Editorial for EJEL Volume 15 Issue 1

Welcome to volume 2 of the special issue of EJEL, focusing research methodologies in e-learning.

As expressed in the call, e-learning research is largely heterogeneous in that there is large variation in the use of research methods and approaches. There is research focusing on evaluation and effectiveness, being based on single case studies or covering several cases. Added to this is the broad variety of pedagogical approaches, domains and contexts that are being approached. The contributions in volume 1 of this special issue largely reflected this and presented reflections on the use of research methodology and results, as well as the anchoring and proposing of new approaches to e-learning research. Volume 2 is no exception to this and presents a blend of qualitatively and quantitatively oriented e-learning research; research focusing on the evaluation and results as well as the processes of e-learning research; analyses of e-learning and anchored suggestions for change of policy and power structures; contributions to the continued development of theory and methodology within e-learning research; as well as the assessment of e-learning quality. All in all, contributions aiming for continued discussion and reflection.

Paula Charbonneau-Gowdy makes a strong argument for a critical and reflective approach to researching technology use to unravel research approaches that can aid in closing the gap between research and practice. The argument is made that while technology is increasingly becoming a social networking facilitator, qualitative research has the power to uncover the stories that matter in socially embodied learning contexts. Hence, the author makes an argument for the importance of qualitatively oriented e-learning research. In the article “An e-learning team’s life on and offline: a collaborative self-ethnography in postgraduate education development”, Alison Clapp presents an ethnography involving a community developing e-learning courses. In any collaboration, such as in designing and delivering e-learning courses there will be stakeholders with different backgrounds and experiences. Being a subject matter expert is one thing, designing and delivering e-learning courses is another. Based on ethnography as an interpretative approach, the author presents “guidelines” to staff development to facilitate future engagement in and development of online distance learning. In the same vein, Laura Delgaty points at changes and transformations of relations and power structures that have emerged in the uptake of distance learning, and the need for clear guidance within academia as regards the development and delivery of distance learning. The study reported in the article, building on practitioner inquiry methodology and use of mixed-methods, is a direct response to these concerns and makes a call for new models of organizational roles and responsibilities. New competencies are demanded and traditional roles and cultures need to be redefined. The article makes a case for practitioner inquiry being a legitimate research approach in that it is accessible and valuable to teachers, and the article further adds to applied and useful knowledge concerning distance learning practice.

Katja Derr approaches the problem of course evaluation given that there is large variance in participants’ knowledge levels, learner behaviour and commitment. A study is presented in which the effectiveness of a mathematics pre-course was evaluated to investigate whether the pre-course enabled “at risk” students to improve their starting position in STEM-related subjects. A pre-post test design revealed the importance of basic mathematical knowledge for academic achievement in engineering, and that students having participated in additional face-to-face courses showed less learning gain as compared to students having participated in an e-tutoring version. Online test attempts by students in the pre-course further proved to be a reliable indicator of student engagement. Identifying good indicators of student learning processes and engagement, as well as that of efficiency and quality of e-learning courses, is admittedly difficult. In the article “Motivational gaps and perceptual bias of initial motivation: additional indicators of quality for e-learning courses”, the problem of finding good indicators of course quality is approached. Rosário Cacao presents a study on the motivation of trainees in e-learning-based professional training and more specifically, the effect of their motivation on perceptions of course quality. The concepts of perceived motivational gap and real motivational gap are defined and suggested as indicators of e-learning quality. The results from the study show that the conceptual gaps help explain how trainees’ perception of quality is affected; the gaps were minimized when perceptions of quality were higher, and when they were positive perceptions of quality was higher than average.
The authors Levinsen and Ørngreen in their article present and discuss workshops as a research methodology, and more specifically how workshops as a research methodology pertains to e-learning. An analysis and discussion of five studies on upper secondary and higher education teachers’ professional development and on teaching and learning through video conferencing, paves the way in their argumentation - more precisely, the argument that workshops can provide the means for understanding complex work and knowledge processes supported by technology, and among these e-learning. The format aids in identifying factors that are not obvious to participants or researchers, and thus helps in identifying blind spots. The pivotal role of the researcher as a facilitator of such workshops and the analysis of these, is further discussed from a research ethical point of view. While the authors Levinsen and Ørngreen contribute to a discussion on research methodology within e-learning by introducing the format of workshops, Magnussen et. al., presents a methodological discussion of the potential and challenges of involving mobile eye tracking technology in studies of knowledge generation and learning; and more specifically, within a science centre context. A study is presented where eye tracking technology has been used by families and children, as well as of school classes visiting a science centre. The authors present how the use of eye tracking technology and methods influence research on an interventional level, on a data level, and on analytical level and how eye tracking can supplement other analytical approaches.

In the article “The e-learning setting circle: First steps towards theory development in e-learning research”, the authors Marco Rüth and Kai Kaspar presents a model that enables comparability and generalizability of e-learning project results by structuring, standardizing and guiding e-learning approaches at the level of a general research methodology. The authors in their argumentation point at the heterogeneity of e-learning approaches with fairly unique combinations of situational factors guiding the design of e-learning. And more specifically, that this is conducted in a bottom-up fashion – and hence comparability and generalisability becomes difficult if not impossible. There is thus a lack of comprehensive theories that allow assuming top-down approaches to e-learning research. The e-learning setting circle that is presented is a first step in such adirection. The model builds on two elements; a guiding element making clear the setting and assessment of goal attainment, and a universal element building on multi-criteria decision making. The model further consists of the following three clusters; context setting, structure setting, and content setting. The model is presented as a strategic conceptual framework that can be used to foster theory development in e-learning projects and research.

Hence, the articles in volume 2 make further contributions to an ongoing critical discussion and challenging of established approaches and paradigms within e-learning research and practice.

Robert Ramberg
Guest Editor
Abstract: We describe a study on the motivation of trainees in e-learning-based professional training and on the effect of their motivation upon the perceptions they build about the quality of the courses. We propose the concepts of perceived motivational gap and real motivational gap as indicators of e-learning quality, which reflect changes in both perceived and real students' motivation. These indicators help evaluate the changes in the trainees' motivation, as well as the bias that occurs in the perceptions about initial motivation.

In the sample analyzed, the real motivational gap was more negative when the perceived motivational gap was negative and not so positive when the perceived motivational gap was positive. We found that there is a perceptual bias on initial motivation when the perceived motivational gap is not null. This means that, for the sample analyzed, the trainees may have “adjusted” their perception regarding the initial motivation as a function of their final motivation, bringing it closer to the latter and supporting their final status. We also show that these gaps help explain how the trainees' perception of quality is affected: the gaps were minimized at higher levels of perceptions of quality and when they were positive, the perception of quality was higher than average.

The two proposed conceptual gaps are useful to measure quality in e-learning and implement specific actions to improve it. The results of our study are useful as they create insights on perceptions of quality in an indirect way, i.e., without asking the trainees to think about what they believe quality is, so that they can quantify it. They also enable training companies to create additional and complementary indicators of quality of e-learning courses that can help explain changes in perceptions of quality.

Keywords: attitudes, courses, expectations, e-learning, gaps, motivational gap, motivation, motivation to learn, perception bias, quality, quality indicators, quality of e-learning, satisfaction, service, training management, training motivation

1. Introduction

Along with innovation, quality is one of the keys to business success and competitive advantage. Yet, the idea of creating, measuring, and improving quality is difficult to put into practice.

Most of the proposed approaches share the idea that what counts is quality as it is perceived by the customers (Grönroos, 1990, 2007), namely by the trainees (Ehlers, 2004). This does not mean that other stakeholders who are impacted by the training should not be taken in account (Juran and Gryna, 1993, Kazmer and Haythornthwaite, 2005). This holds true especially when opposite perceptions about the same course may occur among different stakeholders. Measuring quality is difficult because it is a perceptual and multi-dimensional variable. Due to this, quality is measured through indicators. Different factors have been pointed out as dimensions of quality in e-learning, such as increased professional competence, tutoring support, technology, and design process (Donabedian, 1980, Ehlers et al., 2005, Tergan and Schenkel, 2004, Ehlers, 2004, Frydenberg, 2002, Hayes, 2015).

Defining and measuring quality is a hard task no matter the product or service under analysis. Among goods, the concept of quality is often related to technical specifications, such as its durability, reliability, precision, and ease of operation and repair (Kotler et al., 1996, Deros et al., 2009, Dror, 2007). When services are at stake, quality has another meaning, because services are mainly intangible processes where production and consumption cannot be totally separated and the customer actively participates in the production process. This is especially true in educational services: learning occurs mainly due to the efforts made by the learners; a successful learning experience is also constructed by them (Freire, 1985, Freire, 1992, Vygotsky, 1934, Mukhopadhyay, 2005, Freire, 1998) and depends on their ability to learn from that experience (Dewey, 1916, Dewey, 1925). Thus, in e-learning and educational services in general, quality is more related to the process, than to the delivery of finished educational products. Moreover, the outcomes of that service, the learning and the transfer of learning, cannot be foreseen nor determined with accuracy. In this learning process, the
attitudes of the trainees and their motivation are critical. Motivation influences the trainees’ predisposition to learn, their participation, and willingness to learn.

In this paper we propose two indicators of quality in e-learning based on the evolution of the trainees’ motivation: the real motivational gap and the perceived motivational gap. We hypothesize that significant changes in the trainees’ motivation along the course affect the perception of quality of the course. For instance, if a trainee starts the course with low motivation and progressively his motivation increases during the course, then his perception of quality will be generous. Yet, if he progressively becomes more unmotivated, something must be wrong and his perception of quality will be poor.

We present the results of an empirical study aimed at understanding the impact of the evolution of the motivation of the trainees upon the perceived quality of e-learning-based professional training. We used two online surveys to track the trainees’ motivation and perceptions of quality. The article starts discussing motivation as a relevant dimension to understand quality and conceptualizing motivation and quality in a dynamic way. It then discusses the problems related to the process of retrieving initial motivation. Following this theoretical framework, the second part of the article presents the empirical research we have developed at an e-learning-based professional training company.

Our aim was to understand the relation between the motivation for training in e-learning-based professional training and the perception of quality and determine if motivation can be used as an indicator of perceived quality. With that purpose in mind, we draw three hypotheses:

H1: There is no difference between the perceived evolution of motivation and the real evolution of motivation for training;

H2: Initial motivation can be measured retrospectively at the end of the course, without distortion;

H3: The evolution of the motivation of the trainees can be used as an indicator of perceived quality.

2. Training Motivation as an Indicator of Quality

The concept of quality is not only difficult to define, but it is also not consensual. If two customers may have different ideas about what quality is, they can be rating different things. Consequently, the comparison between their perceptions of quality may become difficult. Companies have to use several clues to survey the evaluation the customers make about the quality of what they are buying. For that, they need to have a set of key indicators to help them improve quality. But how can we infer about perceived quality? Specifically, can we use the trainees’ motivation as an indicator of quality?

Learning achievements contribute to the perception of quality (Ehlers et al., 2005, Holton III, 1996). Learning is influenced, among other factors, by motivation and, although there is not a perfect relationship between motivation and learning (Ahl, 2006), there is a tendency to align attitudes, which are predispositions to behaviour, with behaviour itself (Kallgren and Wood, 1986). This means that initial or pre-training motivation (Cohen, 1990, Noe and Schmitt, 1986) promotes a predisposition to learn and to learning itself. At later stages, it also promotes a predisposition to transfer and make use of the learning outcomes in other contexts (Byrnes, 1996, Mendelsohn, 1994, Packer, 2001) and generates an increased perception of quality. This suggests that training attitudes and motivation can help explain the perception of quality. This also means that, as motivation evolves throughout the course, and the expectations involved may be disconfirmed (Oliver, 1980, 1993, Churchill and Surprenant, 1982), the perception of quality may also change.

Training motivation includes energizing, directing, and maintenance components (Noe and Schmitt, 1986, Colquitt et al., 2000, Kanfer, 1991). It is the force that influences the enthusiasm toward the training program, the stimulus that directs trainees to learn, and the persistence that will lead to the use of the newly acquired knowledge and skills, even in the presence of adversity and lack of reinforcement.

Measuring the perception of quality through motivation has several advantages: At the beginning of a course, the trainees may have a perception of quality based only on the opinions of others. But they are able to rate their motivation, i.e., the internal force that drives them towards the course and their goals. They know if they
are feeling energetic, enthusiastic, and persistent or if they are making a worthless effort, feeling discouraged, without vivacity, and wasting time. They can easily rate their motivation and justify it. After starting a course, the trainees start making their own quality judgments (“this is a good course”), and their motivational reaction to that experience may be considered a secondary effect of the experienced quality. In other words, the evolution of their motivation is an expression of the perceived quality. Another advantage of using motivation to measure quality is that changes in motivation have an immediate impact, while unexpected changes in the perceptions of quality may be revealed too late to let the company take action.

Following motivation can provide clues that help improve quality. For instance, if a trainee says that he feels unmotivated because the platform is often unavailable, the trainer is rude, or the program is of little interest to his current job and his career, that is expressive in terms of the perceived quality. That also points toward objective and specific actions that can be taken to improve the trainee’s motivation, and, by the end of the day, his perception of quality.

3. Conceptualizing Training Motivation and Quality

Figure 1 illustrates a dynamic model of training motivation. Initial or pre-training motivation and trainees’ attitudes have received very little attention in the literature (Cohen, 1990), but initial motivation is what creates motivation to learn, which, in turn, has a direct impact on learning (Holton III, 1996). The expectations created by the trainees before they engage in a training course (left panel in Figure 1) are related to the training process and to the training utility, i.e., to the functional and outcome components of the training service (Grönroos, 1990). The outcomes of the training are valued for their expected utility. Different outcomes may be valued (Holbrook, 1999), such as job opportunities, promotions, self-fulfilment and self-esteem, fun, and social recognition. These expectations shape the training attitudes and the motivations of the trainees before they start a training course and the initial motivation mobilizes them to engage in the learning process. Those expectations are also related to the trainees’ own initiative to receive training, their involvement in the training decision, and the financial sacrifice in which they incur to follow the course.

Expectations created about the course play a relevant part in the motivational process. The individuals are motivated for tasks that are doable (Deci, 1975, Deci and Ryan, 1985, 1991): they will be motivated toward a course that provides the appropriate level of cognitive challenge but that they perceive as achievable. In addition, their expectancy, the predicted instrumentality (which is the belief that if you perform well, a valued outcome will be received), and the valence (which is the value that the individual places on the expected outcome) interact to create a motivational force (Vroom, 1964). This means that the trainees change their level of effort according to the value they place on the outcome of the training process and on the perception of the strength of the relationship between effort and outcome. They will not be motivated if they believe that they will not perform better after the learning effort, if they believe that the increased performance will not increase their rewards, or even if they do not value the rewards they will get.

During the course, the training attitudes, namely motivation, evolve and the initial expectations are disconfirmed (central panel in Figure 1). The disconfirmation of expectations is influenced by the service performance, i.e., the training process. Expectations are also shaped by external factors, which include changes in the workplace environment, the changes that occur in the trainees’ job, and the closeness between the training objectives and the functions expected to be performed after the course (Noe and Schmitt, 1986).

At the end of the course (right panel in Figure 1), the perception of quality is influenced by the trainees’ perspectives of utility, which include short-term and long-term expected uses. The perceived utility is reflected on the trainees’ predisposition to transfer and on predicted changes. The perception of quality is also influenced by the training process and the trainees’ attitudes and these include satisfaction and motivation. At the end of the course, customer satisfaction and trainees’ motivation get separate destinations:

a) Customer satisfaction, which depends on the disconfirmation of expectations (Oliver, 1980, 1993, Churchill and Surprenant, 1982), will influence future training decisions and the trainees’ perception of quality.

b) Post-training motivation expresses reformulated expectations of utility, i.e., perspectives of utility, which are closer to effective use than the initial expectations of utility.
4. Retrieving Initial Motivation

Stated motivations, or needs, may evolve throughout the attendance of the course, especially if we look at education as transformation (Harvey and Green, 1993): as the trainees create their learning paths, they may find new needs or uses they were not considering when they started the course and may influence their motivation. Yet, although expectations have a major impact on the initial motivation to learn, attitudes and feelings may be decided after behaviour (Festinger and Carlsmith, 1959, Bem, 1972, Zanna and Cooper, 1974), i.e., after the trainees have started or completed the course. As a result, the hypothetical differences between the initial motivations and the perceptions about them at a later stage may be affected by the training itself. On the other hand, the opposite may occur, and initial beliefs, affects, or preferences may persist after disconfirmation (Ross et al., 1975, Sherman and Kim, 2002). For example, the trainees may show levels of motivation similar to the initial ones, even if they are disappointed with a course. In other words, we may expect a disconfirmation bias (Edwards and Smith, 1996, Lord et al., 1979), where individuals agree with what supports their beliefs, but also a consistency of beliefs (Higgins, 1987, Higgins et al., 1986a, Higgins et al., 1985, Higgins et al., 1986b). As Edwards and Smith (1996) pointed out, disconfirmation bias combines cognitive process and emotions as people tend to engage in a deliberative search of memory in an attempt to retrieve material for use in refuting the position advocated or the evidences.

