How Can a Blended Learning Environment Enhance Job-Related Competencies of In-Service Physical Educators? – Development and Implementation of a Web-Based Video Analysis Service (EQUEL)

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Abstract

A web-based video analysis service (EQUEL) will be developed with the aim of encouraging in-service physical education (PE) teachers to reflect on their own teaching practice and how they can develop it further. Moodle® will enable their access to a web-based library with short authentic PE video sequences. By using the log files and user data from PE teachers, this database will be scientifically supervised and evaluated. The monitoring is marked by a strong orientation towards the desires of educational policy and practice in the federal state of Brandenburg and will be based on an educational design research (EDR) approach.

Key words: Reflective practice, blended learning, physical education, education-based research, job-related competencies.

Research topic

In the last few years, there has been a considerable rise of interest in blended learning to improve the educational experience of in-service teachers (Borchert, Fritzenberg & Schloeffel, in press). This development was triggered essentially by three main events: firstly, the new technological opportunities, which the Internet offers. Enhanced technology advancements allow educators and learners to teach, learn, and gain knowledge online in various ways (e.g., Podcasting, Wikis, MOOCs). These advancements are jointly responsible for the development of active learning processes with the latest online tools and the teaching of media competence in school (Ganz & Reinmann, 2007). Secondly, the released results of the first two national and international large-scale assessments in the late 1990s and early 2000s, TIMSS (Trends in International Mathematics and Science Study) and PISA (Programme for International Student Assessment), influenced the increased interest in new media in educational systems. They triggered a fundamental discussion about the effectiveness and outcome of national school systems, educational standards, and competencies (Author, 2015). Thirdly, the rise of blended learning is linked to the results of the so-called Hattie study (Hattie, 2008) in terms of the influencing factors for educational learning success. It launched an interdisciplinary discourse on a national as well as international scale about the actual effects and efficiency of educational teaching and learning processes.
Especially the debate about competencies and educational standards has led to an opening of the educational concept and an increased focus on integrative learning arrangements (Rauschenbach, 2015). Considering the new educational technologies, it was concluded that it is unnecessary to waste valuable contact time with instructors and fellow learners to gain knowledge. Rather, this time could be used to gain more complex experience, to reflect on and consider it, and try new approaches. This, however, requires a smart combination of traditional and computer-based learning opportunities, which offers varied possibilities for gaining qualifications and independent knowledge (Erpenbeck, Sauter & Sauter, 2015). Following this, we developed a multimedia-based blended learning concept for in-service teacher training, which considers the specific circumstances of PE teachers. The main research questions of the study related to EQUEL (Internet based quality development of PE teacher training) are: (i) How can a blended learning environment enhance job-related competencies of in-service physical educators, and (ii) how can the instructional quality of PE be increased by a multimedia-based didactical approach to teacher training.

**Theoretical framework**

It is common sense that the instructional quality is significantly dependent on how well PE teachers are trained and how they reflect on and instructionally design their lessons (Drewicke, 2015). Therefore, the theoretical framework of the study is based upon knowledge about blended learning (Sauter & Sauter, 2004), the development of competencies (Erpenbeck & Sauter, 2016), and the evidence efforts of reflective practice in PE (Schoen, 1983; Serwe-Pandrick, 2013). All three terms (blended learning, competencies, reflective practice) are closely related to each other and part of a superimposed discussion in the educational system.

Blended learning is defined as a purposeful arrangement of traditional media, methods and ways of organizing learning with e-learning solutions and possibilities (Kupetz & Ziegenmeyer, 2005). Following Erpenbeck, Sauter and Sauter (2015), there has been a paradigm shift from a pure gain of knowledge in the early 1990s (offline eLearning) towards the development of competencies through blended learning arrangements since 2006. Furthermore, the developments in the area of blended learning are jointly responsible and important for the transition from self-organized learning towards self-regulated learning. It can be ascertained that blended learning serves illustration (it is more than the mediation of information), the recreation of links (it is more than a feedback of the actual state of the learner) and the “emotional impregnation” (Erpenbeck & Sauter, 2016, p. 8) of knowledge. This means that knowledge has to be permeated emotionally so that there could be a development from ‘knowledge itself’ towards ‘knowledge for us’. Only the shift from knowledge itself towards knowledge for us could lead to a legal capacity and the development of competencies (fig. 1).
Admiration (of the teacher, the scholar, the beauty of the material ..), enthusiasm, passion, commitment, desire, interest, curiosity, participation, but also caution, deliberation, fear ...

