An Analysis of Teacher-Students Interactions in Three Science Classes: a Pilot Study

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Abstract: This study examined the interactions between a veteran teacher and her students in 3 science classes. One of the classes was co-designed by the teacher and the researchers with the KCI model in mind. Teacher's enactments in the classroom were video-recorded. Results indicate that: 1) there are differences in teacher-students interaction among the three classes; 2) the teacher interacted with students equally in whole class and in small groups in KCI model of teaching.

This paper presents an analysis of the interaction between the teacher and the students in a technology-enhanced inquiry activity, by examining a veteran teacher as she used Cmap – a collaborative concept mapping tool – in three science class sessions. The following research questions have guided the analysis: 1) what are the overall patterns of teacher-students interactions in these three science classes? i.e. the frequencies and the percentage of time spent on each type of interaction; 2) are there any differences in terms of teacher-students interaction pattern between the KCI-oriented class session and non-KCI class sessions?

Research Method

This research is part of a broader program of work that investigated the teacher's role in Knowledge and Community Inquiry (KCI, Slotta & Peters, 2008) model. This study includes three iterations. The first iteration includes two class sections in the original KCI research where Cmap was used. Students worked in groups. Each group were asked to create one concept map. Students were allowed to add any concepts that they thought important to the concept map. In the second iteration, Cmap was used in the same two grade-eight class sections on cell science unit. Students were asked to create one concept map of his/her own without collaboration with peers. In the third iteration, Cmap was used in two grade-twelve class sections studying homeostasis. Students were asked to put some specific key concepts (i.e. homeostasis, endocrine system, osmoregulation, etc.) and their interrelationship in maps. Both iteration 2 and 3 were not part of an official KCI model. Video data analysis was used in this study. We used the coding scheme in Table 1 to analyze the video data.

Table 1: First level coding scheme for video data analysis.

Code	Full Name of Code	Meaning
WCI-L	Whole class interaction: logistical or procedural	The teacher provides procedural or logistical information to students in the whole class, such as talking about the agenda of a class or next class, managing students' behaviour, helping students solve technical difficulties, giving instructions on how to use software, etc.
WCI-C	Whole class interaction: conceptual	The teacher talks about science concepts or principles to students in the whole class.
WCI-P	Whole class interaction: pedagogical	The teacher gives instructions on what to do or suggests ways of thinking to students in the whole class.
SGI-L	Small group interaction: logistical/procedural	The teacher provides procedural or logistical information to students in a group, such as talking about the agenda of a class or next class, helping students deal with technological difficulties, giving instructions on how to use software, etc.
SGI-C	Small group interaction: conceptual	The teacher talks about science concepts to students in a group.
SGI-P	Small group interaction: pedagogical	The teacher gives instructions on what to do or suggests ways of thinking to students in a group.
Other		The teacher is not interacting with students.

Findings

Because in the third iteration, each class session was only about 15 minutes, we converted the absolute time spent on each interaction into time percentage. Figure 1 shows that the WCI-L (whole class logistical or procedural interaction, 16.61% of the total time of all interactions) and SGI-L (small group logistical or procedure interaction, 28.69% of the total time of all interactions) are the most frequent forms of interactions between the teacher and the students. This means that the teacher interacted with students most often to provide

procedural or logistical information, such as talk about the agenda of a class, help students deal with technological difficulties, either to the whole class or to students working in groups.

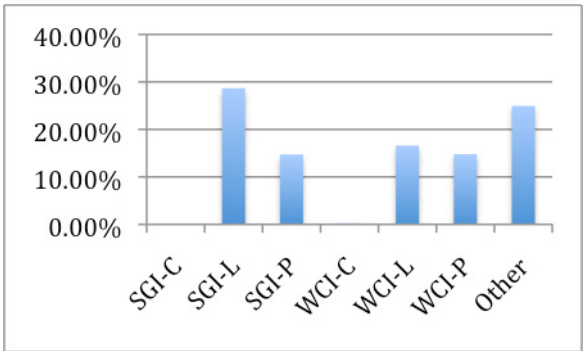

Figure 1. Time Percentage on Each Type of Interaction.

