VIDEO-BASED COLLABORATIVE LEARNING: EVIDENCE FOR A PEDAGOGICAL MODEL.

Ricardo Monginho* Marije Bent, Alessia Evi-Colombo****, Frank de Jong**, José Ramos*, Sirpa Laitinen-Väänänen***, Eila Burns***, Erick Velazquez-Godinez*****

*Évora University, Portugal
**Aeres Applied University Wageningen, The Netherlands
***JAMK University of Applied Sciences, Finland
****Swiss Federal University for Vocational Education and Training SFIVET Switzerland
*****Artificial Intelligence, Lingua ExMachina, Amsterdam, The Netherlands

Abstract

The educational potential of video is a long-lasting, multi-faceted topic, and the affordances of technological advancement have recently revitalized this discussion. However, teachers are still far from competently integrating or becoming accustomed to video-based pedagogy, especially in combination with collaborative pedagogy. To provide teachers and teacher educators with sound principles for implementing video-supported collaborative learning (VSCL), this symposium fosters a teacher experiment, a cross-over analysis on a pedagogical model for effective VSCL, and student feedback in relation with VSCL. The experiment shows students' growing lexical richness and cohesion by working peer feedback on student's video recorded teaching practice. The cross-over analysis shows the evidence for the VSCL-pedagogical model based on data from many other experiments in the European ViSuAL-project. The same holds for the student-feedback analysis. In this symposium we interact about practical experiences in relation with the effective principles of the developed pedagogical model and the experiences of the students.

INTRODUCTION

The modernization of European Higher Education Institutions (HEIs) calls for a workable pedagogy and skilled instructors that will implement video technologies into their practice with the aim of promoting collaborative learning and knowledge building. By doing so, the ViSuAl project aimed at attaining three main goals:

1. Evidence-based hands-on pedagogy to utilize video-supported collaborative learning (VSCL);
2. Hands-on principles for a sustainable HEIs and educational technology designers (ETDs) partnership;
3. Pedagogical design principles and workable pedagogy practices for instructors and ETDs to enhance the use of their products in education.

The chosen methodological approach is that of a design-based research process, which enables co-creative development, as well as testing and validation of pedagogical model and practices.
The project stems from a thorough needs analysis on the topic of VSCL, and a comprehensive literature review (Ramos et al. submitted), which provided the researchers with a framework aiming at developing a prototype of the pedagogical model. This prototype enabled a preliminary cycle of field experiments involving teachers, students, teachers', instructors and ETDs. Collected data from these experiments and their analysis has been employed to improve the prototype of the pedagogical model and the observed practices, which has been corroborated through a second cycle of experiments and the consequent analysis of the reported data. The different data is analysed in three analytic studies which results are presented in this paper. In study 2 data of different experimental international locations are analysed.

Teacher education aims to move students from novice to expert level. In study 1, we analysed student's textual peer feedback on video recordings of their teaching practice. The question was: What is the impact of curriculum literature on the word use in the peer feedback? Secondly, do lexical richness and cohesion as indicators of growing expertise increase in the students' feedback during the course? First, the impact of the curriculum and literature on students' feedback was analysed by semantic network analysis of prominent words. Secondly, the lexical richness and the semantic cohesion of students' feedback and reflections were analysed. Our findings show that students created stronger connections between the prominent words from the literature. The lexical richness and semantic cohesion also increased. This means that students incorporated vocabulary from expert sources and maintained semantic consistency while using the expert vocabulary. This might be seen as evidence that peer-feedback on students' own video recordings stimulates students to become experts in the field of teaching.

The use of video has shown its potential to impact teaching practice, both in teachers' pre-service education and in-service professional development (Ramos et al. submitted; McDonald & Rook, 2015). The combination of video use with more current pedagogical approaches like knowledge building or active, collaborative learning is rarely seen in the classroom.

Teaching is a knowledge-rich profession (Guerriero, 2013) and *teachers regularly evaluate knowledge* in relation to their practice to update their knowledge base, thus

improving their teaching practice. Being an expert is more than knowing a list of facts and formulas relevant to the teacher's domain (Darling-Hammond et al. 2005). Instead, experts organize their knowledge around core concepts or ‘big ideas’ that guide their thinking about domains and acting in the classroom. Beginners rarely refer to major principles (Larkin et al. 1980). When watching a videotaped lesson, expert teachers’ perceptions differ from those of novice teachers (Sabers et al. 1991). Expert teachers interpret practices according to very different standards, using more sophisticated pattern recognition and segmentation.

