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English across Curricula in Science Education
Kurzfassung

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English across Curricula (EAC) in Interactional Science Education

English is lingua franca in science and technology. Besides, Latin based technical terms in science are often identical or similar in German and English. These facts constitute in themselves a reason to employ English in science education. From the point of view of didactics there are several issues that could be supported by using English in science lessons. The following hypotheses are stated as facts – to be proved or disproved:

- When confronted with English in their science lessons, students will pay enhanced attention to language and phrasing of technical knowledge.
- They will thus avoid confusing technical terminology with every day expressions.
- A focus on language will improve Gender Sensitivity in science education, as female students are frequently more interested in languages than in physics and chemistry.

Taking into account the special situation of our school, where most classes are attended by more than 50% of migrants, we wanted to investigate an additional hypothesis:

- Employing English in Science lessons will grant equal opportunities to migrants, since English is a foreign language to all our students.

As promoting migrants is a central objective of our school, we included a special consideration of the students' native languages in our project, by adding a column for these languages to key words lists and by encouraging students to use their native languages for internet research and short texts. This might

- promote their emotional approach to science subjects and
- support the availability of their native languages as a professional tool for them.

Performance:

In the course of this years project English was employed in Chemistry lessons of 4th, 7th and 8th graders. Besides, English played an important role in an IT-project: "e-Content and Biological Science", where a website on Austrian molecular biology research

about antibiotics was established (in cooperation with the subjects: Informatics, Biology, English and European Studies). Moreover, English was language of communication in a cross-curricular international Comenius project (EUTRAMO – European Traffic and Mobility). Thus, English was part of both normal lessons and projects.

The didactic concept of the author and all teachers involved is based on a constructivist theory of learning, so that lessons were generally designed in a way to have students work out new concepts and knowledge and solve problems themselves. The discourse is interactional rather than transactional. Specifically, experiments done in pairs and groups were intended to lead to cognition by means of suitable questions.

English materials were: key word lists, information texts, tasks (both practical and written), tables, gap filling exercises, puzzles ….

During lessons students worked with dictionaries, encyclopaedias and English text- and work-books.

To facilitate work itself and the assessment of students' performance a moodle platform was used for the project. It contained Word and "pdf" files of work-sheets as well as online-tasks. Students could upload files via the communication forum, post questions and start discussions.

Students' assessment did not include an evaluation of their competences in EAC, but it was largely process oriented. Their written contributions (both as hardcopy and on the platform) constituted about 20% of their Chemistry marks in the report (40% being based on their cooperation during lessons and the remaining 40% being results of presentations and learning target checkups).

Action research was based on the hypotheses stated above. For evaluation we relied on:

- journal entries of the author referring to personal observations and feedback given by students,
- a video documentation and analysis of a lesson in a class of 7th graders (done at the beginning of May) and
- interviews with students of the same class (performed in June).

The latter two items were done by experts from the Institute of Theoretical Physics of the University of Vienna.

While all the observations and students' statements collected by the author tend to support the stated assertions (especially the gender aspect), evidence is less clear as far as the video and interviews are concerned. Although both materials show clearly that independent working is both well liked by students and efficient with respect to their progress, the role of EAC cannot be defined unambiguously. Evidently, students that are interested in science regard the use of English as an additional challenge and are ready to understand its value. Students that are less gifted in science on the other hand did not seem to grasp how the use of English might improve their understanding of the subjects, but at least they did not think that it made matters worse.

Both the video-analysis and the interviews performed (10) yielded useful evidence concerning the definite situation during Chemistry lessons. It turns out that many students have difficulties to cope with technical expressions and their meaning.

As a first conclusion, students should initially be better informed about the objectives of EAC both in general and in connection with the specific concept outlined above. Besides a more elementary approach for the introduction of new technical terms might be helpful.

A subsequent project is planned, where the results of this project will be spread and a set of good practice methods and materials for EAC in science education be compiled.