Often, expectations, needs, and motivations cannot be identified before the consumption and are measured at the same time as the level of satisfaction, i.e., at the end of the course. Several reasons contribute to explain why researchers rely on ex post facto measures (Cohen et al., 2007): one is that the training companies may not wish to suggest possible service experiences to consumers before use. Another is that most companies do not have access to their customers before they purchase the service. Therefore, attitudes, motivation, and expectations are often measured ex-post. As a result, they are not anticipatory attitudes or expectations, but rather post-service judgments of prior attitudes or expectations. Two problems can arise from this practice. One is the possibility of individuals retrospectively making a biased judgment of their prior situation, influenced by their experience with the service. The other is that the individuals may also have been experiencing other services and living other experiences, and the retrieval of specific attitudes can be disturbed. Retrospective, recalled, or retrieved measures are valid, especially if the anticipations are clear and related to the particular service under analysis (Oliver, 1997). Even so, retrieved attitudes are higher for dissatisfied and complaining customers than for satisfied and non-complaining consumers, as negative experiences create higher expectancies, in retrospect, to justify the dissatisfaction (Halstead, 1993). As a
result, retrieved expectations, and motivations, can be biased and tending to align with experienced performance.

Influenced by Oliver’s (1980, 1993) disconfirmation paradigm of service quality and SERVQUAL (Parasuraman et al., 1988), our study also measures the bias in the process of recalling motivations.

In the perceived motivational gap, we have used a retrospective measurement of initial motivation, and the values of the perceived motivational gap reflect a comparative and conscious judgment. For example, if a trainee rates his final motivation lower than initial motivation, he is expressing, conscientiously, a decrease of his motivation during the course. The alternative to this ex post facto design (Cohen et al., 2007) is to compare final motivation with the motivation the trainee had stated at the beginning of the course, i.e., the initial motivation stated at the beginning of the course. Table 1 compares the two methods of calculating the motivational gap and the two variables we have created to cover each alternative: the perceived motivational gap and the real motivational gap.

**Table 1:** Alternative ways of measuring initial motivation

<table>
<thead>
<tr>
<th>Hypothesis 1</th>
<th>Hypothesis 2</th>
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<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Measurement of initial motivation at the beginning of the course and final motivation at the end of the course. Measurement of both initial and final motivation at the end of the course.</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td>Attitudes measured in the same time frame to which they are related. One conscious comparative reaction about two moments of time.</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td>The trainee may not recall how he rated initial motivation (he may be more motivated at the end than at the beginning but believe that he gave a lower rate to initial motivation and rate final motivation in such a way that it suggests a reduction of motivation along the course). The trainee may not recall exactly what his motivation was at the beginning of the course. He assumes that he can recall it and that it is not influenced by his current (final) motivation.</td>
</tr>
<tr>
<td><strong>Variable</strong></td>
<td>Real motivational gap</td>
</tr>
</tbody>
</table>

5. Method

5.1 Participants

We surveyed students of EVOLUI.COM, a provider of asynchronous e-learning for professional training with fifteen years of experience in the consumer e-learning market and 65,000 clients from 30 countries. The reasons for choosing EVOLUI.COM are related to its significant market share in Portuguese speaking countries such as Portugal, Brazil, Angola, Cape Verde, and Mozambique, as well as countries that traditionally welcome Portuguese-speaking immigrants such as France, Luxembourg, Canada, and Switzerland. The diversity of courses offered was also a reason for choosing EVOLUI.COM, as it would increase the study’s generalizability: EVOLUI.COM offers about 230 short-term courses, in Portuguese, about diversified topics, such as management, design, foreign languages, healthcare, soft skills, pedagogy, and technology. The courses take up to 30 hours to be completed and range in length between 1 and 9 weeks.

The participants were attending courses at EVOLUI.COM, for which they had paid, and we asked them to answer two surveys, one at the beginning of the course, and the other at the end. None of these surveys were mandatory and the participants did not receive any reward for answering the surveys.

The 343 cases considered included registrations in 127 different courses. The longer courses took 9 weeks to be completed, and the shorter ones took only 1 week. The participants’ age ranged from 22 to 64 years and 78.7% held a graduation degree. 11.1% of them were unemployed. The cases analyzed included students living in nine countries: Portugal, Spain, France, Switzerland, Holland, Angola, Cape Verde, and Mozambique. In order to diagnose potential biases, we confirmed that no individual course represented more than 5% of the sample. We also looked at the students who had not answer the surveys and tested if there were differences in terms of age, gender, country of origin, type of course, difficulty, and duration, trainees’ situation facing employment, as well as any previous experiences with e-learning courses. We did not find any differences besides that regular students (defined as students who had already completed a course in the past 6 months) tended to decline the invitation to answer the surveys more often than first-time customers/students and that
78.5% of students that rated their motivation equal or lower than 5 at the beginning of the course were reluctant students.

### 5.2 Instruments and Procedures

We have used two online surveys adapted from Cação (2010). We have decided not to adopt repeated-measures or a longitudinal design, and rather measure motivation in two different surveys. The first survey was introduced at the beginning of the courses, and included questions about the motivations to attend the course, expectations of utility, general attitudes towards training, and *initial motivation* (Appendix 1 lists the relevant questions used in this analysis). The second survey was introduced at the end of the course as a satisfaction survey (Appendix 2). In this survey, the trainees were asked to rate satisfaction, perceptions of quality, *final motivation* and perceptions of what had been the *initial motivation*, perceptions of short and long-term utility, and several other issues related to service performance.

Both surveys used a 1 to 10 numeric scale, where 10 was the highest value. The surveys were made available online in a SCORM compliant file. The results were later analyzed with SPSS.

In order to increase the validity of the study, we have asked other researchers to discuss the theoretical and internal validity of both surveys. We also tested the surveys using a pilot sample of 66 respondents and made minor adjustments based on them.

Over a period of three months, we have collected 582 responses to the first survey and 1099 to the second. 378 answers were paired, which means that, for the same course, the same trainee answered both surveys. Only the paired surveys were considered and the remaining data was discarded.

We faced two types of duplication of records: the first occurred when, for the same registration, the trainee submitted his answers twice in one, or both, surveys. In this situation, we considered the second answer, since the most probable reason for a repeated submission is the correction of an initial appreciation. Yet, we realize that, for the initial survey, we could have kept the first answer, as it could be closer to the initial expectations. The second kind of duplication occurred when the same trainee attended more than one course and, thus, had the opportunity to submit one survey for each registration. In this situation, we considered the first pair of answers and discarded the others, in order to ensure independency. After eliminating the duplicated answers, we kept 343 paired cases. Of these, none had more than 10% of missing values and 225 cases were totally complete. The internal consistency of the data was high (Cronbach alpha of .953).

### 6. Results and Discussion

#### 6.1 Perceived Motivational Gap

The trainees were asked, at the end of the course, to rate their current motivation for the course and to express what they believed their motivation was at the beginning of the course. In other words, we have asked them to rate, comparatively and in a reflective way, their *final motivation* and their *initial motivation* (which was measured at the end of the course). In this way, the trainees were able to rank both motivations comparatively, and we were able to analyze the perception of both motivations at a certain moment of time.

In order to compare the two motivational variables, we have created a *dummy* variable, which we have labelled *perceived motivational gap*. The *perceived motivational gap* was computed as the difference between *final motivation* and *initial motivation*, and was measured at the end of the course (Equation 1)

\[
\text{Perceived motivational gap} = M_f - M_{i1}
\]

where:
- \(M_f\) = Final motivation
- \(M_{i1}\) = Initial motivation perceived at the end of the course

The average *perceived motivational gap* was about zero (-.26), which suggested that there were no significant changes in the motivational level of the trainees. Even so, the Wilcoxon (1945) signed ranks test rejected, with 95% confidence, the hypothesis of *final motivation* being equal to *initial motivation* measured at the end of
the course (p-value = .013) except for the cases where final motivation was low (below 3) or equal to 8, which is the median value of final motivation.

The perceived motivational gap was an ascending curve and had positive values only for levels of final motivation equal to 9 or 10 (Column 6 in Table 2). For levels of final motivation below 9, the perceived motivation gap was negative and the lower the final motivation, the more negative the perceived motivational gap was. This is consistent with attitudes of dissatisfaction or of slight disappointment: if the trainees were not satisfied or had some kind of disappointment, they would state that their initial motivation was higher than the current motivation. This holds true even if the trainees state that their final motivation is moderate (e.g. 7 or 8), i.e., the trainees may report a moderate level of final motivation while stating that final motivation was not as high as initial motivation.

At lower levels of final motivation, a negative perceived motivational gap suggests demotivation and dissatisfaction. Yet, at moderate levels of final motivation it may just indicate disappointment, tiredness, and minor unfulfilled expectations.

**Table 2: Perceived motivational gap, real motivational gap, and perceptual bias of initial motivation**

<table>
<thead>
<tr>
<th>Final motivation</th>
<th>Percentage of cases</th>
<th>Perceived quality</th>
<th>Average Initial motivation perceived at the end of the course (M₁)</th>
<th>Average Initial motivation measured at the beginning of the course (M₀)</th>
<th>Perceived motivational gap</th>
<th>Real motivational gap</th>
<th>Perceptual bias of initial motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
</tr>
<tr>
<td>1</td>
<td>.30%</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.48%</td>
<td>4.60</td>
<td>6.60</td>
<td>8.20</td>
<td>-4.6</td>
<td>-6.20</td>
<td>-1.60</td>
</tr>
<tr>
<td>3</td>
<td>0.59%</td>
<td>2.00</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>2.96%</td>
<td>5.80</td>
<td>7.40</td>
<td>7.80</td>
<td>-3.40</td>
<td>-3.80</td>
<td>-0.40</td>
</tr>
<tr>
<td>5</td>
<td>5.03%</td>
<td>6.65</td>
<td>7.18</td>
<td>7.35</td>
<td>-2.18</td>
<td>-2.35</td>
<td>-0.17</td>
</tr>
<tr>
<td>6</td>
<td>9.17%</td>
<td>6.94</td>
<td>7.52</td>
<td>7.52</td>
<td>-1.52</td>
<td>-1.52</td>
<td>-0.00</td>
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<tr>
<td>7</td>
<td>13.31%</td>
<td>7.75</td>
<td>7.64</td>
<td>7.67</td>
<td>-0.64</td>
<td>-0.67</td>
<td>-0.03</td>
</tr>
<tr>
<td>8</td>
<td>24.56%</td>
<td>8.31</td>
<td>8.22</td>
<td>8.26</td>
<td>-0.22</td>
<td>-0.26</td>
<td>-0.04</td>
</tr>
<tr>
<td>9</td>
<td>24.26%</td>
<td>8.87</td>
<td>8.14</td>
<td>8.56</td>
<td><strong>0.86</strong></td>
<td><strong>0.40</strong></td>
<td>-0.42</td>
</tr>
<tr>
<td>10</td>
<td>18.34%</td>
<td>9.69</td>
<td>9.19</td>
<td>9.42</td>
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</table>

### 6.2 Real Motivational Gap

Since we also had measured initial motivation at the beginning of the course, we were able to compare it with final motivation. For that purpose, we have created a dummy variable, which we have labelled real motivational gap. This gap was computed as the difference between final motivation and initial motivation measured at the beginning of the course (Equation 2).

\[
\text{Real Motivational Gap} = M_f - M_{i0}
\]

where:

- \(M_f\) = Final motivation
- \(M_{i0}\) = Initial motivation stated at the beginning of the course

The real motivational gap had a median value of 0. Unlike the perceived motivational gap, the real motivational gap had an average of -4.5, which was highly influenced by very low levels of final motivation. The real motivational gap also followed an ascending curve and had negative values for levels of final motivation below 9, and positive values for levels of final motivation equal to 9 or 10 (Column 7 in Table 2).

Yet, the real motivational gap was always lower than the perceived motivational gap, except when final motivation was 6, in which situation both gaps were equal. Simply put, the real motivational gap was more
negative when the perceived motivational gap was negative and not so positive when the perceived motivational gap was positive.

In this scenario, we hypothesize that there may be some kind of perceptual bias. In other words, the trainees may have “adjusted” the initial perception of motivation as a function of the final motivation, bringing it closer to the latter. For instance, as the perceived motivational gap was positive for levels of final motivation equal to 9 or 10, this suggests a positive bias of the perception of what had been the initial motivation. This may hint the thought: ‘As I am very motivated now, at the end of the course, I must have been very motivated at the beginning’, which may cause an exacerbation of the current perception of initial motivation relatively to the one held at the beginning of the course. As the courses analyzed were short-term courses, we believe that the differences in the two measurements of initial motivation are due to a change in the perception rather than to problems in recalling the previous assessment.

In order to confirm H1, the hypothesis that there were no differences between the perceived and the real evolution of the motivation, we used the Mann-Whitney test (1947). The hypothesis of the two gaps being equal was rejected (p-value = 0.01), which suggests that there are differences between the perceived motivation and the real evolution of that motivation, even in short-term courses.

### 6.3 Perceptual Bias of Initial Motivation

The results of the real motivational gap suggest that service performance could have influenced the perception of the trainees about their initial motivation.

For that purpose, we have compared, for each level of final motivation, the same variable — initial motivation - measured at the beginning and at the end of the course. Our aim was to compare hypothetical changes in the trainees’ perceptions of initial motivation and to confirm the existence of a perceptual bias.

We have created a dummy variable, which we have labelled perceptual bias of initial motivation. This bias is the difference between initial motivation perceived at the end of the course and initial motivation measured at the beginning of the course (Equation 3).

$$\text{Perceptual bias of initial motivation} = M_{i1} - M_{i0}$$  \hspace{1cm} \text{Equation 3}

Where:

- $M_{i1}$ = Initial motivation perceived at the end of the course
- $M_{i0}$ = Initial motivation measured at the beginning of the course

The average perceptual bias of initial motivation was -.22. It never took positive values, but it was minimized for values of final motivation between 5 and 8 (column 8 in Table 2). The Wilcoxon (1945) signed ranks test rejected the hypothesis of the initial motivation perceived at the end of the course being equal to initial motivation measured at the beginning of the course (p-value = .019). In other words, it rejected the hypothesis of the perceptual bias of initial motivation being zero, which means that, for the sample analyzed, there was some kind of distortion on the perception of initial motivation. The second hypothesis we were aiming to confirm was, then, rejected.

Using Wilcoxon (1945) ranks, we have also tested if the perceptual bias of initial motivation could be zero in three different scenarios: when the perceived motivational gap was negative, zero, and positive. Whenever the perceived motivational gap was zero, we did not reject the hypothesis of the perceptual bias being also zero (Table 3) and we can consider that there was no perceptual bias. Yet, whenever the perceived motivational gap was negative or positive, we rejected the hypothesis of having a perceptual bias of zero.

As a result, whenever there was a perceptual motivational gap, there was also a perceptual bias on initial motivation. Simply put, with a 95% of confidence,
Rosário Cação

Mf = Final motivation
Mi1= Initial motivation perceived at the end of the course
Mi0= Initial motivation measured at the beginning of the course

Table 3: Perceptual bias of initial motivation and the perceived motivational gap

<table>
<thead>
<tr>
<th>Perceived motivational gap</th>
<th>N</th>
<th>Average perceptual bias</th>
<th>p-value of perceptual bias of initial motivation</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing cases</td>
<td>8</td>
<td>0.50</td>
<td>-</td>
<td>Perceptual bias</td>
</tr>
<tr>
<td>Negative</td>
<td>118</td>
<td>-0.36</td>
<td>0.002</td>
<td>No perceptual bias</td>
</tr>
<tr>
<td>Zero</td>
<td>134</td>
<td>0.09</td>
<td>0.541</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>83</td>
<td>1.24</td>
<td>0.000</td>
<td>Perceptual bias</td>
</tr>
<tr>
<td>Total cases</td>
<td>343</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.4 The Relation between the Gaps and the Perceptions of Quality

In order to test our third hypothesis, we analyzed the relation between the trainees' motivation and their perceptions of quality.