Study 3 focuses on the essential for learning at vocational and professional higher education ie.g. the tight integration between practical, theoretical, and self-regulative knowledge (Tynjälä, 2008). One method to enhance this integration can be a systematic video-observation of one 's real work situations, where students can analyse and reflect the practice in the frame of theories. There are several studies published regarding the role and benefits of using videos and video-observations in education and in teacher education particularly (e.g., Hougham, 1992; Wang & Hartley, 2003; Powell 2005; Maclean & White, 2007; Rich & Hannafin, 2008; Calandra, et al. 2009; Kong et al. 2009; Tripp & Rich, 2012; Coffey, 2014; Goeze et al. 2014; Mercado & Baecher, 2014; Gaudin & Chaliès, 2015). We argued that teachers need their own experiences of video-observations to understand, justify and apply video-observation as a teaching method. Thereby, we designed and implemented pedagogical experimentations, which focused on enhancing video-supported collaborative learning (VSCL) for the professional teacher education (Burns & Laitinen-Väänänen, 2018). One aspect and assumption in developing the pedagogy was, based on the previous studies, that observing one’s own work, and particularly peer’s work (Wu & Kao, 2008), would empower and encourage to make the change and development into the working practices. This international research sheds light on that perspective.
The research question in study 3 was: What kinds of meanings do the students give based on their experiences to the video-supported collaborative learning?

METHODS AND RESULTS

Study 1: Acquiring Expert’s Vocabulary: Analysing Students Textual Feedback on Video Recordings.

Method

This study 1 reports an experiment in bachelor-level courses of a VET teacher education curriculum in the Netherlands. This experiment aimed to support student teachers’ development from 'novice' to 'starting expert’ by using teacher-students’ video recordings of their teaching practice and peer feedback. The study concerns a pre-experimental one-group case study design (Campbell and Stanley, 1966) with

repeated observations: x-O-x-O-x-O-x-O-O^{f} (N=15 students). Dependent variables to indicate the growth of expertise were lexical richness, semantic cohesion and betweenness centrality.
Lexical richness has been used as a linguistic variable to assess Alzheimer's disease progression (Hernández-Dominguez et al. 2018). In contrast to the loss of words and meaning, our hypothesis is that students will acquire more vocabulary, professional terms and that their lexical richness is increased at the end of the course.. We used the Type-Token Ratio (TTR) to measure the lexical richness of students' vocabulary each month to detect when it increased.

Lexical richness reflects the variety of the lexical items, it does not reflect the meaning that they create together. Therefore, we included the assessment of *semantic cohesion* of the students' comments. We used two metrics: 1) based on the semantic similarity between all words in a given text. 2) based on the centroid distance between all words given in a segment of text (Korenčić et al. 2018).

We used KBDeX to analyse the *betweenness centrality* (Matsuzawa et al. 2012; Oshima et al. 2013) to measure the extent to which an 'expert' word had a mediating function in the conceptual network of words. We identified topics by applying topic modeling methods, a probabilistic technique used in machine learning (ML) and Natural Language Processing (NLP) to explore documents. A topic represents a group of words with a high likelihood of occurring together in a document (Ignatow and Mihalcea, 2017). The resulting groups of words can be interpreted as lexical fields. The meaning of the words in a lexical field depends on each other; they form a conceptual structure that is part of a particular activity or field (school: teacher, book, notebook, pencil, student, etc.).
We used a well-known statistical language model, Latent Dirichlet Allocation (LDA), to generate the topics (Ignatow & Mihalcea, 2017). The data used for this analysis corresponded to the literature used by students during their course. For the topic modeling analysis, we did not consider the time as a variable to analyse the topics' evolution during the semester.

We pre-processed the data by conducting the usual tokenisation, lemmatisation, and part-of-speech (POS) tagging. The reason for filtering only using nouns and adjectives is that we wanted to analyse the attitude towards learning and teaching of the student teachers. According to Biber and Conrad (2019), academic prose has a higher frequency of nouns than conversations.

