INCLUSION AND CHEMISTRY TEACHING – DELIBERATING CONFLICTING DEMANDS

Christine Heidinger\(^1\), Simone Abels\(^2\), Thomas Plotz\(^4\) and Brigitte Koliander\(^1\)

\(^1\)University of Vienna, Vienna, Austria
\(^2\)Leuphana University Lüneburg, Lüneburg, Germany

Almost worldwide inclusive school systems have been politically enacted. Also, almost worldwide the implementation of inclusion at schools is a major challenge. Most of the literature concerning inclusive pedagogy focuses on social participation and pedagogical approaches in general. Teachers, especially at secondary level, are troubled to transfer these demands to their certain subjects. This paper presents an explorative case study focusing on the conflicts a teacher experiences when teaching a subject like chemistry at an inclusive school. Exemplarily, we present transcribed cut-outs of a videotaped teacher-student-discourse on atoms. Following the steps of the documentary method, a qualitative approach developed by the sociologist Ralf Bohnsack distinguishing between explicit and implicit knowledge, we analyse the orientational frameworks guiding the teacher’s actions during the discourse. On a surface level, her actions seem to be rather determined by traditional scientific educational approaches. Reconstructing her actions more deeply, we can show evidence for a participation oriented framework as well as for the challenges this conflicting demands of science and inclusion put on her teaching. We implicate that future professional development courses must not only concentrate on inclusive pedagogies, i.e., how to teach, but also on the reflection of implicit beliefs in inclusive science teaching.

Keywords: Secondary school, classroom discourse, teaching practices

INCLUSIVE SCIENCE EDUCATION

The process of inclusion aims at “increasing participation in learning, cultures and communities, and reducing exclusion within and from education. It involves changes and modifications in content, approaches, structures and strategies, with a common vision which covers all children of the appropriate age range and a conviction that it is the responsibility of the regular system to educate all children.” (UNESCO, 2005, p. 13, original emphasis). The educational goal of an inclusive pedagogy seems clear and desirable, but there is still a huge gap between the goal and classroom practice. Teachers still struggle to transfer inclusive demands to their subject teaching (Abels & Schütz, 2016). Especially, the implications for an inclusive subject-specific teaching approach are difficult to grasp for teachers. Further research on teachers’ difficulties as well as on appropriate support measures for teachers are needed (Seitz, 2006).

In this paper, we therefore explore a teacher’s difficulties with inclusive practice in the field of science education. Our research question is: What are the difficulties for a science teacher to apply the demands of inclusive practice to her subject-specific teaching? In order to answer the question, we conducted an exploratory case study at an inclusive middle school. The teacher has been accompanied by one researcher during the chemistry lessons in two 8th grade classes for one school year. The teaching was videotaped and analysed. Based on the findings we implicate appropriate support measures for teachers.

METHOD

For this presentation we chose a double lesson analysed in depth by documentary method (Bohnasack, Pfaff, & Weller, 2010). The chemistry lessons in this inclusive middle school (grade 5-8) in Austria, where students with and without special need learn together, were always organised in half groups with ten students max. On average, the students had one chemistry lesson per week. The teaching goal of the chosen double lesson was a revision of the atomic structure and the introduction to atomic bonding. The two lessons can be split up into different content-related phases: In the first 20 minutes the teacher instructed the students to work in small groups recalling the atom structure based on their notes and subsequently they were requested to share their knowledge. Afterwards the teacher revised the Bohr model conducting a
teacher-led classroom discussion (duration: 50 min.). In the third phase (15 min.) she introduced a new topic (atomic bonds), again by discussing the topic with the students in a teacher-led discourse.