- Final motivation correlated strongly with perceived quality (Spearman rho of .806);
- The perceived quality of the course increased with the final motivation (column 3 in Table 2);
- The perceived and the real motivational gaps were minimized when the perceived quality was equal or higher than 8 (columns 3 and 4 in Table 4);
- The perceptual bias on initial motivation was minimized when the perceived quality was 5, 7, or 8, and always negative or around zero (column 5 in Table 4).

The average perceived quality was 8.23. The perceived quality was always below that average at negative values of the real motivational gap. At positive values of the real motivational gap, the average perceived quality was always higher than that (column 3 in Table 5). This suggests that negative real motivational gaps can be related to lower perceptions of quality.

The perceived quality was also maximized when the real motivational gap was null (for which the average perceived quality was 8.81). It was also maximized when the real motivational gap was 5 but this scenario is not expressive, since only two cases fulfilled this situation. A similar situation happened with the perceived motivational gap: whenever this gap was negative, the perceived quality was below the average. At positive values of the perceived motivational gap, the average perceived quality was higher than the average (column 3 in Table 6).

Table 4: Perceptual bias of initial motivation and the perceived motivational gap

<table>
<thead>
<tr>
<th>Perceived quality</th>
<th>Number of cases</th>
<th>Perceived motivational gap</th>
<th>Real motivational gap</th>
<th>Perceptual bias on initial motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
<tr>
<td>-</td>
<td>3</td>
<td>-0.67</td>
<td>-0.33</td>
<td>0.33</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>-6.00</td>
<td>-6.00</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>-4.00</td>
<td>-5.33</td>
<td>-1.33</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>-2.30</td>
<td>-2.30</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>18</td>
<td>-1.44</td>
<td>-2.28</td>
<td>-0.83</td>
</tr>
<tr>
<td>7</td>
<td>49</td>
<td>-1.33</td>
<td>-1.29</td>
<td>0.04</td>
</tr>
<tr>
<td>8</td>
<td>85</td>
<td>-0.21</td>
<td>-0.24</td>
<td>-0.02</td>
</tr>
<tr>
<td>9</td>
<td>104</td>
<td>0.34</td>
<td>-0.05</td>
<td>-0.38</td>
</tr>
<tr>
<td>10</td>
<td>61</td>
<td>0.72</td>
<td>0.49</td>
<td>-0.23</td>
</tr>
</tbody>
</table>
Table 5: The real motivational gap and the perceived quality

<table>
<thead>
<tr>
<th>Real motivational gap (1)</th>
<th>Number of cases (2)</th>
<th>Average perceived Quality (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>5</td>
<td>7.4</td>
</tr>
<tr>
<td>-9</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>-8</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>-7</td>
<td>2</td>
<td>6.5</td>
</tr>
<tr>
<td>-6</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>-5</td>
<td>5</td>
<td>6.4</td>
</tr>
<tr>
<td>-4</td>
<td>8</td>
<td>6.13</td>
</tr>
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<td>-3</td>
<td>12</td>
<td>6.50</td>
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<td>-2</td>
<td>42</td>
<td>7.55</td>
</tr>
<tr>
<td>-1</td>
<td>65</td>
<td>8.20</td>
</tr>
<tr>
<td>0</td>
<td>112</td>
<td><strong>8.81</strong></td>
</tr>
<tr>
<td>1</td>
<td>43</td>
<td>8.74</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>8.64</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>8.38</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>8.50</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

To confirm that the gaps were significant to explain the perceptions of quality, we have used linear regression. We have used the stepwise method (Efroymson, 1960) to follow the successive stages of introduction of variables in the regression model. The first model we have tested (Equation 4) explained 79.8% of the variability of perceived quality. In the second model (Equation 5, with the standardized betas), we have included the initial motivation measured at the beginning of the course, the real motivational gap, and the perceived motivational gap. The inclusion of these three variables may sound redundant, as they are related. For instance, the real motivation gap includes the final motivation and the initial motivation measured at the beginning of the course, which are already included in the factor. Yet, all these variables helped improve the quality of the regression and multicollinearity was not a concern (VIF 2.77 and tolerance = 0.36). The goodness-of-fit improved from 0.798 to 0.822, which suggests that the added variables are relevant to explain the variability of the perceived quality.

Table 6: The perceived motivational gap and the perceived quality

<table>
<thead>
<tr>
<th>Perceived motivational gap (1)</th>
<th>Number of cases (2)</th>
<th>Average perceived quality (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-9</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>-8</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>-7</td>
<td>3</td>
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</tr>
<tr>
<td>-6</td>
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<td>3.00</td>
</tr>
<tr>
<td>-5</td>
<td>4</td>
<td>8.00</td>
</tr>
<tr>
<td>-4</td>
<td>8</td>
<td>6.50</td>
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<tr>
<td>-3</td>
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<td>6.50</td>
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<tr>
<td>-2</td>
<td>38</td>
<td>7.34</td>
</tr>
<tr>
<td>-1</td>
<td>46</td>
<td>8.11</td>
</tr>
<tr>
<td>0</td>
<td>133</td>
<td>8.70</td>
</tr>
<tr>
<td>1</td>
<td>35</td>
<td>8.66</td>
</tr>
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<td>25</td>
<td>8.65</td>
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<tr>
<td>3</td>
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<td>4</td>
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<tr>
<td>5</td>
<td>4</td>
<td>9.00</td>
</tr>
<tr>
<td>6</td>
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<td>9.00</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>10.00</td>
</tr>
</tbody>
</table>

The improvement in the goodness-of-fit, as well as the original contribution of motivation to explain quality, confirms our third hypothesis that the motivation can be used as an indicator of quality.
Perceived Quality_0 = X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 + X_9 + X_{10} + M_f + M_{i1}  

Equation 4

Perceived Quality_1 = 2.396 + 0.219 X_1 + 0.042 X_2 + 0.129 X_3 + 0.148 X_4 + 0.044 X_5 + 0.157 X_6 + 0.172 X_7 + 0.017 X_8 + 0.054 X_{10} + 0.12 M_f + 0.11 M_{i1} + 0.084 M_{i0} + 0.106 RMG

Equation 5

RMG + 0.162 PMG

Where

Y = Perception of quality
X_1 = Global satisfaction
X_2 = Fulfillment of expectations
X_3 = Immediate professional utility
X_4 = Future professional utility
X_5 = Fulfillment of training objectives
X_6 = The platform and its functions
X_7 = Training contents
X_8 = The trainer’s expertise
X_9 = The contribution of the forum for the learning process
X_{10} = The dynamics and help from the trainer in the forum
RMG = Real motivational gap, as defined in equation 2
PMG = Perceived motivational gap, as defined in equation 1

7. Conclusions

In the online training company of our case, as in many other training companies, worldwide, two main categories of students turn up: those who pay for their tuition and those whose tuition is paid for by their employers. The former follow courses of their own choice, have high initial motivation, complete the courses in over 80% of the cases, come back for additional courses, and recommend them to their friends and family. We call them the willing students. The latter tend to follow courses selected by their employers, mostly on the basis of cost-effectiveness and legal obligations, rather than on relevance for the employees, and they are often required to take them in periods and within schedules that are not of their liking. They tend to attach little value to the courses, complain often, and achieve low rates of completion, or even drop out. We call them the reluctant students.

The motivation of the students influences their perception of quality, which, in turn, influences customer retention and future sales. It is, therefore, of critical importance for the training companies. Given the distinction between the two kinds of students, the perception of quality must be appreciated in context. For instance, a perception of quality of 70% is an unquestionable success if it comes from a reluctant student, but it can be damaging if it comes from a willing student. This means that the company must monitor the perceptions of quality attentively and take corrective actions that are adjusted to the students’ profiles. In particular, it must follow carefully the reluctant students, so as to improve as much as possible their perceptions of quality.

As the motivations of the customers can be followed automatically, at the beginning and end of each learning event, by asking the students to fill in a form on the learning platform, the perceived and real motivational gaps, as defined in this paper, can be computed and thus used to help the training companies adjust their offer to the motivations of the students.

Our research lets us conclude that the perceived motivational gap and the real motivational gap can be used as indicators of quality in e-learning courses. They help evaluate the changes in the trainees’ motivation, as well as the differences in their perceptions of quality.
We have found out that the real motivational gap was more negative when the perceived motivational gap was negative and not so positive when the perceived motivational gap was positive. We have also found out that there is a perceptual bias on initial motivation when the perceived motivational gap is not null. This means that the trainees may have “adjusted” their perception regarding the initial motivation as a function of their final motivation, bringing it closer to the latter. The relationship between the proposed gaps and the perceptions of quality was also exposed: the gaps were minimized at higher levels of perceptions of quality and when they were positive, the perception of quality was higher than average.

These results are useful as they create insights on perceptions of quality in an indirect way, i.e., without asking the trainees to think about what they believe quality is, in order to quantify it. They also enable training companies to create additional and complementary indicators of quality of e-learning courses that can help explain changes in perceptions of quality.

The two indicators of quality that we propose are not to be used alone. They must be complemented with other indicators to provide an overall idea of what the student thinks about the quality of the course. Yet, they are easily measured and they can help trainers rethink their pedagogical strategy, which, in turn, can improve the overall perception of quality of the course.

Even so, our study has limitations that we have to acknowledge. We were not able to find what led to the changes in motivation. In addition, we cannot tell if the perceptual bias on initial motivation is due to the training experience itself or to the passage of time and the regular distortions of memory and retrieval. We suggest that the motivational gaps and the perceptual bias on initial motivation should be studied in other learning contexts and even in courses with longer lengths. We also suggest that both gaps, as well as the perceptual bias on initial motivation, should be included in studies about quality in e-learning.

References


Wiley and Sons Ltd.


Appendix 1

Using a scale of 1 to 10, where 10 is the highest value, please rate:

<table>
<thead>
<tr>
<th>1. Your motivation towards the course</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>2. Your expectations of utility about the course</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

Appendix 2

Using a scale of 1 to 10, where 10 is the highest value, please rate:

<table>
<thead>
<tr>
<th>1. Your global satisfaction</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>2. The degree of fulfillment of your expectations</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>3. Your initial motivation</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>4. Your current motivation</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>5. The degree of fulfillment of training objectives</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>6. The quality of the platform and its functions</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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</table>

<table>
<thead>
<tr>
<th>7. The quality of the training contents</th>
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<th>4</th>
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<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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</table>

<table>
<thead>
<tr>
<th>8. The trainer's expertise</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>9. The contribution of the forum</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>10. The dynamics and help of the tutor in the forum</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>11. The competence, kindness, and promptness of the staff</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<th>10</th>
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<table>
<thead>
<tr>
<th>12. The immediate utility of the course to your current job</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
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<table>
<thead>
<tr>
<th>13. The utility of the course in the future</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>9</th>
<th>10</th>
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<table>
<thead>
<tr>
<th>14. Your global quality perception</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<table>
<thead>
<tr>
<th>15. The quality-price relation</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</thead>
</table>
Redefining Practice: Challenging Academic and Institutional Traditions With Clinical Distance Learning

Laura E Delgaty
School of Medical Education, The Medical School, Newcastle University, Newcastle Upon Tyne
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Abstract: With the uptake of distance learning (DL), which has actually been marginal for most academics, teaching contexts, traditional power structures and relationships have been transformed, leaving lecturers potentially disenfranchised. Institutional and cultural change is vital, particularly changes concerning academic roles. The advent of DL has caused role ambiguity; however published literature related to academic roles is confusing and lacks clear guidance. For academics involved in post graduate clinical education, information is even more incomplete. Using a framework of communities, this study is a direct response to these concerns. The aim was to systematically and critically evaluate the implementation of clinical DL in an effort to improve practice.

Maintaining a practitioner inquiry methodology, this study investigated the development and delivery of a new DL module. Data collection consisted of documentary analysis of meetings, interviews with staff and students, student evaluations and analytics. Data analysis incorporated both quantitative and qualitative methods to triangulate the research findings.

New competencies for academics emerged, including leadership and management. Barriers to staff progress included: ambiguity in roles, lack of leadership and unpreparedness for responsibilities, time, and workload. Student barriers included: time, fear, relevance of learning, isolation and increased autonomy. Explicit planning, organisational support and working within communities were requisite to create a ‘sustaining’ technology.

This study contributes to educational practice on two levels. Firstly, by striving for rigour, it demonstrates that practitioner inquiry is a legitimate research approach that is accessible and valuable to teachers. Secondly, it adds to useful and applied knowledge concerning DL practice. Avoiding traditional workload assumptions that are erroneous and inaccurate, this study provides new models of organisational roles and responsibilities. The results challenge the evolutionary nature of academia, suggesting working in communities and new competencies are required whilst traditional roles and culture must be redefined.

Keywords: Distance learning, clinical education, academic staff, competencies, communities

1. Introduction to Problem

Learning technologies and distance approaches to teaching are being increasingly deployed in Higher Education (HE). There is pressure for academics to become more involved in distance learning (DL), although there has been both academic resistance (Ellaway, 2011) and lack of acceptance (Baran et al., 2011). This may be related to the well documented difficulties for academics including: confusion concerning the organizational culture (Briggs, 2005), a dearth of clear guidance (Ryan et al., 2004) and poor organisational support (Curtis, 2001) with DL innovations. Interestingly, in DL research, initially, the focus was on technological, practical and pedagogical aspects, but Casanovas (2010) suggests that we have failed to embed these innovations and change into educational institutions and organisational change is required. One of the major changes necessary concerns roles and competencies of academics (Baran et al., 2011). Academic roles have evolved over time and until recently, there was a relatively clear view of what that role encompassed. However, the advent of DL has led to a lack of clarity around academic identities and confusion over both roles and responsibilities (Wilbur, 2016, Baran et al., 2011). This clarity is essential as it is well documented that role ambiguity leads to job dissatisfaction and decreased performance in academics (Delgaty, 2015, Briggs, 2005).

To further obscure the picture for those involved in clinical postgraduate education, the majority of research on DL has focused on undergraduates or children and has not focused on health professionals as learners (Cook, 2009).

1.1 Organisational Change

The majority of research on change in HE has not focused on DL, but on the removal of the two-tiered system and internationalisation (Robertson et al., 2009).While the majority of DL research has focused on student experience and implementation strategies, there is a less detailed understanding of how DL impacts the...
culture, roles and identities of staff (Hanson, 2009, Conole, 2004). In *Rethinking Pedagogy for the Digital Age*, Beetham and Sharpe agree and warn in the implementation of e-learning technologies ‘the problem ... is more about the human and organisational aspects.....than it is about the use of technology’ (Beetham and Sharpe, 2007, p. xvi). The challenge for universities is not about how to use technology, but how to manage the changes due to technology.

Unequivocally, with the implementation of DL in HE, given the traditional paradigms that exist, significant modifications of existing models are necessary (Conole, 2002; Nunes & McPherson, 2002) that may threaten the evolutionary model of change within HE. Briggs (2005) warns that clarity concerning DL in HE has actually been insufficiently resilient in the face of change and roles of academics and the environment in which they are expected to work have changed. Finally, Blass and Davis (2003) suggest that the greatest need for change falls on the academic and the academic role must be fundamentally redefined and challenged. It is clear, universities, in general, need to re-examine academic roles related to DL, as the fundamental nature of teaching is changing. When looking specifically at DL and health care education, the findings are similar. Pettersson and Olofsson (2015) suggest that there are organizational conflicts in implementing DL whilst Wilbur (2016) advises there are unresolved challenges at both programme and faculty level when introducing DL into clinical education.

1.2 Role Change

The changing identities of academics involved in DL are supported in the literature (Delgaty, 2015, Pettersson and Olofsson, 2015, Hanson, 2009, Hovenga and Bricknell, 2006, Beaudoin, 1990) and the roles of academics are being threatened (Wilson, 2004) For academics, freedom is being threatened by the drive away from autonomous decisions and academic standards (Peterson, 2001) towards the new pressure of online delivery. However, Wilbur (2016) suggests how these roles are changing and how to actually change them is unclear. Briggs (2005) specifically addressed academic competencies in DL initiatives and warned organisations must define roles and develop frameworks to address the organisational and personal development challenges introduced by DL. A competent online teacher is a new and different role for academics, the competencies required are different and this is an area that is poorly understood. If academics are expected to create effective DL materials for clinicians, how can they plan workloads, create effective learning opportunities and be empowered to argue for resources if they are not prepared for the roles and responsibilities required? Research that informs and shares good practice is one way. Recently, the most cited article in Medical Teacher, a seminal journal in clinical education, was David Cook’s: *The Failure of e-Learning Research to Inform Educational Practice, and What We Can Do About It*. Cook (2009) suggests we have been asking the wrong questions and to inform practice, we need to consider issues of both the institutional infrastructure and context.