Results

Overall, our results show that the lexical richness (see fig. 1) and the semantic cohesion in the students' peer feedback and reflections increased, indicating that these students were developing from novices into experts (Radović et al. 2020).

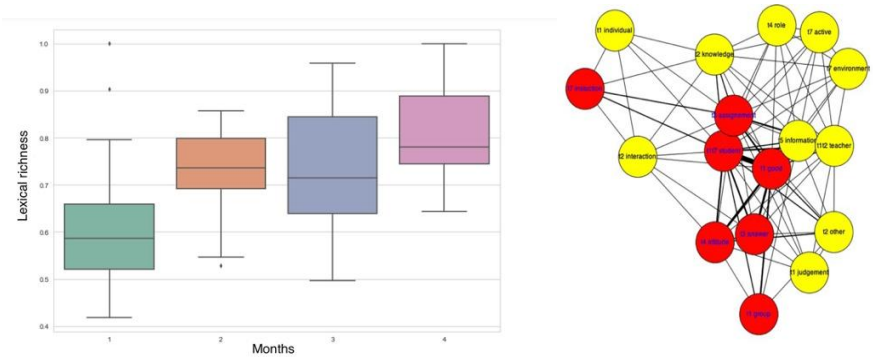

Figure 1: Students' feedback lexical richness increased during the course (left), Semantic network of one of the analysed student groups (right)

Results show that in the beginning of the course, students had little knowledge of the literature concerning interaction and teaching practice. Giving more useful, content-related peer feedback on peers' teaching practice requires more knowledge and understanding that leads to a cohesive teaching concept. This developed during the course, as could be seen by two factors. First, lexical richness increased steadily over time for all four subgroups. Second, KBDeX-analysis of the word networks show that at the end of the course the networks were stronger than in the word networks at the start. At the end of the course, stronger relations were established between a larger number of topic keywords (fig. 1). Thus, expanding students' activities with video recordings, feedback, interactions and reflections did not hinder their conceptual development and growth of expertise. Overall, our results lead to the conclusion that the lexical richness in the students' peer feedback and reflections increased, e.g. students' use of 'expert vocabulary' grew. This indicates that students were developing from novices into starting-experts. So, students incorporated new vocabulary and maintained semantic consistency (Schank et al. 1999).

Study 2: Video-Supported Collaborative Learning within the ViSuAL Project: a qualitative analysis using nVivo

Method

More specifically, the qualitative analysis carried out through the nVivo software allowed the researchers to collect the evidence necessary to answer the following research question:
To what extent did the VSCL approach prove efficient for the teachers and students involved in the ViSuAL project?

And the sub-questions: 1. What kind of objectives were used? 2.What kind of prerequisites are needed? 3. What kind of technology was used and how did it

support collaborative learning? 4. What is the role of the teacher? 5. What kind of VSCL learning activities are involved? 6. What were the learning outcomes? 7. What are the VSCL learning scenarios used?
Fifty-eight documents (12 experimentation plans, 11 video ethnographies, 12 video blogs, 11 appreciative interviews and 12 case reports) constituted the corpus of the data included in the analysis. Analysis was performed via content analysis by applying categories (Miles & Huberman, 1994). Researchers thematically aggregated the data into eight macro categories derived from the key words of the abovementioned sub-questions: 1) collaborative learning activities; 2) effects; 3) issues; 4) objectives; 5) prerequisites; 6) role of the teacher; 7) technology function; with the added technology (8) category. The coding scheme was tested on 20% of all the data sources by two researchers (Cronbach's α=.85) and then applied to the whole corpus using nVivo software.
This presentation focuses specifically on the references coded into categories 1 and 2 and will present the most significant results found with respect to the effects (330 references) and collaborative learning activities (174 references).

Results

Within the category "effects" we've found evidence to support the creation of four dimensions: 1) effects on teachers' pedagogical practices, such as changes in teaching practices (31 references), effective feedback (30 references), learning from viewing video recorded practices (30 references), personal and professional growth (13 references), improving opportunities for bridging theory and practice (10 references) and new pedagogical ideas and competences (9 references); 2) effects on students personal, social and attitudinal development, in which we've included positive attitudes towards VSCL (57 references), deeper reflections and learning (32 references), changes in behaviors and thinking (11 references) and students agency (3 references); 3) effects on the development of skills and abilities reported, consisting in changes in video competences (21 references), changes in collaboration competences (19 references) and changes in digital skills (15 references); and 4) effects on learning, based on what was stated by the experiments' participants regarding the learning process and the adoption of collaborative learning and knowledge building principles manifested in activities such as knowledge sharing (11 references), students engagement on learning (11 references), idea sharing (9 references), peer support (7 references), strengthen group ties (6 references) and improving problem-solving skills (5 references).