Figure 1. Emotional ‘impregnation’ of knowledge (Erpenbeck & Sauter, 2016).

This needs an embedding in mental and representational acting (Erpenbeck & Sauter, 2016). Blended learning is particularly suited as a support in this process.

The discussion about the development of competencies is primarily about job-related knowledge, competencies, and attributes physical educators need within the requirements of PE. The argumentation ranges from questions concerning the control of the educational process, related output diagnostics, problems of test construction and statistic modeling, and the differentiation between competencies and qualifications to issues of derivation, determination and testing. The spectrum is not only complex but also marked by different opinions and positions in the area of educational science. In its historical context, the discourse about competencies and standards in the German educational system is not naturally linked to the results of the first results of TIMSS and PISA (Aljets, 2015). Already 50 years ago, the so-called sputnik shock, an equal development in the German educational system, took place. The fact that the Soviet Union was able to bring a satellite into orbit triggered an unexpected scientific, technical and political thrust in the western civilization (Borchert, 2015). Similar to the development of the last 15 years, the expenditures for education and science rose drastically in Germany in the late 1950s and early 1960s. But in 1964, a revolutionary publication shook the German educational system: The German competence disaster by Georg Picht. Although this book initiated many important and necessary steps in the former educational system, most of them got lost in bureaucratic developments (Erpenbeck & Sauter, 2016). Consequently, Marx could be cited that all things happen twice: once as a farce, the second time as a tragedy.

Common for both events are their close connection and relation to education. One tried to push innovations and major reforms in the educational system by optimizing administrative agreements, whereas the other focused on an expanded concept of
education and the paradigm shift from an input to an output quality (by using the terms competencies and standards).

This development is closely linked to the theoretical approach by the reflective practitioner by Schoen (1983) and the considerations about the specific relationship between one’s own experiences, systematical reflections, and the communicative interaction for learning. We offer a typology of reflection based on intensive and critical thinking as a method for knowledge production and ideational realization in and about practice (Serwe-Pandrick, 2013). Schoen (1983) refers to the importance of practical knowledge for action of professionals (e.g., physical educators) marking it as knowing-in-action. It means the “practical knowledge that professionals hold about their professional work and that cannot be formulated in prepositional terms” (Munby, 1989, p. 31). Within the reflection about knowing-in-action, knowledge becomes describable and transfers into knowledge-in-action. Schoen (1987) marks these processes as a reflection-in-action (when it is taking place during an action) and a reflection-on-action (when it is taking place after an action). The paper will return to this matter shortly.

**Institutional and curricular context of EQUEL**

Initially, the EQUEL database was designed for in-service PE teachers of the German federal state of Brandenburg. EQUEL relates to the PE teacher training, which is organized locally by the Federal Ministry of Education, Youth and Sport Brandenburg. Current findings of the PE evaluation in Brandenburg refer to deficits in the existing teacher training structures (Borchert, 2014). In particular, according to the responses of PE teachers (N = 581) and principals (N = 217), the orientation of the content and the selection of topics as well as the effectiveness of PE teacher training seems to be problematic. Although the formal and informal offers at local and regional level were used, the real impact on their own work and the further development of PE teachers is low. With regard to these findings, the Federal Ministry decided to develop other forms of PE teacher training, which correspond to the current results of empirical educational research (among others Hattie, 2008). Furthermore, a new PE curriculum was introduced in the school year of 2015/16, which, amongst other things, focuses on the media competencies of the pupils. Consequently, it is likewise necessary to improve the media competencies of PE teachers for a curriculum based on modern PE teaching. Regarding this, the initial situation of and conditions for PE teacher training in Brandenburg can be described as follows (tab. 1).