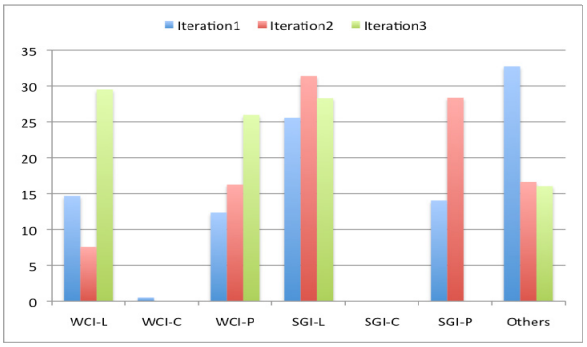

Figure 2. Time Percentage on Each Type of Interaction Compared among Three Iterations.

Figure 2 show the time percentage distributed in each type of interaction compared among the three iterations. The teacher had relatively more WCI-P in the third iteration, meaning that, in iteration three, the teacher interacted with students in "whole class" mode more often than she had done in the previous iterations. Most likely it is because of the shorter total duration of the class – there was a need for efficiency. A deeper analysis of the content of the teacher's discourse disclosed that she gave many direct instructions that asked students to put specific concepts or keywords (i.e. homeostasis, thermal system, etc.) into their concept maps. The second iteration has relatively more SGI-L, meaning that the teacher interacted with students more often in small groups providing procedural or logistical information.

Figure 3 compares teacher-students interactions in terms of whole class interaction and small group interaction. Iteration 3 reflects that the teacher interacted with the students more often in whole class mode. This may reflect a traditional, teacher-centered way of teaching where the teacher gave many direct instructions, although the shorter duration class period may have influenced that greatly. The teacher had more small group interactions than whole class interactions in iteration 2, even though it was not part of any KCI or even an inquiry-oriented curriculum. However, as indicated in previous tables, even though the teacher interacted with students more in small groups, she did not use these interaction opportunities for pedagogical issues, but rather for procedural or logistical issues. In iteration 1, for which the unit was specially designed in KCI model, the teacher interacted with students relative equally in whole class and in small groups. Researchers believe that small-group learning processes are propitious to the development of higher order thinking (Noddings, 1989). Therefore, it is expected that, in KCI model, teacher should interact more with students working in small groups for pedagogical purpose.

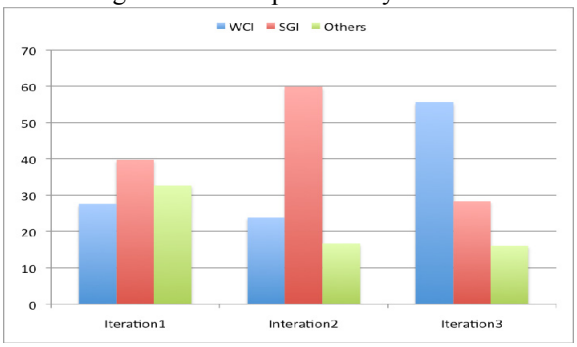

Figure 3. Comparison of Whole Class Interaction and Small Group Interaction among Three Iterations.

Conclusion

In learning sciences, there is a need to understand the dependencies of our innovations on classroom dynamics. Even if the classroom teacher is deeply involved in the design of the innovation (i.e., in co-design), the true nature of our interventions only takes shape during enactment. Thus, further research is needed to understand these dependencies. This study tried to create a description of the interaction between the teacher and the students by examining a veteran teacher using Cmap in three science classes. The results indicate that: 1) in these Cmap class sessions, there are differences in teacher-students interaction among the three science classes; 2) the teacher tended to interact with students equally in whole class and in small groups in KCI model of teaching than in traditional, teacher-centred model of teaching.

References

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Slotta, J.D., & Peters, V. (2008). A Blended Model for Knowledge Communities: Embedding Scaffolded Inquiry. *Proceedings of the International Conference of the Learning Sciences*, Utrecht, The Netherlands.