



VIENNA ENGLISH WORKING PAPERS

VOLUME 15

No3 - SPECIAL ISSUE

DECEMBER 2006

INTERNET EDITION AVAILABLE ON: [HTTP://WWW.UNIVIE.AC.AT/ANGLISTIK/VIEWS.HTM](http://www.univie.ac.at/anglistik/views.htm)

CURRENT RESEARCH ON CLIL

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The acquisition of knowledge in bilingual learning: an empirical study on the role of language in content learning

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This contribution discusses the findings of an empirical study on the acquisition of knowledge in Content and Language Integrated Learning (CLIL), which was conducted by Hans Badertscher and his team at the university of Bern.⁹ By examining the subject-related conceptual fields of pupils, this investigation suggests that the teaching of non-linguistic topics in an L2 does not impair the acquisition of knowledge. The study, conducted at the University of Bern in Switzerland, examined several Swiss schools in which German or French were used as L2, and raises questions about the interrelationships of language and the development of conceptual knowledge. It also requires researchers to consider the factors that compensate for the additional difficulty pupils encounter when they are taught non-linguistic topics in an L2.

During the past fifteen years a considerable number of studies have appeared, especially in Scandinavia and Germany, which provide empirical evidence of the linguistic advantage of pupils when they are taught non-linguistic topics in an L2 (Wode, 1994; Johnson and Swain, 1997; Kroschewski and Scheunemann, 1998; Serra, 1999; Stern and Eriksson, 1999; Burmeister and Piske, 2002). Scepticism remains, however, as to whether the acquisition of *knowledge* is similarly efficient, or if the use of an L2 in the teaching of non-linguistic subject matters creates deficiencies in the pupils' conceptualisation of classroom topics. Canadian studies on content and language integrated teaching seem to remove these doubts, some researchers claim (Vollmer, 2000/2002, 54). The situation in Canada, where many of these studies were conducted, however, differs significantly from the preconditions existing in most European countries, both with regard to the socio-cultural

⁹ The following researchers worked on this project: Hans Badertscher, Otto Stern, Barbara Ruf, Cecilia Serra, Cornelia Heinz, Boldizsar Kiss, Stefan Goetz, Andrea Demierre, Thomas Bieri, Ursula Stohler, Pascale Mathys. The results presented here are a summary of a more exhaustive article that will appear in the collection *Bilingualer Unterricht (CLIL) zwischen Plurikulturalität, Plurilingualität und Multiliteralität*, published by Peter Lang Verlag

context and the target group, and so do similar studies from the USA. A further need to investigate the acquisition of knowledge in CLIL in more detail is indicated by the way in which most existing studies on this topic focus on disciplines such as mathematics or social studies (Ozerk and Krashen, 2001). Subject matters such as history, biology, or geography have far less often been the centre of academic research on this question.

The study presented in this contribution tried to find answers to these questions by collecting empirical data; specifically by focusing on whether deficiencies in subject matter learning exist when the teaching takes place in an L2, and if they exist, how to avoid possible disadvantages for the respective pupils. The intention was to examine the pupils' knowledge when they were taught in an L1 and to compare the findings with those resulting from an L2 teaching arrangement. Thus, classes taught subject matters in an L1 and classes taught subject matters in L2 were videotaped, analysed, and the pupils' cognitive performances evaluated. Such a procedure would help to identify possible differences in the teaching or classroom interaction of L1 and L2 classes. Each class was videotaped for a second time one year after the initial taping, so the development of the pupils' performance could be traced. The investigation lasted from 2002 to 2004. An on-going, follow-up project is evaluating further material from the inquiry and is examining possible reasons for the nature of the findings from the first part of the project.

In order to achieve these goals, the researchers opted for an exploratory rather than experimental research design. Instead of creating new teaching arrangements, as an experimental research design would have required, an exploratory research design was based on the investigation of existing teaching arrangements. It required only minimal interventions of the researchers: one of them was busy with the videotaping, the other with observations of the class. The following procedure was adopted to examine the pupils' knowledge of class-taught subject matter. It was decided pupils should reconstruct specific *conceptual fields* taught in class, rather than being examined on terms or definitions of terms. A conceptual field requires a learner to understand interdependences of various factors, relations between them, causes and effects of events and so on. Therefore, one of the researchers' first steps was to identify which conceptual fields had been taught in class; they consulted lessons plans, videotaped and transcribed lessons to help identify these conceptual fields.

The pupils would demonstrate their knowledge about the conceptual fields taught in class in interviews. A pupil chosen for an interview attended one class held in an L1, and one held in an L2. After either class, the pupil would give evidence of his or her grasp of some specific conceptual field

taught in these classes. From these interviews it would become clear if only conceptual fields taught in an L1 were completely understood and could be reconstructed, and if the same applied for conceptual fields taught in an L2. If, for instance, a pupil were only able to reconstruct a conceptual field from an L1 class, this would suggest that there are deficiencies in the acquisition of knowledge when the teaching takes place in an L2. It might, on the other hand, happen that conceptual fields taught in an L2 were understood better, or that no difference existed between the two teaching methods. The interviews in which the pupils gave evidence of their knowledge were initiated in the same language in which the class was held. The pupils of the L2-classes were, however, allowed to use the L1 when they did not remember an expression in the L2. In cases in which it was necessary, the interviewers helped the pupils reconstruct their knowledge by prompting them in either the L1 or L2 language or by referring to material used in the lesson.