Method of analysis: The documentary method

The method is rooted in Mannheim’s sociology of knowledge and Garfinkel’s ethnomethodology, developed further by Bohnsack during the last 30 years and implemented in educational research (Bohnsack, Pfaff, & Weller, 2010), as well as in science education research projects (Bonnet, 2009; Ruhrig & Höttecke, 2015). The method distinguishes between explicit knowledge, the immanent understanding on a matter-of-fact level, and implicit knowledge “underlying and orientating habitualized social action” (Pfaff, Bohnsack, & Weller, 2010, p. 21). Applied to our research focus this means that the way science teachers design their lessons is not only depending on the content and methodical knowledge which someone is able to explicitly tell. The teaching also depends on implicit beliefs and orientations (“orientational frameworks”; Bohnsack, 2010) which influence the way of teaching in a substantial way. These orientational frameworks are not idiosyncratic for a person, yet culturally shared resources from the same socio-cultural environment. According to the documentary method, these orientational frameworks are identified by shifting the perspective from what is going on to how practice is produced (ibid.). Thus, we focused on communicative actions in the data aiming at identifying patterns. On the one hand, we searched for patterns regarding the “social participation structure (SPS)” (Bonnet, 2009), i.e., the form of interaction. On the other hand, we searched for patterns regarding the “academic task structure (ATS)” (ibid.), i.e., the way science content was taught. Literature was used to compare and abstract the identified patterns. Based on the reconstruction of these patterns the underlying orientational framework of the teacher was derived.

RESULTS

The reconstruction of the social participation structure showed the following overall pattern: The teacher-students-discourse followed the IRE-pattern described by Mortimer and Scott (2003). The teacher asks a question (=initiative, I), the students respond (R) and the teacher then evaluates (E) the answers in terms of their correctness according to scientific knowledge. Mortimer and Scott (2003) classify this classroom discourse as an authoritative-interactive one, because the teacher is heading at a specific scientific objective. The students only have the role of providing the correct answers to the teacher’s questions. The reconstruction of the academic task structure confirms the impression of a mainly authoritative subject-teaching approach. The teacher is mainly concerned with the submicroscopic level of the content taught, although it is known that successful chemistry education has to offer students links between the different observation levels in chemistry: the submicroscopic, symbolic and macroscopic observation level (Johnstone, 2000). The students in the observed lessons, like most novices in chemistry education do, struggled with the differentiation of these observation levels. They showed problems in differentiating the entities electron, neutron, proton and constantly mixed these entities and their characteristics on the atomic (=submicroscopic) and phenomenal (=macroscopic) level.

Within this overall structure of an authoritative scientific educational approach, the teacher showed many strategies to facilitate participation, though. For example, the teacher avoided critique in the process of evaluation (E) and she avoided “indoctrination”. She persistently helped the students to find the right answer to her questions, by offering them hints which were often based on some kind of logic (mathematical or linguistic logic or common sense). So the correct knowledge was always provided by the students, as a response to her questions. Moreover, the teacher was always respectful and very permissive towards ambiguous terms and confused concepts evident in the students’ talk. Therefore many of the students’ difficulties with the content taught were not made explicit. In general the teacher was successful in installing a participative discourse. The students were eager to participate in the discourse and the teacher-student-discourse showed a high density of interaction.

Explication of the teacher’s orientational framework

Based on these contradicting communication patterns we conclude that there are two conflicting orientational frameworks which guide the teacher’s activities. On the one hand the teacher shows a quite participatory orientational framework regarding the social participation structure: The chemistry lesson should provide participation and inclusion in all phases of the lesson. This orientational framework is in
conflict with the teacher’s framework regarding the nature of chemistry and its appropriate academic task structure: Knowledge on the submicroscopic level in chemistry is superior to knowledge on the macroscopic level and therefore chemistry has to be taught on the submicroscopic level.

DISCUSSION AND CONCLUSION

Although the teacher observed in the case study clearly shows a participatory orientation to chemistry teaching, this orientation only allows for participation on the social interaction level. Because of her authoritative orientation regarding the nature of chemistry and chemistry knowledge, she does not facilitate her students to access the world view of chemistry (e.g., by negotiating it with the students’ world view which focusses mainly on the macroscopic level). Moreover, even her participative strategies often prevent her students from understanding chemical knowledge. For example, students’ misunderstandings are not made explicit for the sake of a participatory discourse where everybody is invited to talk freely. The teacher seems to struggle to orchestrate an academic task structure which is not solely governed by the authoritative nature of scientific knowledge. Approaches like inquiry-based learning, project-based learning and other reform-oriented pedagogies allow for participation also on the content level (Abels, 2015). Conclusively, future professional development courses must not only concentrate on inclusive content-related pedagogies, i.e., how to teach chemistry, but should also focus on the reflection of implicit beliefs in inclusive science teaching. Making these implicit orientational frameworks explicit would help teachers to become aware of conflicting demands in their belief systems about inclusive science teaching which we assume to be a pre-requisite for a sustained improvement in their teaching praxis. Though, that remains to be investigated in future studies.

REFERENCES


