case study research (3 ed.). Thousand Oaks: Sage Publications, Inc.