What little, relevant DL literature that has been published suggests communities may be a practical tool to improve relationships and avoid this role crisis (Holley & Oliver, 2000), as an area essential in future research (Baran et al., 2011) and as a topic that would advance scholarship in DL related to in clinical education (Ellaway, 2011). This paper is a direct response to these arguments. Maintaining a practitioner inquiry (PI) methodology, this study focused on developing and delivering a DL module from both a staff and student perspective. Using a framework of communities, the inquiry questions are outlined below and were focused on informing frontline academic and institutional practice

1.2.1 Inquiry questions:

- What are the collaborative staff experiences when developing a DL module?
- What was the role of the academic during the development and delivery of a DL module?
- What obstacles were encountered by staff and students and how were they overcome during the development and delivery of a DL module?

1.3 Context

When reviewing literature on DL, the lack of information regarding context makes it difficult to apply the results to other settings and as a result difficult to inform practice. In three systematic reviews concerning DL in health care professionals (Lam-Antoniades et al., 2009, Khan and Coomarasamy, 2006, Wutoh et al., 2004) context was not specifically addressed and no effort was made to obtain additional information from authors. Cook et al. (2008), in a meta-analysis of DL and health care professionals, suggested that most of the literature
surrounding DL failed to describe key elements of context. For this paper to be useful to others and inform practice, the context must be described in detail.

Newcastle University’s (a well-known ‘Russell Group’ university in Northern England) Master of Clinical Education programme recently delivered its first fully online module entitled ‘Utilising Technology in Clinical Education’ which contributed to a post graduate Diploma in Clinical Education http://www.ncl.ac.uk/msed/study/postgraduate/clined/index.htm (accessed Dec 2015).

At Newcastle University, DL has not been initiated on an institutional basis; this module was developed by an academic (the author), an administrator and a technician with no DL experience. All of the students (n=8) enrolled were full time practicing clinicians of varying grades and specialties. The module was asynchronous, ran from January to June and consisted of independent activities, moderated discussion forums, wikis, required reading, individual and group tasks. The final assignment consisted of a 2000 word critical analysis, using personal experience and literature, of any technology-enhanced learning initiative.

Feedback from students was overwhelmingly positive concerning the module and there was both a 100 percent pass and completion rate. However, unsurprisingly, the academic team experienced difficulties and challenges similar to the ones outlined earlier in this section, in both development and implementation. Therefore, in an attempt to examine and improve practice, this entire process was investigated and a formal PI was undertaken by the author, as academic lead on this project. The purpose of this inquiry was to systematically and critically evaluate the development and delivery of a DL module and was akin to a self-evaluation. Drawing on traditions of action research (McNiff and Whitehead, 2002) and teacher as researcher (Stenhouse, 1975) ways of improving instruction, increasing staff and student satisfaction, improving planning and improving student achievement were explored. By using a PI approach, theories about work from my own individual experiences of work were generated. This approach allowed me to respond to problems encountered in practice, a cornerstone of PI, and is grounded in theory (Wilson, 2004).

2. Methodology

2.1 Justification of Practitioner Inquiry as a Research Design

As introduced earlier, the introduction of DL into HE in general, and clinical education specifically, has been problematic for academics. Distance learning is a new teaching activity and requires novel approaches to research into both educational and organizational change (Pettersson and Olofsson, 2015). Therefore, as academics and practitioners, we need to be looking at novel and perhaps non-traditional approaches to research design in order to investigate these unique changes. One approach to researching the specific changes involved with the introduction of DL, is to use inquiry to explore the individual transformations of the teaching and learning environment by practitioners themselves (Farren, 2008). Using PI as an approach elevates the status of practitioner knowledge whilst facilitating the sharing, testing and validating of that knowledge (Wilson, 2004). Farren (2008) when specifically addressing DL, suggests that PI has the potential to allow practitioners to reflect systematically on their practice while implementing informed action. Finally, Wilson (2004) argues we need to wean ourselves from narrow research ideologies and suggests that inquiry into individual DL initiatives is the ideal platform to share and suggests it could be the ideal ‘practical laboratory for learning’ (p. 83).

2.2 Theoretical Framework

Consistent with a PI approach, a broad assumption made in this research is that I, as a teacher, am key to my own educational change. I constantly theorize practice as part of practice itself. Furthermore, although this is local inquiry into my own practice, I see PI as far more broad educationally including: wider educational change and challenge to both university culture and policy context. McQuiggan (2012) suggests that academic faculty must be the catalyst for change with the introduction of DL. She suggests that academics must conceptualize the implementation as transformative to practice. Therefore, this nontraditional inquiry concerns the transformation of my DL practice with a specific goal of improvement. As a result, traditional paradigms of logical positivism and interpretivism did not help view this research inquiry. It was not about measurability, objectivity and predictability, nor was it about solely understanding and interpreting experiences; both forms of investigation would be necessary and valuable towards the research aim and inquiry. Dewey (1938) suggested that inquiry is an activity that deflated the dichotomy between theoretical and practical.
judgements. By choosing PI, the boundaries between theory and practice or knowledge-generation and action were eroded.

The inquiry questions guided the theoretical stance, which was one of Pragmatism, although Pragmatists are not concerned with a particular theoretical position (Cohen et al., 2009). Pragmatists believe research questions are of primary importance; more so than the method or the philosophical worldviews that underlay the method. In Pragmatism, there is a logic of controlled inquiry in which rational thought is interspersed with action. Inquiry, to me, was a directed transformation of an indeterminate situation into a determinately unified one. This transformation requires practical action that must inform theory and the two are interspersed (Dewey, 1938). Fundamentally, practical action must inform theory and theory must be adjusted according to practical outcomes of the action. This correlated exactly to my inquiry and stance: theory and practice were not separate dimensions. Theories and distinctions were necessary to me, but not separate to practice. Theory was something I ‘learned’ from my direct experience and ultimately returned to inform experience. In this inquiry, theories generated about DL were due to my experience and these theories should ultimately inform future experiences. Cohen et al. (2009) proposed that this type of research should include small scale interventions in which teachers could investigate the functioning of the real world with an examination of the effects of individual interventions. This PI is my real life account of the ‘structure’ behind both developing and delivering DL. By making my inquiry public and sharing my results, the crucial role of teacher as researcher, which is essential yet has largely been ignored (Stenhouse, 1975), is evident. Ideally, this will enable others to learn from and see potential similarities in their situations (Winter, 2002).

2.2.1 Ethical considerations
Practitioner Inquiry can be ethically dangerous (McNiff and Whitehead, 2009) as the boundaries between inquiry and practice are difficult to define; yet demonstrating ethical coherence is essential for rigour. Full institutional ethical application was received prior to beginning the research.

2.3 Methods
There were the four main sources of data (documents, staff and student interviews, student evaluations, and web analytics) encompassing both qualitative and quantitative data, which, again, is coherent with a Pragmatic approach (Cohen et al., 2009).

2.4 Documents
2.4.1 Documentary data collection
Documents are stable and accessible sources of data, provide rich descriptive information and can help ground a study in context (Ary et al., 2010). Documentary analysis may be useful for ‘rendering more visible the phenomena under study’ (Cohen et al., 2009, p. 201) and may show how situations and processes have evolved over time. All departmental files were searched beginning in 2008. In total, 35 relevant documents (curricular committee minutes and team meeting’s minutes etc.) were found.

2.4.2 Documentary analysis
Qualitative content analysis was used in coding these documents. Graneheim and Lundman (2004) described qualitative or thematic content analysis as a method of analysing data that is used to interpret meaning from the content of text data. Thematic content analysis is a useful tool in the analysis of educational documents as it may help identify factors stressed, ignored and the influence of both social and political factors

2.5 Interviews
2.5.1 Interview data collection
Two distinct groups of stakeholders were interviewed to explore different perspectives: the staff (n=3) who were involved in the development and the students (n=8) who were involved in the delivery. Semi-structured interviews were used, a common approach in qualitative research, allowing previously unidentified areas of importance to the participants to be explored (Kvale, 1996). Lasting on average an hour, a set of open, predetermined questions were used which were both pre-tested and piloted. The questions were focused loosely on: overall experiences before (staff) and after (staff and students) the module went live, barriers and facilitators related to contributions and participation on the module and other questions emerging naturally from the interview itself.
2.5.2 Interview analysis

Again, broadly following Graneheim and Lundman’s (2004) model, overarching descriptive labels or themes were developed, while ensuring that all coded material was included. Then, using both the interview questions as a guide and the descriptive labels which emerged as the transcripts were read, the themes were reviewed and defined.

2.6 Evaluations

2.6.1 Student evaluations data collection

In e-learning environments, evaluation questionnaires are a valuable method of successfully capturing phenomenon in an objective manner (Hermans et al., 2009), are recognised to be both economical and time-efficient (Cohen et al., 2009), and can potentially be generalisable to a wider population (Robson, 2002). Student evaluation questionnaires were sent out electronically four times, spanning the entire module. These questions included: rating scales and open ended questions concerning strengths and weaknesses of the content, delivery and general experiences of the module. Arguably, although the entire cohort was evaluated, a small sample (n=8) cannot be said to be representative or generalisable. However, a high response rate (mean of 90% with four evaluations) may have increased the generalisability of results (Robson, 2002).

2.6.2 Student evaluations analysis

Quantitative data was entered into a Microsoft Excel spreadsheet and descriptive statistics performed. Free-text responses were transcribed, the data was read through, codes were assigned and broad themes emerged.

2.7 Web Analytics

2.7.1 Web analytics data collection

Web analytics provided the opportunity to explore staff and student behaviour patterns online. They have been used primarily in business to track consumer groups related to marketing efforts, but can be used as a powerful way of extracting actionable knowledge in distance education (Rogers et al., 2010). The data was approached from a positivist viewpoint and was treated as an object that could be captured and measured (Crotty, 1998) and interpreted objectively.

2.7.2 Web analytics analysis

Adhering to ethical standards, data was retrieved and online staff and student working profiles were created using simple statistics. All data collected was anonymous and analysed by groups, not individuals.

3. Results

3.1 Introduction

The results are presented beginning with the staff perspectives then student perspectives. The analytics, encompassing both perspectives are presented last, providing an overview of both stakeholders. Wherever possible, the results are displayed in a table view facilitating clear definitions and structure to the results, adding both rigour and robustness to this research by demonstrating transparency (Cohen et al., 2009) and credibility (Kalinowski et al., 2010).

3.2 Staff Perspective

3.2.1 Course documentation

Using Nvivo, all module formal documentation (n=35) was coded, refined and grouped into the five themes presented below (Table 1).
Table 1: Themes and codes from documentary analysis

<table>
<thead>
<tr>
<th>Theme</th>
<th>Definition of theme</th>
<th>Codes making up theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibilities</td>
<td>Issues of who was doing what and how the module was to be delivered. There were several concurrent meetings when the interface and roles or responsibilities were not clear.</td>
<td>Jobs, Managing, Administrator, Tasks, Supervision, Clarity/lack of responsibility, Roles, Leading, Who is doing what?</td>
</tr>
<tr>
<td>Vagueness</td>
<td>A certain vagueness, we’ll have to ‘wait and see’ feeling was present. Individuals were frequently unprepared, absent or filling in for someone else and not familiar with the agenda.</td>
<td>Waiting, Too busy, Vague timings, Vague jobs, Imprecise information</td>
</tr>
<tr>
<td>Institutional processes</td>
<td>The top-down initiative and formal processes. There was an awareness of the university hierarchy. Involvement with ‘the school’ appeared to be more of a threat, or a tool for action, as opposed to a developmental process. There was not a clear (formal or informal) power structure.</td>
<td>Accountability, Who is in charge? Ignoring lack of progress, Power, Control, Authority, Influence</td>
</tr>
<tr>
<td>Communication</td>
<td>There appeared to be barriers to discussion and conflicts as to the developmental process. Several questions were asked in the meetings and the answers were incomplete.</td>
<td>E-mail, meetings, discussion, Clearness/lack of clarity, No pattern of communication, No past habits of communication, ‘How’ do we communicate?</td>
</tr>
<tr>
<td>Temporal issues</td>
<td>Time, progress and deadlines were mentioned repeatedly. However, these appeared to conflict in that individuals were not aware of them, they were meaningless or alternatively they were structured and necessary.</td>
<td>Time, Deadlines, Speed, Targets, Aims, Sequence, Chronology</td>
</tr>
</tbody>
</table>

3.2.2 **Staff interviews**

Using Nvivo, the interviews were coded, refined and grouped into the five themes (Table 2).

Table 2: Themes and codes for staff interviews

<table>
<thead>
<tr>
<th>Theme</th>
<th>Definition of theme</th>
<th>Codes making up theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change</td>
<td>This was any clear indication of change that was taking place. It did not matter at what level; there was some movement or attempt to move.</td>
<td>Emergent, Planned or cultural change, Change in tradition, Organisation support of change</td>
</tr>
<tr>
<td>Practicalities</td>
<td>This was any technical or pragmatic issue. It was about the day to day work that needed to be done on the module and was tangible.</td>
<td>Time, Delivery ‘Getting on-getting the job done’</td>
</tr>
<tr>
<td>Influence</td>
<td>This concerned power or position. It was a broad theme that consisted of outside ‘influences’ that were less tangible but affected the development process.</td>
<td>Leadership, Supervision, Motivation, Vision, Rationale Empowerment, Managing</td>
</tr>
<tr>
<td>Group Behaviours</td>
<td>This encompassed anything the team, or those involved specifically did that affected and/or involved others. It involved specific group behaviours, not general influences.</td>
<td>Teamwork, Group actions Communication, Conflict, Roles, Administering</td>
</tr>
<tr>
<td>Individual</td>
<td>This concerned the expectations, or behaviours of individuals. It included individual characteristics of people.</td>
<td>Accountability, Trust, Individual actions</td>
</tr>
</tbody>
</table>

3.3 **Student Perspective**

3.3.1 **Student interviews**

Using Nvivo, student interviews were coded, the results refined and four themes emerged (Table 3).

Table 3: Themes and codes for student interviews

<table>
<thead>
<tr>
<th>Theme</th>
<th>Definition of theme</th>
<th>Codes making up theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other participants</td>
<td>This encompassed anything that students said concerning other students or staff. It could have been when others were contributing, identifying who other group members was, or how they reacted to other students. It was an external factor concerning another member of the group-including the academic.</td>
<td>Contribution of others Others in general, Identification of others, Academic role, Knowledge expert, Moderator, facilitator</td>
</tr>
<tr>
<td>Personal attributes or behaviours</td>
<td>This was an individual or personal perspective. It was usually something of an affective nature (motivation, fear, isolation). It was a personal view of what helped or hindered them, internally, in e-learning</td>
<td>Confidence, Motivation, Isolation or working alone, Facilitation or support, Expectations</td>
</tr>
<tr>
<td>Value to individuals</td>
<td>This encompassed anything that the student thought was valuable to them or relevant to them as clinicians or teachers. It was focussed on the individual, but at a pedagogical level. It included personal examples of what was helpful and indications of things that were student or learner centred.</td>
<td>Examples or experience Theory/practice balance or relevance, Learner centred or learner needs</td>
</tr>
<tr>
<td>Concrete issues</td>
<td>This was a more concrete theme and included comments concerning the layout, structure, timings and evaluation of the module. Technology itself was included in this theme.</td>
<td>Content, Structure, Time, Administration, Planning, Evaluations, Technology, More efficient use of technology in communication</td>
</tr>
</tbody>
</table>
3.3.2 Student evaluations

Using Nvivo, students evaluations were coded, results refined and three themes emerged (Table 4).