<table>
<thead>
<tr>
<th>Table 1. Initial situation of PE teacher training in Brandenburg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning environment</td>
</tr>
<tr>
<td>classroom, gym, swimming pool</td>
</tr>
</tbody>
</table>

With the aim to reflect on teachers’ practices and further the development of their teaching, we launched a web-based video analysis service at the end of 2016, enabling in-service PE teachers to access a web-based library with short PE video sequences.
According to a video-based casework, the video sequences are connected with additional material to the topic, didactic key aspects and learning conditions.

Currently we are developing and testing a plug-in for Moodle 3.1. The plugin is called video database. It has three purposes: (i) storing videos, (ii) searching and browsing in a video database, and (iii) video playback and annotation of time-related annotations.

Video storage includes video upload as well as predefined and customized metadata schemata. The predefined metadata relays to the Dublin Core Meta Data Set. It was extended by file-specific aspects such as mime type, duration, and information about the video and audio codec. The costume metadata set is dedicated to context specific classifiers, taxonomies, or resource related keywords. The video database provides a video manager for searching and filtering within the provided metadata. The core of the plugin provides video playback and annotation facilities. All related functions are based on Vi-Two1 as an open source JavaScript framework for interactive videos. The player enables the user to adjust the playback rate, repeat segments in a loop, and zoom in and out. Thus, it increases the chance to perceive volatile situations and visual details in the video. The plugin supports different types of spatiotemporal video annotations. A point in time or time range defines an annotation. The spatial dimension is optional but includes points as well as areas or objects that can be placed within the video frame. An annotation can be used as a marker to highlight video fragments (e.g., by putting a frame around it or pointing an arrow on it). In addition to that, highlighted objects can be labeled, classified or described by the user. All annotations of a video are mapped on the timeline. We listed them on a separate page to make it easier to oversee and maintain contributions from the users. Furthermore, the user has the possibility to take part in a discussion forum, which is connected to the video material and the annotation given in the video sequences.

The EQUEL database is one aspect of various modifications, additions and extensions to the PE teacher training structure and the focal points in the federal state of Brandenburg. It is closely linked with an innovative didactic framework of PE teacher training, which relates to a suitable reflective practice approach for pre-service student PE teachers (Mehl & Friedrich, 2015; Borchert, 2015). A blended learning scenario was developed at the interface of scientific training and the profession-oriented development of PE teaching competencies. Similar to the EQUEL project they embraced the potentials of utilizing teaching videos, the possibilities of learning and teaching environments as well as a didactic approach to reflective teacher training (Mehl, 2011). This expertise and prior knowledge is expected to benefit the EQUEL study as well as the PE teacher training structures in the federal state of Brandenburg (tab. 2).

Table 2. Desired development of PE teacher training in Brandenburg.

<table>
<thead>
<tr>
<th>Learning environment</th>
<th>Participants</th>
<th>Materials</th>
<th>Methods</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>classroom, gym, swimming, usage of eLearning</td>
<td>in-service PE teachers, PE coordinators, external experts (scientists)</td>
<td>video technique, video recording, reader</td>
<td>training courses, discussions within the department conference,</td>
<td>traditional and trend sport, theory and practice of reflective teaching and learning in PE,</td>
</tr>
</tbody>
</table>

1 See https://github.com/nise/vi-two (last access 2016/09/26)
platform (Moodle®), video database

| video-recorded gym observations, micro-teaching | critical situations in PE, didactics |

Method

By using the log files and user data from PE teachers, this database will be scientifically supervised and evaluated. The monitoring is marked by their strong orientation towards the desires of educational policy and practice in the federal state of Brandenburg. Due to the fact that radical innovations in the educational system are frequently without a chance to establish, EQUEL monitoring is based on an educational design research (EDR) approach. “Design research is not defined by methodology. All sorts of methods may be employed. What defines design research is its purpose: sustained innovative development” (Bereiter, 2002, p. 330). This approach is more suitable for creating innovations in education practice than other research approaches (Reinmann, 2005). Furthermore, it mentions the demands of educational context as per the conditions of in-service PE teacher training in Brandenburg. Moreover, this approach enables the scientists to involve stakeholders (e.g., PE teachers, PE coordinators, external experts) in judging design quality.