In order to avoid a pupil's previous knowledge falsifying the results (for instance when a pupil knew more about a topic that was going to be taught in class than his or her peers), preliminary interviews were held prior to the lessons. During the preliminary interviews, existing knowledge about these conceptual fields was recorded. If a pupil was already familiar with a topic to be discussed in a lesson, this student had to be discarded from the study. After the preliminary interview and the second interview, which was held immediately after the class, a third interview was held approximately two months after the class had taken place. The aim here was to find out how well a topic was still known after a longer period of time. All three types of interviews were videotaped, and the respective dialogues transcribed. At the time this article was submitted, ten sets of interviews had been evaluated. Each included an example of an L1 class and an example of an L2 class with the same pupil, and consisted of a preliminary interview, an 'intake' interview (immediately after the class), and a 'longterm memory' interview (after two months).

The lessons that were videotaped and analysed were taken from classes at grade four, five, and six (Primarschule), and from classes at grade seven, eight and nine ('Sekundarstufe 1'). One of the schools chosen for this investigation operated in the German speaking area of Switzerland and three in the French speaking area. In the former case the L2 was German, in the latter French. While some of the schools investigated for this project were financed by the state, others were private schools. The schools have different conventions for the teaching of non-linguistic subjects in an L2. Some of the schools already begin with immersion classes in kindergarten; in other schools the pupils have only learnt the L2 for a very short time.

For the study presented here, five lessons from an L1-class and five lessons from an L2-class were recorded and analysed. The conceptual fields taught in these lessons and which some of the pupils were asked to reconstruct during the interviews included the subjects of history, biology, chemistry, German, and geography. (German was chosen as an example of a linguistic subject matter that nevertheless requires content learning as well). The lessons had different (but similar) subject matters—for instance one lesson was about geography and another about history. Both lessons were held with the same class of pupils, and the same pupils were interviewed after a lesson in L1 and in L2. In one interview a pupil was, for instance, asked to reconstruct the conceptual field ‘Christopher Columbus and the track to the West’, which was taken from a geography class. This conceptual field required the pupil to understand that Columbus wanted to find a shorter maritime track to India, that he believed that the earth is round and therefore decided to arrive in India from the other side than ships used to at that time. In the preliminary interview, which checked the pupils’ possible existing knowledge on the topic, one pupil said that he knew that Columbus was looking for a new maritime track to India, and that, unlike his contemporaries, Columbus did not believe that the earth is flat. The pupil was, however, not yet able to make the connection between Columbus’ choice of the maritime track and his belief that the earth is round. During the ‘intake’ interview, which was held straight after the lesson, the pupil was capable of making this connection: he explained that Columbus wanted to get to India by choosing a maritime track to the West because he believed that the earth is round. The pupil tried to give this explanation in the L2 French. During the interview that was held two months after the lesson the pupil was still able to reproduce this information completely, mostly by using the L2.

The evaluation of the interviews, which examined the pupils’ knowledge of the class-taught conceptual fields, suggested that no significant differences exist in the acquisition of knowledge when pupils are taught in an L1 and when they are taught in an L2. In either case the pupils are capable of reproducing the conceptual fields taught in class, even if they have only partially mastered the L2. Pupils who usually perform well in class performed well in the interviews, and those who usually performed less well in class performed less well in the interviews, too. Content and language integrated learning seems to have neither positive nor negative consequences on the acquisition of knowledge. It is important to note, however, that the pupils were only capable of demonstrating the acquired knowledge if they were allowed to use the L1 as well. This aspect might have to be considered in questions of transitions of the pupils from one grade to the next.

This outcome of the investigation raises certain questions. How is it possible that no differences could be found in the acquisition of knowledge when the teaching took place in L1 or in L2? It seems difficult to deny that learning a subject matter in an L2 poses an additional difficulty for the pupils, and that factors must therefore exist that compensate for the linguistic obstacle the pupils have to surmount. The second part of this research project, which is ongoing, is trying to identify some of these compensatory factors, such as the structure of the lesson, the number and the quality of negotiations of meaning, and the use of media. At the present stage of the study it seems that there are no significant differences between the structure of L1 and L2 classes. It seems, however, that more negotiations of meaning take place in L2 classes than in L1 classes. This factor might compensate for the linguistic obstacles that CLIL pupils have to surmount.

If the investigation suggests that none of the factors mentioned can explain why this study could not find any significant differences in the acquisition of knowledge in L1 and in L2 classes, then the reasons for this paradox must be sought elsewhere. It is possible, for instance, that conceptions about the construction of knowledge have to be revised. The construction of knowledge might be connected with the learning of language so firmly that the two elements cannot be viewed as separate entities. Language could then not be regarded as a mere vehicle for the transport of knowledge. Rather, the language itself would then have to be seen as a constitutive element for the construction of knowledge.

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