Table 4: Themes and codes in student evaluation data

<table>
<thead>
<tr>
<th>Theme</th>
<th>Definition of theme</th>
<th>Codes making up theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual behaviours and processes</td>
<td>This encompassed issues that were complex and personal. It involved personal internal processes and was related to individual behaviours, attributes or interpretations.</td>
<td>Confidence , Identification of others, Accountability, Responsibility, Isolation and working alone, Learner centred/own learning needs, Theory practice balance/relevance, Individual technology use in communication, Other’s contributions, Knowledge expertise of academic</td>
</tr>
<tr>
<td>Technical or practical issues</td>
<td>This included codes that were functional or technical in nature. They were concrete and tangible and geared towards practical and quantifiable issues.</td>
<td>Time, Reading/accessing resources, Experiences/Examples, Technology itself</td>
</tr>
<tr>
<td>Structure and Administration</td>
<td>This theme included anything controlled by external practice. These may have been complex issues, but were processes or issues that were influenced or controlled peripherally and external to the individual students</td>
<td>Facilitation/ Staff Support Administration/structure, Evaluation, Academic roles, Moderator, Facilitator, Setting social rules</td>
</tr>
</tbody>
</table>

3.4 Web Analytics: Staff and Student Perspective

3.4.1 When were staff working online?

Over 75 percent of the recorded academic time was spent outside of ‘normal’ work hours (Figure 1).

![Figure 1: Timing and pattern of staff contributions](image)

3.4.2 When were students working online?

Almost 70 percent of the all contributions from students occurred outside of normal working hours (Figure 2).

![Figure 2: Timing and pattern of student contributions](image)
The students contributed most regularly on Sundays (Figure 3) and the busiest 4 hour period was consistently 2000 hrs. until midnight (Figure 4 and Figure 5). This was contrary to the literature which suggested Monday as the most popular day and the busiest period being noon until 1600 hrs. (Rogers et al., 2010) for online contributions in DL.

![Figure 3: Postings by day of week](image1.png)

![Figure 4: Time of posting on weekdays (M-F)](image2.png)

![Figure 5: Time of postings on weekends (S-S)](image3.png)

4. **Analysis**

One of the ways to establish rigour in PI is to demonstrate critical reflection, validity, transparency, theoretical coherence and fulfillment of original inquiry questions (McNiff and Whitehead, 2009). Furthermore, Elliott et al. (1999) suggest to exhibit rigour, data must be situated in context and grounded for readers, using verbatim examples of responses. Therefore, for robustness, the results below are presented in situ, affording the reader...
the opportunity to interrogate the raw data, not just read a description (Elliott et al., 1999) in relation to the original inquiry questions.

4.1.1 Inquiry questions:
- What are the collaborative staff experiences when developing a distance learning module?
- What was the role of the academic during the development and delivery of a distance learning module?
- What obstacles were encountered by staff and students and how were they overcome during the development and delivery of a distance learning module?

4.1.2 What are the collaborative staff experiences when developing a distance learning module?

4.1.3 Lack of clarity in development

In analysing the results related to the development (or before the module went ‘live’), the most overwhelming initial themes were those of lack of clarity in roles, responsibilities and related changes. This was seen in staff interview comments such as:

“I think your [the academic] role became more transitional, it was not clear...it was mutual, dynamic.”

Was the academic responsible for chasing others or solely for writing the academic content? Was it clear to the rest of the team? The rest of the team thought the academic should be chasing others, taking initiative and directing this project as a programme manager. This was evident in the staff interview:

“We are here to deliver what you [the academic] need, so if we are not doing that, then it is your [the academic] job, I mean, you [the academic] provide the direction really.”

Alarmingly, with failed or delayed implementation of DL initiatives, there is a tendency in the managerial discourse to blame the individual academic for ill will, indolence, ineptitude or indiscipline (Knight & Trowler, 2002). Interestingly, this was one of the most fundamental questions asked during this module. If this module was not a success, was the academic at fault? It was also an issue for the rest of the team:

“If the module was a complete flop, it would be your [the academic] flop. Although, you [the academic] have been asked to do something and it is your [the academic] responsibility, but you are 100% reliant on IT services to do what you [the academic] need to do. So, if you [the academic] are let down, I can’t see how you [the academic] could be held personally accountable, but um...I think you [the academic] are...yep it would be your [the academic] flop. It is difficult. I think yeah- this process has opened my eyes, really.”

The documentary analysis of minutes supported this confusion:

“***** expressed concern that the team was not all aware this would be going live and made available in January.”

“***** is concerned a decision about where this new module will be hosted has not been made and she asked whose responsibility is this to decide?”

It slowly became obvious the academic was responsible for the success or failure of this module and would be held accountable.

4.1.4 What was the role of the academic during the development and delivery of a distance learning module?

4.1.5 Development phase

The academic role in the development (or before the module went ‘live’) phase, did not concern anything related to content or knowledge to the other staff members, but managerial tasks were important.

“As module leader maybe it should have been you [the academic] doing the chasing from the start. I understand your [the academic] difficulty in that- because of the hierarchy- because of the different teams, but no one was doing that, and I mean, you [the academic] are the module leader, right?”
The team was aware they were being asked to do something difficult, out of their comfort zone and had no power or voice to make demands and it was unclear who was leading. The ‘team’ existed within the rigid structure and hierarchy of the University and it was obvious this positional or traditional power was important and the academic should be leading and administrating:

“There needs to be someone influential enough to take things forward. We don’t have that positional power. Everyone has a slightly different opinion, but ultimately, you [the academic] are, ah have to, ah deliver the module. It has to be a compromise…. I think you’re [the academic] role became more well… it was not clear cut technical or anything…I think you [the academic] were supposed to be in charge.”

It was clear the rest of the team expected the academic to lead, organise and support the team. Communication expert was highlighted as a required managerial competency. There was generally a feeling of poor communication within the smaller team, and within the University as a whole.

“There were certain things that were not communicated well- like things not looking black and white - a lot of the things we asked for, just were, not done but we didn’t know why or who was supposed to be doing them. Was it time or was it the fact that with the difference in personalities they thought we were just being picky? We wanted it to be right and they are hoping it just functions the way it is.”

This was also supported in analyzing the team minutes:

“**** explained she had sent both storyboards and PPT on to IT and is still waiting for any feedback. She also asked who was coordinating this over summer and who decides if it will go live in time?’

4.1.6 Development roles (staff perspective)

Three main development roles and associated competencies became apparent for the academic. These roles were all necessary before the module ‘went live’ to students and included:

Administrator: The academic needs to be supervising the staff team. They require the explicit power to control and manipulate resources. Required competencies include: Resource allocator, resource planner, monitor, and coordinator.

Manager: The academic needs to take control and direction for DL initiatives. They need to assist others and devise teaching materials and methods. Required competencies include: Communicator, expert, organiser, supervisor, supporter and evaluator.

Team Leader: The academic is required to provide guidance and direction to other staff members and the institution. The team leader monitors progress, offers guidance and facilitates achievement of key targets. Required competencies include: Visionary, planner, securer, course developer, curriculum planner, and marketer.

4.1.7 Delivery roles (staff perspective)

The role of the academic while the module was delivered (or after the module went ‘live’) was very different. Student interviews suggested value in the role of the academic in providing information and being an authority in content.

“You [the academic] made it clear what we needed to do…your [the academic] knowledge around the literature was solid, the reading lists were appropriate and the topics we discussed were relevant to us as clinicians.”

A second major aspect concerned the contributions the academic made. The speed and frequency of facilitation as well as the facilitation itself was important:
“You [the academic] saw links between our posts that maybe we hadn’t picked up on and I found that the most useful thing. We were all talking along one discussion forum, but making our own comments on the topic. You [the academic] guided the discussion.”

This concept was supported by the web analytics. Learner/instructor dialogue has been the focus of research, the findings of which suggest that the speed of academic response to posts in an online environment correlates to perceived learning (Swan, 2002) and satisfaction (Baker, 2004). The greater and faster the instructor interactions are the lower the level of psychological separation there will be (Moore and Anderson, 2007). The students on this module were all full time working post graduate students. The time they had available to work was in the evenings and weekends. Although, unequivocally, student expectations surrounding instructor availability must be managed, we know when the students were working and what the literature suggests. The introduction of DL has changed ‘when’ students are learning, and as a result, the onus fell to the academic to change ‘when’ the teaching occurred. Traditional workload expectations did not apply as can be seen by the analytics. The majority of both student and staff work occurred outside of traditional classroom hours.

It was also clear the academic needed to plan and supervise the level of working, contributions and organize the learning processes.

“You [the academic], well, you [the academic] were there and I knew it. I knew you [the academic] were reading what I posted, so I wanted to make sure it was good enough, critical enough. You [the academic] picked out the patterns between what we were saying that none of us could have done and I found that was useful. You [the academic] made us analyse things a little more deeply than on the face comparisons.”

4.1.8 Delivery roles (student perspective)

Three main delivery roles and associated competencies became apparent for the academic. These were all necessary after the module ‘went live’ to students and included:

Facilitator: The academic needs to be leading and coordinating the group. Required competencies include: Enabler, instructor, assessor, collaborator, supporter, and contributor.

Moderator: The academic needs to be ensuing standards, conversations and activities. Required competencies include: Organiser, supervisor, planner and monitor of learning processes.

Knowledge Expert: The academic needs to demonstrate skill, authority and practice in the content or subject. Required competencies include: Subject specialist, acknowledged expert and information shaper.

4.2 Overall Roles and Responsibilities (staff and student perspective)

The coded data and emerging themes from both the team documentation, evaluations and interviews suggest six roles developed with corresponding competencies for the academic whilst developing and delivering this module (Figure 6).
4.2.1 What obstacles were encountered by staff and students and how were they overcome during the development and delivery of a distance learning module?

The faculty team did not think it was possible to progress without working together. In developing the module success only came once communities were formed and the team began to work together. However, the team struggled as there were no established practices or routines and the normal processes of module development were disrupted. There were obvious tensions as the group tried to conform to the traditional institutional procedures and systems that were set out as seen in the interview:

“Trying to coordinate something...to do with formal communications and things... I think there is something that doesn’t fit with that model. It just didn’t work. We had to work around things.”

A community was formed by staff and the team began to work together, to learn together and function as a small group within, but distinctly separate from the larger organisation as it could not flourish within these abstract rules and procedures.

“It isn’t circumventing, but it is out of necessity that the formal structures and procedures break down.....they didn’t work...we had to work together... just us.”

Similarly, in the evaluation, it was clear the students thought learning in this situation was possible only through communities which evolved spontaneously, yet were essential for success.

“We all worked together so well. It just happened so smoothly. I can hand on heart say this is one of the few times, I felt as if what I wanted to learn and how I wanted to develop, was part of learning in a group.”

Two different communities formed: the staff in a development team and the students in a delivery team. The academic, a member of both, was clearly responsible for creating environments and taking on roles in which these communities could foster.

4.2.2 Overcoming obstacles: Development community (staff) and community of practice

A community of practice (CoP) describes a group of people who share an interest, craft or profession (Lave and Wenger, 1991). CoPs embrace the sharing of knowledge across organisational boundaries (Allee, 2000). The team experienced the shared objectives of these CoPs, which was not to work towards formal deadlines or goals, but towards the objectives of the community itself:

“... I think in the end it comes down to a small group of individuals working together, getting these things off the ground...”
A CoP shares common interests, the desire to learn from and contribute to the community. Using shared dialogue, not organisational structure, the team functioned as a community. It was social engagements that allowed learning to occur, not the cognitive processes and conceptual structure (Lave & Wenger, 1991):

“I thought this module would be more about the technical side, but it was more about working relationships.”

CoPs cannot exist in the abstract as they revolve around people with common ideas and mutual accountability and therefore require engagement (Wenger and Snyder, 2000). The team’s experiences concerned practice, not abstraction and the ideas and actions were reflected in their engagement.

“We can go so far……..there has to be involvement form a learning technologist, straddling the technology and learning. I had no knowledge in that area. I am reliant on that information coming to me from you. We needed to work together.”

By illustrating the power of these informal relationships, this sharing and validation of knowledge may be most responsible for performance in an organisational setting (Brown and Duguid, 1991, Lave and Wenger, 1991). In CoPs learning is a relational practice in the workplace that is derived from the social experiences of those involved.

4.2.3 Overcoming obstacles: Delivery community (students) and community of inquiry

Transactional Distance Theory (TDT) provides a broad framework for structuring DL, creating meaningful interactions and facilitating learner autonomy (Moore & Anderson, 2007). Effective DL is not independent, but a collaborative-constructivist learning experience within a community of inquiry requiring structure, dialogue and autonomy (Moore & Anderson, 2007, Dewey, 1938). In the student results, structure was necessary for the community. This corresponded to Moore’s element of design and structure:

“The structure made sense. What I mean is, each activity seemed to follow on from the next in a logical order” Dialogue or interaction, according to Moore (1997) is essential in successful DL. This dialogue was also highlighted consistently by the students.

“Other people were being careful and constructive….people were contributing in an intellectual fashion, not a flippant one. I wanted to comment on what others said and I wanted to hear what they thought about my ideas. The actual online discussion definitely contributed to me learning.”

The final element discussed, Moore’s (1997) autonomy, encompassed individuals proceeding through instructional processes independently, controlling their learning situation and learning how to learn. These higher order activities also seemed to be important and evident to the students:

“You don’t realise how interested you would be. You don’t realise how much thought it was. It wasn’t just reading other people’s posts. It was then mulling them over and wanting to write something…... and being careful….critical what I wrote.”

It was also clear that the students were aware of the expectations to develop their autonomy or higher level activities and accepted this:

“In the last strand, It was obvious we were left to be more independent which was a bit scary- felt like mother bird leaving us to fly alone after teaching us, but still watching.”

The students and academic were part of a community.

“By the end of it, we were almost like an online virtual family, helping each other out, giving advice etc.”

4.3 Summary

Using PI as a method actively allows and encourages teachers to change practice. Stenhouse (1975) suggests, in his ‘teacher as researcher’ model, a teacher’s personal research and development should be inextricably
linked to increasing their understanding of their work and therefore improving their teaching. He argues teachers must critically research and share their own practice. Practitioner inquiry and the evaluation of actual practice is essential to bridge the gap between ‘research’ and ‘teaching practice’. Evaluating this practice and sharing the results contributes to filling this gap.

4.3.1 Rigour

In this research, the assumption was made that both authenticity (subject to external criticism) and accuracy (subject to internal criticism) (Cohen et al., 2009) could be established due to the author’s intimate relationship with this data (Seale, 1999). Whilst numbers within cohorts and response rates were reported for the quantitative data, this paper rejects the traditional framework of validity for the qualitative data reported. The assumption that there is an external reality to individual experiences and perceptions was not made in this relation to the qualitative data. Therefore, credibility and transferability, as alternative criteria to judge quality have been employed and the following was done to ensure quality. All documentation analysed were first person documents, adding to credibility of the interpretation (Seale, 1999).

Power within both an academic setting (both staff-staff and staff-student) is omnipotent. Recognizing and confronting power differentials between the researcher and the researched is essential (Cornwall and Jewkes, 1995). The participants were aware the researcher was involved in this inquiry with a desire to improve both the development and delivery of DL. The raw data and analysis were reviewed by an experienced social science researcher. No claim was made that this small, non-random, convenience sample is representative of the population as a whole (Patton, 2002). Rather, this purposive sampling was strategic and allowed individuals to be chosen who would be familiar with the module, and thus have rich experiences that were relevant to the research aim (Crotty, 1998). Furthermore, the sampling strategy was not about generalisability, but facilitated the exploration of the aim and with the rich description, ideally will be transferable to other, similar environments. As a reminder, the overall goal of this research was to explore the ‘authentic’, and in this case collaborative, understanding of peoples’ experiences.

5. Conclusions

Martin’s (2002) manifestations of cultural organisations, suggest there is a clear hierarchy, job descriptions, behavioural norms, stories and certain rituals with which all members of organisations are familiar. However, the results of this research, which are well supported in the literature suggest that the advent of DL has caused complications and role confusion for academics. Arguably, many of the roles of traditional teaching are easily transferred into an online environment (Gold, 2001). However, new skills (Twomey, 2004), changing responsibilities (Hovenga & Bricknell, 2006) and altogether new roles are at the heart of academic conflict (Pettersson and Olofsson, 2015) with DL. The hierarchy has changed, new norms need to be developed and conventional institutional constructs need to be addressed. Part of improving practice for the academic in this research involved working within communities, regardless of the conventional structures or traditions of the university. Brown and Duguid (1991), suggest that ‘conventional descriptions of jobs mask not only the ways people work, but also significant learning and innovation generated in the informal communities-of-practice’ (Brown & Duguid, 1991, p.40). There were two communities that formed: a development community comprising of other staff members, which was informal and concerned professional development within the University and delivery community comprised of students focused on formal learning. The academic was a member of both communities, but with very different roles in each.