This becomes especially important in judging the overall desirability of a design compared to accepted practices. The weighing of incommensurables involved in such a conclusion rules out an expert judgment and calls for the representation of the various viewpoints of those with the most stake in the matter. (Walker, 2006, p. 13)

Only through systematic organization, accomplishment, evaluation and re-design it is possible to show the complexity of teaching and learning processes (Reinmann, 2005).

Looking at the (further) development of teaching competencies of in-service PE teachers, the EDR initially focuses on theoretical contributions (through the discussion of competencies), design knowledge (in this specific educational context), useful artifacts (lesson settings, course planning, assessment methods) as well as examples of good practice (given by means of authentic PE video sequences). For data interpretation, analysis and explanation we use a discipline-specific scaffold, which follows the cycle of design (fig. 2).

Besides improving teaching competencies of PE in-service teachers, the study yields on further benefits regarding the development of a convenient didactic concept for the meaningful linkage of presence learning and web-based learning of in-service PE teacher training. This didactic concept follows the demands, schedule and procedure of PE teacher training in Brandenburg. Therefore, the monitoring will contribute to a high practical relevance of the research in the field of PE in-teacher training.
How Can a Blended Learning Environment Enhance Job-Related Competencies of In-Service Physical Educators?

Figure 2. Educational-Based Research Cycle.

**Perspectives and expectations**

There is plenty of evidence that blended learning arrangements are suitable for supporting the self-regulated and self-organized learning of educational professionals. The same applies to videos as a powerful and effective technology for learning and reflection on teaching (Schwartz & Hartman, 2007; Borchert, 2015). With the possibility to reflect-on-action (not only reflection-in-action) the study unified both advantages and takes a new approach in the context of PE teacher training.

With a view to the results of Giaimo-Ballard and Hyatt (2012), we suppose that through routine reflection PE teachers will improve their own teaching practice based on their perception and awareness of educational problems. According to Stallion, Murill and Earp’s (2012) findings, we also expect the work with the EQUEL database to lead to an increase in PE teachers’ effectiveness in the classroom and the gym. By using PE video sequences to routinely and consistently reflect on one’s teaching techniques and strategies, there will be a strong likelihood of a rising effectiveness. At the same time, the reflection on the complexity of instructional processes and the expansion of subjective theories could promote flexibility in thinking about alternative educational options for action in PE (Krammer & Reusser, 2005). It can be assumed that specifically the EQUEL discussion forum, which offers a platform for dialogue and reflection simultaneously, will enable PE teachers to gather important and relevant data on how to teach their students best. Furthermore, we would like to promote the development of a (self-)reflective attitude of PE teachers (emotional ‘impregnation’ of knowledge). Related thereto, especially the education design research (EDR) allowed an appropriate procedure. As a result, we would like to derive contextualized theories on learning and teaching (theoretical output) as well as possible improvements for PE practice (practical output) (Reinmann, 2005).

The described steps are based on the idea of pushing the competence-orientated shift in PE teacher training. This relates to the change from knowledge itself (imparted through books, readers, abstracts) to knowledge for PE teachers (imparted through authentic PE
video sequences and a blended learning environment). The EQUEL study has the potential to make a powerful contribution in this context.

As a result, PE teachers may refine their individual teaching style by “embracing a problem-solving orientation and reflection on their own practice” (LaPrade, Gilpatrick, & Perkins, 2014, p. 627). In this context, we expect that EQUEL will help enhance the educational realities of PE teachers directly (through the development opportunities created by the study itself) and indirectly (through design principles for prospective research) (McKenney, Nieveen, & van den Akker, 2006).

Finally, it must be noted that blended learning has to be planned didactically diligently. However, every medium in education is only as good as the didactic concept covering it: Neither a medium involves a solution to educational problems nor a new technology is a didactical approach itself.

References