Regarding the collaborative learning activities, the analysis shows that the most referred activity was the reflective discussion (31 references), which features included the involvement of several people engaged on carrying out a collective discussion on a topic, "feedback giving", "reflecting on a practice from a video, with the final goal to reflect on their own practice", and other kind of discussions finalized "to see the change in [one's and others'] practices". Another interesting result shows

that collaborative video design, creation and editing (26 references) was the second most referred activity. This activity included a group of many others such as to design activities on videos performed collaboratively in groups, which could vary from “creating a storyboard for the sketch they wanted to film in order to help their colleagues learn” something or to “receiving a video made by their peers on that procedure and turning it into an interactive video”. Other less frequent quotations have appeared also within the data.

Study 3: Enhancing video-supported collaborative learning - learners’ perspective

Method

After participating in the experimentations, the higher education students’ (in BSc-degree programs for Facility Management and Music pedagogy, in pre- and in-service programs for Professional Teacher Education) and trainees (in in-service training for Management and Leadership) (N = 57) were asked for reflective feedback, by applying open-ended questions, as part of their final program assignments and in their course feedback.
The data were analysed by applying the content analysis (Miles & Huberman, 1994). This qualitative analysis revealed themes that students raised when reflecting on their VSCL experiences.

Results

Based on the analysis, five main themes emerged describing the meanings students gave to the VSCL: ‘positive experience’, ‘saves and requires time’, ‘difficult but instructive’, ‘peer’s essential role’ and ‘I learn a lot’. These themes were described more openly with extracts from the data in the presentation.

CONCLUSIONS

Conclusions for the studies presented in this symposium went as follows. Regarding the first study, it is possible to state that the influence of peer feedback using video recordings of authentic teaching situations stimulates creation of more advanced ‘personal’ concepts about teaching. This finding may encourage student-teachers to update their knowledge base by using pedagogical and methodological insights offered by the teacher trainer and the course literature. The findings can motivate teacher-educators and student-teachers to improve their teaching skills and practice and to recognize relevant patterns in their thinking about teaching reflecting on video practice recording helping to become more expert: true professionals.

From the second study, results coming from the analysis proved to be consistent and allowed us to understand in what way and to what extent did VSCL sustain learning and professional development. Moreover, among the cases studied it was possible to observe that there is a great variation in terms of collaborative learning activities but also that that wide specter of variation seemed to lead to very positive effects towards VSCL and to support the flowering of knowledge building.

In the third study, the i.e presented showed that video-observation is a powerful and practical tool to combine practical and theoretical knowledge in learning. In addition, that study indicated that student's own and peer's video analysis enhance reflective skills. From that perspective, the findings of the third study study complement those of earlier studies. Furthermore, that study indicated that seeing and analysing your own practice from videos can be difficult, even embarrassing for the student. However, that experience could be turned into a positive, empowering, and instructive experience over time. Despite these mixed feelings, or maybe because of that, video-observation and -analysis could be considered as a powerful learning tool. Another interesting observation was the question related to the nature of peer-student's role in supporting professional development and learning. This is an important finding, as in collaborative learning, the crucial element is the social interaction and its power in the learning process. Though, the main reason for designing and implementing VSCL experimentations was not financial, it was interesting that students mentioned video-observations to save time and money. A possible explanation for this might be that students did not need to travel to the university to discuss their teaching practice, as they had access to the uploaded video recordings online - and were able to review and comment on them at home. Based on the research related to the third study, we suggest expanding the research-based use of video-supported teaching and learning in vocational and higher education.
Especially now, when we all are more experienced in using digital tools in learning, and when collaborative learning is more difficult to implement than in face-to-face practice, and as teaching the practical skills online asks for innovative practices.
In another article, submitted to the European Journal of Teacher Education the pedagogical model that could be generated on the basis of these and other data-analysis is described (Cattaneo et. al. 2022, under review).

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