In educational environments, if change can be understood, strategies can be developed to manage this change and the evolution or revolution of the change process itself will be successful (Nunes & McPherson, 2002). The ‘revolution’ of DL as promised has not occurred (Ellaway, 2011) in clinical education. Instead an evolutionary change model developed which has been unsuccessful and has actually disenfranchised lecturers (Holley & Oliver, 2000). Unequivocally, with the implementation of DL in HE, given the traditional paradigms that exist, significant modifications of existing models are necessary (Conole, 2002; Nunes & McPherson, 2002) particularly the need for role clarity (Delgaty, 2015). For academic institutions to remain resilient in this time of rapid change, the roles of academics must be redefined and managed. Whilst this challenges the accepted evolutionary nature of the academic role (Briggs, 2005), individual academics must redefine their roles or they will ‘do what they have always done’ which won’t benefit the institution or the students.

Moore (2007) explained, both the culture and structure of HE will continue to be threatened by the emerging organisational models of DL. He suggested institutions should plan processes and involve teachers in the implementation of new program directions. Schwahn and Spady (1998) agree and proposed that structural
and cultural change has been viewed by many lecturers in higher education as largely beyond their control. By clarifying expectations and addressing change, the disruption in HE due to technological initiatives (Fullan, 1999) can be minimised.

The choice to approach this DL initiative using PI was planned and strategic. I agree with Kelly (1989) who suggests that teachers should be evaluating their own work, analysing it critically, and constantly working towards development and improvement. By purposefully choosing PI, this research was uncompromisingly focused on informing and improving my DL practice. Furthermore, using this research methodology as a basis for publication in a peer reviewed journal contributes to, and represents, educational scholarship at one of the highest academic levels. Only by evaluating individual practice and approaching practitioner problems in this fashion, can PI which often needs legitimisation in the context of HE (Noffke and Somekh, 2009, Huges et al., 1998) become recognised.

Finally, by using a plurality of perspectives, a believable lived experience (Winter, 2002) has developed and useful and practical knowledge has emerged. This practical knowledge includes: the need for role clarity and new competencies in DL. For academics these roles include: administrator, manager, team leader, facilitator, moderator and knowledge expert. Furthermore, the results suggest critical modifications to the organisational culture of HE are essential including encouraging the involvement in communities. Social discourse and negotiation may help academics (Briggs, 2005) who are presently ill-equipped to deal with the shifting workloads and roles DL demands have presented. Collaborative or cooperative communities are necessary to change organisational culture in HE, however, these struggling communities have to flourish and function in a climate of rules, regulations, tradition and structure. Only through informed practice can academics be empowered to plan change, collaborate and avoid DL workload models recognised as unsustainable (Schofield et al., 2003). This study prepares academics to argue for and managers to advocate: clarity in organisational support, new competencies and working within communities. These three are requisite both to redefine roles and to create a sustaining technology that is an improvement on current practices for both staff and students.

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An e-Learning Team’s Life On and Offline: A Collaborative Self-Ethnography in Postgraduate Education Development

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Abstract: This paper primarily discusses the methodology of a case study into interactions and working practices of an e-learning team, on and offline. Although several ethnographies have been published on online learning, there are apparently none involving communities developing courses. This is a unique insight, bringing a new view of course and staff development. The e-learning team develops courses in the Faculty of Medical Sciences Graduate School in a UK higher education institution. Interactions occur online and offline, the team’s workplace ‘setting’. The ethnography is to inform future staff development by analysing interaction outside the team with the subject specialists, generally time-poor clinicians and research scientists who have varied experience of e-learning, but are required to provide course content and to teach their subjects in online distance learning courses. Records kept by team members were enlarged upon via weekly interviews and collated by a team member who developed a narrative, subsequently coded into content themes. The main themes were technology, pedagogy and communication. Conversation analysis provided theories on methods useful in staff development for later action research. Consideration was also given to issues of power within the interactional relationships. The paper discusses challenges and strengths of this collaborative self-ethnography as a research methodology in this e-learning setting. It was concluded that collaborative self-ethnography is a highly suitable research methodology for this type of study.

Keywords: E-Learning team, online distance learning, ethnography, staff development, pedagogy, technology, communication, power, Foucault

1. Introduction

Teaching online employs a different pedagogy to teaching in face-to-face situations (Kim & Bonk 2006), and has a requirement for technical support to develop and maintain course content in an accessible and stable form. Expertise in interface design and graphics is required to improve student learning experience (University of Edinburgh 2016). In addition, administrative duties need addressing. Ellis and Phelps (2000) describe the change from an academic working alone in course design, to teams of people providing online course development. This may facilitate all these requirements; Restauri (2004) suggests there is greater student success if team development of distance learning courses is carried out.

Such a team is employed in the Graduate School of a Faculty of Medical Sciences in a UK higher education institution (HEI), working with clinicians and scientists (the subject specialists), who may have previously lectured face-to-face, to develop courses. Conversion from the traditional face-to-face lecturer and subject specialist to online moderator with knowledge of online instructional design is an important aspect of development for many faculty staff in online distance learning (ODL). In order to teach online courses they require knowledge of online pedagogy as well as knowledge of use of the technology (Salmon, 2005).

A collaborative self-ethnography to investigate the interactions of the aforementioned e-learning team developing ODL postgraduate courses was carried out. This was the inductive cycle of planned action research into staff development for clinicians and biomedical scientists who are required to develop and run these ODL Masters courses in their specialist subjects. Faculty staff and clinicians in particular have limited time available to undertake staff development so knowledge of the most beneficial and time-economic methods of staff development would be useful. This study into interactions of the e-learning team, initiated and funded by the HEI’s Equal Acclaim for Teaching Excellence Project (EquATE), set out to inform how staff development for time-limited subject specialists is designed and implemented. Findings of this study are presented below. However, this article mainly discusses the use of collaborative self-ethnography as a research methodology in the study.

1.1 Aims of the article

The article aims to answer the following research questions, which are listed in order of detail provided in this article:
1. How and why is collaborative self-ethnography useful as a research methodology in the investigation of teams developing e-learning?
2. How does the collaborative self-ethnography of the e-learning team inform us of future requirements and methods of staff development for online teaching?
3. What are the dynamics of the inter-relationships of the e-learning team with clinicians and scientists who are subject specialists?

2. Background

2.1 Collaborative self-ethnography

Ethnography, as defined by Bryman (2012, p432), is a data collection method where the observer/ethnographer is immersed in a group or community where they observe the interactions and behaviours of the populace recording fieldnotes on their observations. These are then used in descriptions of the population. Self-ethnography is defined by Alvesson (2003) as “a study in which the researcher describes the cultural setting to which he/she has natural access”.

Collaborative self-ethnography involves more than one researcher in a setting to which all the researchers have access (Burford May and Pattillo-McCoy, 2000). Methods of data collection in these types of study are mixed rather than just observation; participant observation, a characteristic of ethnography, is employed, but so also are interviews and other context-specific methods.

Ethnographic methods are novel for communities involved in online course development; Alvesson (2003) states that: “It is rare that academics study the lived realities of their own organizations”. There have been many ethnographies published about online learning (Browne, 2016; Fitzsimons, 2013) but apparently none involving communities developing courses rather than about those immersed in learning online, so this study is a unique insight, bringing a new view of course development and staff interaction. There appears to be a dearth of collaborative self-ethnography as research methodology around e-learning altogether.

However, Ngunjiri et al (2010), although describing the ‘blurred distinction between researcher-participant’ in auto-ethnography, say it allows a narrative to be produced where the self is seen in the context of the social world around it.

As a research methodology of choice for this study, collaborative self-ethnography was thought to provide a rich source of commentary by experienced e-learning design and development staff on their interactions with current and proposed subject specialist faculty staff. The immediacy and simplicity of recording interactions with other team members and faculty staff out-with the team made it an ideal method for use both on and offline.

2.2 Staff development for online course design

Staff development for online course design has been much-researched with many case histories published. These describe various development methods and strategies, but none stand out as more efficient than others.

Taylor (2003) describes the move to online teaching having a requirement for situated learning (citing Brown et al 1989) which is within both a social and physical context. Describing staff development in the University of Southern Queensland this approach using ‘immersion in interactive online learning’ seems to have been highly successful as this is now a well-known e-university. Here teams of early adopters created an online course to facilitate staff development in pedagogy and technology for ODL.

Ellis and Phelps (2000) discuss action learning and collaboration with an online course development team finding that the collaboration was one of the most useful aspects. Staff enthusiasm for online course development was high which is likely to lead to greater success, although there were issues around how much academic staff were meant to contribute to course development compared with the team. This study used action learning and research as at the time there was so little other research done to inform staff development.
Jenkins et al (2011) reported that a ‘committed local champion’ is one of the best drivers for the increased use of technology in education. However, they showed that since previous surveys had been carried out there had been an increase in the lack of staff knowledge of online learning as a barrier to the use of technology, suggesting that staff development is as important as ever as ODL progresses from its’ infancy to maturity.

2.3 Staff inter-relationships between e-learning teams and subject specialists

Consideration is given to power relationships and how these may affect staff development within the study, including how e-learning specialists share their knowledge with subject specialists, whose mastery is in another discipline. Personal authority may affect the resultant level of staff development.

Foucault wrote:

“Do not ask who I am and do not ask me to remain the same: leave it to our bureaucrats and our police to see that our papers are in order.” (Foucault, 1972)

This implies we all have to change but the change is forced upon us by the power of other people within their own structural systems. In order to change from a subject specialist with a history of face-to-face lecturing to online teaching, a subject specialist will undergo some changes in knowledge which may also require changes in attitude. Response to this requirement for change will have a bearing on the success of any staff development methods.

Cramp (2015) cites Lave and Wenger (1991) stating ‘the importance to learning of negotiating meaning, constructing shared understandings’. Both negotiating and sharing imply an equal level of power amongst the participants suggesting that less success in staff development may be the result of unequal relationships, with the perception of greater power in the more knowledgeable party.

There can be resistance to the change to online teaching for varying reasons. This may be lack of time, recognition, perception of quality, lack of knowledge of pedagogy and technology and particularly considerations of workload (Panda and Mishra, 2007; Maguire 2005). Delgaty (2015) argues for a cultural change in institutions developing ODL courses, suggesting there should be support allowing staff development and the possible change in identity that comes with changing teaching practices and working with others in teams.

3. The e-learning team

The e-learning team consists of a faculty e-learning co-ordinator (team leader), two programme co-ordinators, a pedagogic specialist, an e-learning administrator, an e-learning technician and an e-learning illustrator. Within the Graduate School office the team are seated closely together enabling rapid communication with each other offline. In addition to this close proximity there are monthly team meetings which allow the team to keep up to date with each other’s work as well as mind-mapping to solve any problems and providing constructive criticism. The team members are encouraged to attend university-wide events involving technology-enhanced learning, seminars and meetings useful for their individual, as well as team, functioning. Occasional social events are organised for the whole team.

The team has grown with the need to employ more individuals in the development and running of e-learning courses over the past three years as the university policy includes capacity building at Masters level. Prior to this, individuals were employed according to programme requirements since the inception of the first fully online Masters course within the faculty eleven years ago. Then it was sufficient to have a single e-learning co-ordinator for the programme. As expectations of further markets for other programmes increased there was a greater need for the development of courses and improvement of content management systems and their aesthetics. Over two years the team was formed. There are now four different programmes containing several strands running or in development by the team.

The faculty e-learning co-ordinator (FELC) not only directs the team but also acts as an interface between the team and the postgraduate dean, helping to inform policy for future directions. The e-learning co-ordinator (ELC) and the programme e-learning co-ordinator (PEC) work on different programmes but have similar jobs, providing pedagogical, technical and to a greater or lesser extent, administrative support. The e-learning
academic specialist (ELAS), the author of this paper and researcher, provides pedagogical support as well as actually leading two of the twenty credit modules as lecturer/moderator. The ELAS is responsible for legal aspects such as obtaining licenses for copyrighted images. Administrative duties are undertaken by the e-learning administrator (ELA); the e-learning technician (ELT) develops the content management system and the e-learning illustrator (ELI) provides images and animations for the courses which not only add to the learning experience visually, but in many cases make up formative assessments such as drag and drop quizzes. However, all the team may use their multiple skills when appropriate, for example the ELA is able to use illustrative software when required and the ELI directs technical aspects of the virtual classroom.

The team communicate with each other whenever necessary to ask for others to provide material or technical expertise. This usually occurs several times each day. Communication is mostly offline and verbal but may take the form of emails to ensure records are kept or when the recipient team member is too busy to provide instant attention. Team meetings are very informal with no minutes kept. Communication throughout the team is excellent. The team has been together long enough to know each other well, including who has skills sets for anything outside their day-to-day roles.

Figure 1: Team interaction with other faculty members

Figure 1 illustrates the team interactions with other faculty members. These interactions may be face-to-face or online as emails, and occasionally via Skype or the web-conferencing facility Adobe Connect. When a new course is planned, the programme or module leader usually finds subject specialists who will decide on assessments, learning outcomes and provide content with suggestions for activities to engage the students once these have been suggested by e-learning team members, or by themselves when they have prior experience of e-learning. This tends to be the exception rather than the norm. The subject specialists are usually clinicians and research scientists who may already teach face-to-face, whose experience ranges from none through some, often as an online student in the case of clinical staff, to a very small minority with a high degree of experience in teaching online, mostly at other HEIs. All need some training on the use of the content management system as it is purpose built. However, many need training in online pedagogy in addition to this. There is nothing specific within the study team’s work descriptions that they will engage in staff development, but it is assumed that this is implicit within the job.

4. Methodology

The e-learning academic specialist (ELAS) approached data collection with the questions:

- What can interactions of the e-learning team tell us about staff development needs?
- Through our working practices how do we help other faculty staff engage in e-learning?

It was felt that an interpretivist approach would be most suitable for the study design compared to positivist approaches, as this study was to form a theory rather than test one. Any theory developed would be used to design methods and content which would be later tested by action research for staff development. The choice of ethnography was governed by the ease of access to ‘observers’ and their willingness to take part.

4.1 Study design

Firstly, ethical approval from the Faculty Preliminary Ethics Committee was obtained to carry out the collaborative self-ethnography within the team. Prior to commencement the study design was discussed and agreed upon at a monthly team meeting. Team members recorded their own interactions electronically (including email records) or on paper with the ELAS interviewing them approximately weekly about their records. The interactions were either online via email and occasionally virtual classrooms and Skype, or face-to-face in meetings. This was essentially an open study for the team, removing the ethical issues of
ethnographies with data collected in a covert way. Where any comments from staff outside the team would be used in the study, details of the study were fully explained to staff members and their permission sought for use ensuring maintenance of open-ness.

Considerations about power and workload issues led to the FELC maintaining her own records, concentrating on recording those interactions which were of interest to staff development only, rather than for example future policy meetings which would have a more indirect interest for this study.

Fieldnotes collated by the ELAS were shared electronically for all to triangulate for accuracy. The weekly ‘interviews’ were semi-spontaneous and constitute ‘participant observation’ (Hammersley and Atkinson, 1995, p1-2). Questions were unstructured and timing depended on the participants rather than procedure. In addition, the ELAS recorded team interactions at monthly meetings where new technical developments and problems are discussed. Minutes of the programme meetings were investigated for content relevant to staff development. The notes produced by these methods formed the narrative text for data analysis. The narrative was made available electronically for team members to triangulate the data.

Team members were interviewed at the end of the study by the ELAS to ascertain the training they had themselves received prior of during their employment in this field. In developing the study design, no consideration was given to the history of those outside the team and only small consideration was given to the history of the team itself. When the narrative was being written historical features became apparent so some consideration was given to this alongside the ethnography.

The study ran for five and a half months starting mid-January and finishing late June 2016, covering a full semester which was commenced and completed along with the run-up to another within the study period. This enabled the preparation, running and evaluation of programme modules to be completed during the study. This does run counter to traditional ethnographies which are carried out over twelve months or more to cover each season (Gonzalez, 2000) but the full cycle of ‘seasons’ was covered by this timescale, the full academic year merely repeating this cycle three times.

4.2 Data analysis

Content coding of a narrative produced by the research was used as the first step in data analysis. A scrutiny-based technique fitted the research questions to produce different themes. The author considered that further analysis of the themes would provide areas in which staff development could be built upon later.

Preliminary hand-coding of the narrative text at 6 weeks was carried out by the ELAS. ‘Pawing’ divided it into themes (Ryan and Bernard, 2003), which are detailed below. The themes found divided the areas of working practice. At this point only three themes were used: communication, pedagogy and technology which informed the author’s development of some preliminary materials for staff development of subject specialists newly engaged in ODL courses, the subject of a future study. The final and complete narrative text was stored in the NVivo 11.0 database (QSR, 2016). Coding here divided it further into nine themes: pedagogy, technology, communication, time issues, training, marketing, aesthetic issues, external advice and social. The ELAS then took the content of each theme to interrogate further in conversation analysis in context, to make meaning of the interactions by considering what they achieved (Bryman 2012, p529).

Conversation analysis of the e-learning team narrative was used to provide answers to the study questions within the account of the study.

5. Narrative

This narrative first details the training and prior experience of team members which was gleaned from individual interviews. The purpose of this was to understand how they had developed their knowledge of ODL with a view to formulating development materials for subject specialists, shown by Table 1:
### Table 1: Team members’ development of expertise

<table>
<thead>
<tr>
<th>Team member</th>
<th>Formal training</th>
<th>Informal training</th>
<th>Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty e-learning co-ordinator</td>
<td>PGCertEd (online education)</td>
<td>Work in USA HEI and school where faculty and teachers</td>
<td>Started by supporting module leads then developed full masters programme before becoming academic faculty e-learning co-ordinator, developing and overseeing programmes</td>
</tr>
<tr>
<td>FELC</td>
<td></td>
<td>willing to share online teaching knowledge and techniques; online PGCertEd student</td>
<td></td>
</tr>
<tr>
<td>E-learning administrator ELA</td>
<td></td>
<td>Natural administration skills and previous administrative experience</td>
<td>Ran the administration side of the new online modules in one programme and now inputs admin, design and pedagogy in several programmes</td>
</tr>
<tr>
<td>Programme e-learning co-ordinator</td>
<td>MSc Digital Education (Masters year student)</td>
<td>Self-taught on VLE use</td>
<td>Role changed from admin to more pedagogically orientated with running of VLE and other teaching aspects then increased</td>
</tr>
<tr>
<td>PEC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-learning academic specialist ELAS</td>
<td>PGDip Digital Education Current PhD student studying online education</td>
<td>Online MSc and PGDip student Mentored by experienced tutor during first course design</td>
<td>Developing, editing and in some cases leading modules in various programmes</td>
</tr>
<tr>
<td>E-learning technician ELT</td>
<td>Course for creatives in advertising industry</td>
<td>Self-taught website design</td>
<td>Website design and development both in HEI and freelance</td>
</tr>
<tr>
<td>E-learning illustrator ELI</td>
<td>HND multimedia design</td>
<td>Self-taught design</td>
<td>Developing medical education e-learning in industry before provision of images, animation and film editing for HEI</td>
</tr>
<tr>
<td>E-learning co-ordinator ELC</td>
<td>Certificate in teaching IT Masters in Computing</td>
<td>Self-taught website design</td>
<td>Developing websites in other HEI before developing programme in HEI</td>
</tr>
</tbody>
</table>

It can be seen that training was both formal and informal. Most subject specialists would have little time for formal qualifications so informal staff development is the likely path for future training.

There was much overlap between the categories produced by coding: training involved technical or pedagogical issues and there was an overarching category of communication. The importance of communication is such that without it team function would likely cease, but within the themes it was used solely for areas not necessarily covered by the other themes.

#### 5.1 Technology

Of all references in the themes, perhaps unsurprisingly given the nature of the teaching mode, technical details and issues made up a large proportion. Technical training of non-team members was given one-to-one in many cases on an ad hoc basis. This could be described as just-in-time but had the advantage of immediate experiential learning. As an example, telephone conversations allowed practise in the use of virtual classrooms to enable tutorials to be run in evenings, with the ELI as technician ‘in residence’ to prevent and solve problems:

“The ELA offered lots of advice over the phone and occasionally asked the ELI for more technical details for running the virtual classroom”.

“Worked with a face-to-face administrator, teaching her how to upgrade tests on the virtual learning environment (VLE) for the next running”

These comments show that one of the primary functions of team members was staff development in an informal way. Incidences such as these showed how individual team members inducted non-team members into the e-learning community of practice. Cochrane et al., (2013) cite Lave and Wenger (1991) who describe communities of practice as “groups of people with a common interest exploring issues within a particular context”. The support given by e-learning staff to less experienced staff enables them to join the community of practice via Zygotsky’s ‘zone of legitimate peripheral participation’ (Smith, 2016). The just-in-time mode may
seem lacking in organisation and poor time management, but it suits clinical staff in particular who have little
time to attend organised sessions. This ‘knot-worked’ approach may form the basis of future action research.

The ELT responded to the needs of team course designers by creating a new page type to display content as a
slide show (in this case for patho-histology). This is an example of the on-going continuous improvement of the
technology which makes up the bulk of their workload. Demonstration and training the team to use these
improvements often occurs at team meetings but is also on a one-to-one basis as needed.

The ELT, the PEC and the ELA commented on the lack of confidence many non-team staff have with
technology. The ELT and the PEC both said that staff members were generally happy to edit and apply content
to the content management system once they had received a short session of one-to-one training. Some staff
appeared too busy to implement their new knowledge immediately and often required emailed instructions
later in addition to the initial training, which sometimes caused irritation amongst the team. Historically many
of the subject specialists had lectured face-to-face but had little to do with the institution’s virtual learning
environment (VLE). This may have provided some tension with the expectations of the team that faculty staff
would learn ‘new tricks’ with the technology, whereas these staff may have had no particular wish to change
the status quo where previously they handed their PowerPoint slides to an administrator to post on the VLE.
Furthermore, despite training, some staff did not gain the necessary confidence and preferred course changes
to be carried out by the ELA. Whilst on the whole ‘digital natives versus digital immigrants’ (Prensky 2001) are
controversial: we are both immigrants and natives at one time or another when using different technologies;
however, confidence in technological use depends upon experience and practise will encourage self-belief in
technological capability. Provision of a ‘sandpit’ where staff could practise uploading and editing content in the
safety of privacy may improve confidence with technology.

5.2 Pedagogy

Much of the team’s work involved developing new modules and updating old ones, eliciting many interactions
with non-team staff. At two team meetings the progress of a new module development was peer reviewed by
the rest of the team who provided constructive criticism on learning activities. In other modules under
development the emphasis was on the application of the knowledge students would gain, so clinical staff were
asked for case studies and reports based on real life for students to discuss.

One module being updated after student feedback suggested it was too heavy on content needed videos of
‘talking heads’ and diagrams added to more succinctly explain the details a large amount of text had failed to
address. The PEC commented that specialists do not necessarily understand how hard content is to
understand for non-experts; this may be core knowledge or threshold concepts (Meyer & Land 2003). This may
form a barrier to students fully grasping concepts, but the PEC commented that if she could understand then
so will the students, providing a solution in the course editing. Another module which the PEC was updating
required alterations so the increased number of students taking the course would still be able to participate in
collaborative activities successfully without their role being reduced or the tutor being inundated with work to
provide feedback on.

At the other extreme, the ELAS found that in one course there needed to be more content, explaining to the
subject specialist that some factual content as text and video was necessary rather than the suggested reading
alone which needed scaffolding first. It was however the norm to be given too much material as content.
Subject specialists all showed great enthusiasm for their disciplines and the knowledge they had to impart, not
realising that the workload they would produce within an ODL course would be oppressive to the students as
well as being beyond the 20 credits specified. The course developers (FELC, ELAS, PEC and ELC) had to strike a
balance between enough information for useful student activity and an excess of content for students to
navigate.

In the development of new modules the response of staff with no experience of ODL was enlightening. In
meetings with clinicians on more than one occasion the ELAS found that there was a high level of discomfort
with the idea of teaching online as opposed to lecturing. This may be historical, due to clinicians receiving
lectures as their main means of knowledge transfer in their own degrees. Some expected to use PowerPoints
with voiceovers or lecture capture systems. This was a common occurrence and showed the typical
transmission mode of teaching in face-to-face lectures where knowledge was presented rather than
knowledge being discovered by the students. Many of these subject specialists were experienced face to face
lecturers. Others had a little knowledge of running ODL in that they realised PowerPoints from lectures online would be a dreary learning experience for the students, but they did not know which alternative methods to use. Once the ELAS explained how the team would work with the subject specialist to develop content with mixed media and plenty of individual and collaborative student activity there was a great deal of relief expressed. This was summed up by one clinician:

“I was really dreading doing this, but it sounds as though it might be interesting”.

This statement expresses a change in views as well as a willingness to engage, suggesting that care in depicting ODL and what is required for staff development will lead to greater enthusiasm for the task. The acceptance of differences in online teaching and learning from face to face and the willingness to develop their online pedagogy was generally at a high level once it had been understood that help from the e-learning team would be given and the onus was not solely upon the subject specialists. However, the notion that nothing could surpass lectures for teaching was not mentioned, but implied in a few cases (“You can’t use online for everything”). The majority of knowledge transfer in medical schools is by lecture (Brown and Manogue 2001). Discourse showing regression to their original training and rejection of new methods suggests a certain amount of clinging to the past and resistance to change.

The ELI has developed many useful illustrations including self-test limb anatomy drag and drop animations which will be used as re-usable learning objects. Over the study period these were catalogued via a personal staff web-space and also sent to non-e-learning staff who might find them useful in teaching. It is noticeable that whilst there is a willingness to share resources there are no specific means to communicate their availability to other staff. A repository of resources linked to by staff areas on the institutional VLE would be useful to showcase reusable learning objects.

5.3 Communication

Whilst coding the narrative into themes it was realised that virtually all overlapped with ‘communication’. It was decided to look at only those aspects of communication in this section which had not been covered by the other sections in the narrative and discussion.

Within the daily lives of the team communication was both a positive and negative force. Many of the positive incidences of communication involved non-team member e-learning ‘champions’ who were already very knowledgeable on the subject. In addition, people who had been given enough information at the beginning of the conversation to enable them to understand how ODL courses function were then able to grasp how the team could help them in course design. It was easier to meet and discuss course development with a champion:

“It’s really easy to discuss pedagogy as he totally gets e-learning”.

Where some training had been given to those lacking in experience:

“This was a more positive meeting ....she has a number of images, history and the accompanying report so it should make a very nice activity.”

The FELC commented at the end of the study that carrying out the study had brought the team closer together. This may have been due to increased communication and a greater depth of understanding of each other’s roles developing courses.

5.4 Other coding themes

The other categories found when coding were: time issues, training, marketing, aesthetic issues, external advice and social. These will be discussed in less detail as they were only a small representation of the whole narrative; the majority have less bearing on staff development and are of more use to future policy.

Time issues were seen as a problem by clinicians.

“She was concerned about the amount of time it would require her to be online when running the module, particularly if the module is going to attract a lot of students.”
Other issues with time were how long it often took for the team members to receive course content:

“She is busy with stuff until the end of May and will start sending content then”

The time issues experienced suggested that greater emphasis on time management during the planning stage of new courses must be given. All subject specialists are informed how long to expect course development to take, but their clinical and research workload take priority, often until the last minute when courses are then prioritized. In one case a subject specialist was replaced by an e-learning champion (also a subject specialist) in an effort to speed the provision of material for a new module, showing the importance of planning and time management.

Training for the team often took the form of workshops and seminars either within or outside the institution, sometimes for specific needs such as training in new software use for the ELI. The PEC and the ELAS are both engaged in higher degrees in online education. Continuing professional development also occurred by attending conferences although it was surprising that these sometimes missed their mark as described by a comment post-conference about a regional teaching event:

“This year was probably the least useful with the most it was geared towards e-learning being talks on blended learning. One lecturer with a flipped classroom had an almost an evangelistic view of e-learning; what we have been doing for years still appears to be avant garde to other people”

Discussion about marketing involved the provision of illustrated materials by the ELI, potential venues for course information adverts to be placed and possible funding for students.

Aesthetic issues often involved discussion how to display content to the best advantage as well as improving the look of particular courses. This involved all the team and ideas were always welcomed by the team from individual members, such as icons to delineate different activities developed by the EI and deployed by the ELA.

External advice often came from other technical staff outside the team. A meeting of the FELC and the ELT with the IT support services in the institution was fruitful in that they mapped out how servers could be used and maintained for the content management system. Maintenance and planning are essential for the smooth running of ODL courses.

Within the life of the study the team had two social events: both were visits to local restaurants. This is an excellent way of increasing team bonding in a relaxed atmosphere. It is also said to increase creativity: Gilson and Shalley (2004) found that the more a team socialized, the more creative they were.

6. Discussions

6.1 The use of ethnography as a research methodology in the study

In this study ethnographic methods were chosen over single interviews to provide detailed descriptions of tasks over an extended period. The father of modern ethnography, Geertz, tried to ensure that meaning was considered from ‘discourse’ which enabled ‘thick description’ to be produced (Geertz, 1973, p20). The use of documented lists of tasks/interactions as a starting point for the ELAS to provide further detail from weekly interviewing team members developed the thick description required in ethnography.

Ethnography emphasises the importance of social and cultural contexts as well as the value of peer-like relationships between ethnographer and participant (Brown and Dobrin, 2004, p5). The cultural context was one of the strengths of the study: it allowed a picture to develop of the e-learning experts at work, how they carried out the everyday tasks and how those with less experience found challenges and were helped to meet them. Interviews, while providing an intimate view of certain aspects of the culture, would form an incomplete picture. It is unlikely that in an interview the level of discomfort of those engaged in e-learning for the first time would be catalogued. This is especially so if the interviewer were the ELAS as this would bring issues of positionality (Mikecz 2016); clinicians could be described as ‘elites’ and a single interview is unlikely to unearth anything which would have the effect of dispelling this position. Within the workplace, the researcher working...
together with the ‘elite’ brings in trust and a shift in positionality to a more equal relationship as both start to rely on each other for the task ahead, each with their own capabilities.

Using collaborative ethnography leads to a rich picture being developed; however, there are limitations. Some may have reported as others expect to hear, leaving the question of whether there is ‘no one shared or consistent reality’ (Hoeber and Kerwin, 2013). This was not obvious in most instances with the ELAS being present for much of the time to observe as well as receiving the record of interactions from each team member. However, there was one omission noted by the ELAS. None of the other team members recorded their weekly or fortnightly ‘catch-up’ meetings with the FELC. This was not commented on by the ELAS in any interviews as she considered it their privilege to regard conversation with ‘the boss’ as a private space. However, this omission made for a less rigorous ethnography whether it had any bearing on the goal of considering staff training or not. It is also a demonstration of power structures; acceptance that time with an authority is built-in within work patterns making this a mundane activity going unreported.

Over-familiarity with the setting may lead to omissions (Burford May and Pattillo-McCoy, 2000); subjects may be considered too mundane to warrant reporting. An example of this was observation by the ELAS of several team members suggesting to an allied, but non-team member how to solve a computer problem. The exchange took less than five minutes and was not noted by team members participating, probably due to the mundane nature of the problem rather than a desire to exclude this from the study. In ethnography there is “a tension of involvement and distancing” (Hill, 2000). This is an example of involvement within the minutiae of life but a lack of distancing when it came to record details in that the study itself was forgotten.

Some aspects of power issues were considered in planning the study design; this could have taken the form of oppression of the team members if someone in a position of authority examined the minutiae of their working life. This possible conflict was overcome by having a team member rather than the team leader collecting the data, giving the team members the capacity to describe their lives at work without fear of adverse comment. Tew (2006) cites Weber (1968) who considered power as a capacity to do something despite opposition from others; it was empowering for team members to consider their working lives in conjunction with an equal peer, providing much rich data.

However, all ethnographic studies have some issues of power and as the study went on greater consideration was given to this. This includes power of the researcher to reveal truths which are damaging to those observed; the power the observer has in their choice of material for narratives and what to leave out as unimportant or considered too controversial to use. In the case of this close-knit team this does not appear to be an issue. The narrative will be discussed in this paper as comprehensively as possible by the researcher in order to answer the other study questions and in order to satisfy academic integrity, although there has been consideration given to the choice of words over sensitive issues. Furthermore, the problem of over-closeness in a study (Gallinat 2010 p26) has generally been avoided here as each participant has their own separate role and therefore differing ideas about life on and offline in the e-learning team. Power issues from a Foucauldian point-of-view will be discussed later.

There are also ethical issues, as with any ethnography. Just because we can access, should we? Taking issues of ethics into account within the workplace, do employees want management to know exactly what goes on? Highly detailed narrative descriptions of interactions may be above and beyond what actually occurs. The observer’s idea of ‘truth’ is merely a construction of that of others in the interpretivist mode espoused by Geertz (1973, p9). The observer will always bring preconceptions which may cloud the clarity of their data collection. In the practicalities of this study having the team triangulate the data will go towards ensuring its’ veracity although it is impossible to ensure every interaction is reported without individual bias. Fieldnotes were electronically available for this triangulation and there were no comments on any discrepancies leaving the ELAS to believe that this version was the ‘truth’ and the notes were a good record of reality.

6.2 Considerations for future staff development for online course design

Throughout the course of the study it became apparent that where ‘staff development’ was discussed there had been no definition of this term and therefore no expectation of an ‘end product’. This was not necessarily a disadvantage as it removed constraints on what was expected for a very diverse group of people. It could be argued that staff development should be on a continuum and indeed the team themselves engaged in further professional development. The argument for informal training is shown by the team progressing the courses
with the subject specialists once details of pedagogy and technology had been provided. It would also be wise to extend informality to the term ‘staff development for online teaching’ which could cover anything from developing student activities to the use of different social media and collaborative tools and meaning an increase in knowledge and practice in the subject. Assessment of development could also be diverse and could include student course evaluation and a decrease in questions to the technical side of the e-learning team.

Cramp, 2013 mentions ‘the pedagogy of discomfort’ citing Joyes, Hall and Thang (2008) who suggest that it is common to find staff teaching online without any training having moved from face-to-face teaching. This takes them “outside comfort zones and challenging assumptions to encourage emotional engagement may be important in developing meaningful dialogue in DML [distance mediated learning]”. The ethics surrounding this as well as the practicalities of developing and running a functional course make this a hit-and-miss method of encouraging dialogue and may decrease the standard of the courses provided. The author considers it should be mandatory for training before teaching online.

The e-learning team ethnography showed that one-to-one sessions for staff development in technology were vital. The same could be true for online pedagogy and this could benefit from the provision of previous examples of online teaching materials. Greig and Skehill (2008) found benefit in peer action learning for staff development.

More use could be made of champions in light of the enthusiasm shown towards their knowledge and abilities by the team, perhaps talking about course design and running via short videos available to new online teaching staff. Jenkins et al. (2011) considered champions improved the standard of e-learning courses. Mentorship might also be beneficial.

6.3 Team inter-relationships with subject specialists

Of interest is the influence of power in the interactions of the team with faculty staff and clinicians with the e-learning team members which became apparent to the author on scrutinising the conversations within the content themes. In the author’s view all these players are specialists in their own world which have a bearing on attitudes, making it of interest to consider these in the Foucauldian turn. Downing (2008) cites Foucault (1976) that:

“Discourse is a much more specific context, describing the intersection of knowledge and power and the forms of expression and articulation they take in various fields”

Hill (2009) also found it useful to analyse the results of ethnography in an educational context in conjunction with genealogy in the Foucauldian turn. Analysis of the discourses within the narrative shows that as a team there is a certain amount of judgement of those who ‘get’ e-learning, and those who don’t, creating divisions. Here, Foucault’s bio-politics, the different bodies, are apparent where the world is categorized according to those who understand ODL teaching and learning (the e-learning team) and those who don’t (almost everyone else). Hill (2000) shows teachers as politically situated as they have “theoretical ideas about disciplinary power, hierarchical observation, normalizing judgement”. This suggests care must be taken within staff development approaches to avoid alienating those who show ‘otherness’ to the team experts in their knowledge of e-learning. Approaches should be empowering rather than emphasizing the differences in knowledge of teaching activities. Burke (2000) comments that understanding differences in cultural practices in context, searching for that which is common and an acceptance of the differences will counteract a fear of change. To this end communication between team and subject specialists as Foucault’s discourse ‘as a foci for struggle and resistance’ (Burke, 2000) should be sensitive to possible issues of standing within the community of practice of online teaching.

In terms of power relations perhaps too much is assumed that training equals change; staff specialists may see this training as a new way of adding to their workload without empowering them and perhaps demeaning them if they are used to someone else doing technical work for them. Sensitivity needs to be shown when working with specialists highly skilled in their own world who may be reluctant to embrace new teaching methods, at the same time clinging to the older and more familiar methods. The high esteem in which they are held as clinicians could interfere with the relationships with others who are engaged in teaching them something new in an apparently unrelated subject they have been coerced into participating in. There was no
evidence of this found in this case study, just a reluctance of some to teach online as this would add to their workload as well as requiring time to develop the new teaching skill.

7. Concluding remarks

Ethnography has provided a rich description of the working practices and interaction of an e-learning team in a HEI. It has shown many ways in which they interact with faculty staff who are subject specialists with varying experience of teaching online. Considering the results in the light of Foucault’s attribution of power in all aspects of life, future staff development should be sensitive to the ethos of subject specialists who are already experts in their own field. Using ethnography as an interpretivist approach has enabled theories about what is beneficial for staff development to be synthesised. A positivist approach would be less attractive as it would be hard to elicit from staff what training they need if they have yet to understand what the new work would entail and the study was to formulate suggestions for staff development, not to test them. From the interactions it can be concluded that the following ways of staff development will be beneficial for future engagement in ODL:

- Course ‘samples’ as examples to show the multimedia and text content and how social media may be used in ODL
- One-to-one training for simple use of content management system
- Mentors and champions for support

Provision of a ‘sandpit’ within the content management system where ideas can be tried and tested

Whilst not all HEIs have e-learning teams involved in developing courses, where clinical lecturers and research scientists require a knowledge of ODL when required to act as subject specialists in their development and running, the suggestions for staff development are likely to be generalisable.

The use of ethnography could have been complemented by interviews with other subject specialists who were engaged in running ODL but not necessarily interacting with the team during the period of the study. This would provide a more comprehensive picture than that constrained by interactions during the time period. Questionnaires sent to a wider audience, in other faculties and other HEIs in the UK and the wider world on the type of training staff receive for ODL, or wished they had received, would also complement the findings of this study in the planning of staff development activities and could provide information on cultural differences and therefore requirements. Both these research methods will be utilised by the author for planned future research into staff development.

A narrative developed over several months has provided a much deeper level of knowledge about the culture of the e-learning team than single interviews would have done. Avoiding issues of power and sensitive reporting in this case has provided a good framework to answer the research questions without courting controversy. Ethnography has been beneficial to unlock the development needs of subject specialist staff for ODL Masters courses and can be recommended as a research methodology within this type of e-learning situation.

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Mobile Eye Tracking Methodology in Informal E-Learning in Social Groups in Technology-Enhanced Science Centres

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Abstract: This paper presents a methodological discussion of the potential and challenges of involving mobile eye tracking technology in studies of knowledge generation and learning in a science centre context. The methodological exploration is based on eye-tracking studies of audience interaction and knowledge generation in the technology-enhanced health promotion exhibition PULSE at a science centre in Copenhagen, Denmark. The current study is part of the larger PULSE project, which aims to develop innovative health promotion activities where a science centre exhibition is a key setting. The primary target groups were families with children age 6–12 years and school classes with students from 4th to 6th grade. The main purpose of the study was to understand the methodological potential and challenges mobile eye tracking comprises during the different stages of research on informal e-learning in a science centre context utilising digital platforms to enhance informal learning and interaction. The paper presents how eye-tracking methods influence research on: 1) an interventional level: what role eye tracking and eye-tracking equipment plays in interventions; 2) a data level: what new types of data eye-tracking methods specifically contribute; and 3) an analytical level: how analysis of eye tracking can supplement and contribute to other analytical approaches. Finally, the article discusses how the methodological approach presented invites consideration of other ways of understanding how users experience technology-enhanced exhibitions.

Keywords: Mobile eye tracking methods, visitor studies, health promotion

1. Introduction: Eye tracking and studying exhibition visitors

The study of exhibition visitors is a broad field that still lacks a common language (Macdonald, 2007). The research goals of museum exhibition studies vary, covering a range of topics stretching from learning outcomes (Falk & Storksdieck, 2005), to visitor behaviour along the exhibition route (Bollo & Dal Pozzolo, 2005) to interpreting the experience of a museum space (Schorch, 2013). Museums and science centres have both an academic and commercial interest in how visitors experience and interpret the exhibitions presented. The academic interest involves intellectual dimensions that have to do with the science centre as a place where the main purpose is to disseminate science and promote science literacy (Friedman, 2007). The commercial interest concerns the science centre as a place in need of visitors to legitimise its existence and to a certain degree as a source of necessary income. Visitor studies, for example that involve investigating audience behaviour and satisfaction, are necessary in order to create activities that visitors find worthwhile to spend their leisure time and resources on (Dean, 2002). Thus a variety of different methods are applied and experimented with in the pursuit of exploring different aspects of the museum and science centre exhibition experience.

Eye-tracking technology, which involves recording and analysing the gaze of a study subject, is evolving rapidly. There is an ongoing need to explore how best to apply mobile eye tracking (MET) methods in natural environments. The first studies of eye movements began more than 100 years ago (see e.g. Huey, 1908), but it is only in recent years that lightweight mobile devices allow subjects to walk around freely with the eye-tracking device (Hayhoe & Ballard, 2005). Eye tracking has been shown to have strong potential in combination with other methods, e.g. interviews and observations of social interaction, and in comparison to using conventional methods alone, for instance in multimedia learning studies (Jamet, 2014). Recently the possibilities of eye tracking in the study of visitor experiences in exhibitions have been explored (Eghbal-Azar & Schor.).
This paper explores the potential and challenges of eye tracking as a method for studying knowledge generation and learning in a science centre setting. The methodological discussions are based on studies of families in the health promotion exhibition PULSE at the science centre Experimentarium in Copenhagen, Denmark. The study is part of the larger PULSE project, which aims to develop innovative digital health promotion activities where a science museum exhibition is a key setting. The primary target group is families with children age 6–12 years and school classes with students from 4th to 6th grade.

The current methodological study focuses on understanding the potentials and challenges MET comprises during the different stages of research in informal e-learning in a science centre context utilising digital platforms to enhance informal learning and interaction. Based on these studies we present how eye-tracking methods influence research on an interventional, data and analytical level.

2. Background: Exploring user experience in the complex setting of an exhibition

As mentioned, studies of museum and science centre visitors remain a wide research area lacking refinement in common practice and language (Macdonald, 2007). Hooper-Greenhill (2006) argues that the overall foci of studying museum and science centre visits has shifted from: “thinking about visitors as an undifferentiated mass public to beginning to accept visitors as active interpreters and performers of meaning-making practices within complex cultural sites” (p. 362). This has led to a variety of methods in the study of visitors. A classical way of studying visitors is through the use of surveys e.g. on satisfaction (Loomis, 1988) and/or test scores to investigate learning outcomes (Falk, 1997). As with any other context that involves using surveys, the answers are confined to the respondents’ interpretation of the questions. It remains difficult to be exploratory and thorough if investigating an exhibition solely by means of a survey or questionnaire. Other research activities in exhibitions focus on the varying amount of time users spend in the exhibitions and they observe and interpret their behaviour at a distance (Bollo & Dal Pozzolo, 2005; Barriault & Pearson, 2010). However this method of purely observing the user can limit the research findings as the behaviour of the visitors can be due to many non-exhibition factors (e.g. a child having a bad day or staying in one spot for a long time while your mind is preoccupied with what to make for dinner).

Other studies investigate the visitor experience in a more exploratory way, e.g. by walking along with a group of visitors in the museum and playing an active part in the experience by asking questions as the subjects explore (Lykke & Jantzen, 2013). It can be argued that following subjects around intrudes on the behaviour and discussion in the group. Conversely, with just observation or video recording, researchers miss out on the opportunity to ask about aspects of the exhibition visit in situ. There is a long history of interest in the use of video recordings when studying visitor behaviour, mostly focused on patterns of visitor navigation or verbalization (Vom Lehn, Heath & Hindmarsh, 2002, pp. 2-4). When video recording, either by following the group around or with a fixed camera, researchers obtain data that renders the group or person from a third-person point of view. It can be difficult to hear verbalization depending on the distance and quality of the video equipment. the methodological potential and challenges mobile eye tracking comprises during the different stages of research on informal e-learning in a science centre context utilising digital platforms to enhance learning and interaction.

This paper focuses on the methodological potential and challenges of applying eye tracking in the study of social groups in a technology-enhanced science centre exhibition. Exhibition studies employing MET are challenging the view of coherence between the observed time a visitor spends at an exhibition and the individual’s interest in the exhibition and/or its theme (Eghbal-Azar & Widlok, 2013). MET is not only interesting in terms of presenting a new way to analyse new types of data (e.g. heat maps). Eye tracking is also interesting in that it presents the possibility of looking through the visitor experiences through their eyes, from a first-person point of view, with a clear recording of their verbalisations in correlation to what or who they are observing. Other studies have accounted for some attending issues, such as the limited validity of the interpretation of eye movements and cognitive processing (Hayhoe & Ballard, 2005) and the limitations of the interpretation of eye fixations in relation to the attention span and processes of the participant (Treisman, 2006). Mayr et al. (2009) argue that one of the implications of this in a science centre is that:
... while a participant’s eye is fixating a specific exhibit, he may actually be attending to the whole exhibition wall without devoting attention to the fixated exhibit itself, or he may be thinking about something completely different while his gaze still lingers on that specific exhibit (2009, p. 6).

To the best of our knowledge very few MET studies similar to ours that take place in a museum or science centre setting have been carried out. Some focused on the enhanced level of detail that can be obtained from data, e.g. due to the ability of MET to track how participants scan an exhibition (Eghbal-Azar & Widlok, 2013). Others were more practical and design-oriented, exploring how MET can be an integral part of getting information about the exhibition based on where the subject’s gaze is resting (Toyama, Kieninger, Shafait & Dengel, 2012). Both Mayr et al. (2009) and Eghbal-Azar and Widlok (2013) focused on using MET in a natural museum setting and allowed participants to walk around freely with no agenda other than their own curiosity. Both of these studies advocated the use of MET in combination with other methods such as interviews. Eghbal-Azar and Widlok (2013) point out that MET data alone are not enough to get information about how the participants perceive the exhibition. Likewise, both of these studies focused on a single participant at a time and the interaction with the exhibition. However, it is widely acknowledged in the museum community that a visit to a museum is a social activity, and that a visitor’s: “interaction with their companions is an important aspect of their museum experience” (Coffee, 2007, p. 377).

To limit the factors of disturbance Mayr et al. (2009) restricted their study to only one person at a time to explore the exhibition they investigated. This may have provided more clear data, but it also compromised the exploration of the museum experience in its natural environment, as the participant neither had companions nor other visitors to observe.

The current study explores the possibilities and limitations of MET in the natural setting of a science centre with a social group of visitors. The study takes place in the PULSE exhibition, which was designed as an active social experience, with family groups as the main target group. As a result, it represents a good example for studying MET in a highly social science-centre setting that uses a high degree of digital platforms and feedback. We highlight how/if the glasses used to track eye movements interfered with the subjects, who were active during the exhibition, and how/if this affected the other group members. We also describe the new types of data MET can record from the first-person perspective of subjects interacting with digital platforms in science centres. The main focus of the paper is thus to develop a methodological understanding of how to conduct MET studies at the: 1) interventional, 2) data and 3) analytical level in social groups in technology-enhanced exhibitions.

3. The PULSE exhibition and data collection methods

The PULSE project is a large-scale project that was created in collaboration between the Danish science centre Experimentarium and the research institute Steno health Promotion Centre. The project began in 2012 and the core outcome is a technology-enhanced exhibition, with the goal of health promotion. The core target group of the exhibition is the family unit, building on studies that demonstrated how museums could introduce children to science as an academic discipline (Crowley & Jacobs, 2002). The exhibition focuses on the family as a social unit and the notion that parents will see the visit as positive if the children achieve deeper insights by playing games and engaging in various activities (Falk & Dierking, 1992). The project builds on health promotion theories and action competencies that include a number of subcomponents such as knowledge, commitment, visions and action experiences (Jensen, 2000). The exhibition, which opened to visitors in March 2015, was also evaluated through visitor surveys (Zachariassen & Magnussen, 2016). In short the exhibition consists of eight different activities in which participants are active as a team consisting of two to five members. The activities resemble places in the home, for example, a kitchen, where balancing skills are put to use, a bathroom, where cleaning it involves dancing.

3.1 Data collection setup and methods

This paper’s methodological design is based on a study of visitor knowledge generation in the PULSE exhibition (Magnussen, et al., 2016), with a specific focus on developing methodological approaches for MET studies on group interaction in the informal e-learning context of a science centre exhibition context. Conducted in late 2015, the study comprised eight families with children 6-12 years of age visiting the science centre and two groups of sixth graders. The respondents were chosen from the visiting audience based on how well they
matched the project’s target groups. The study was conducted by applying MET methods and by conducting short qualitative interviews with participants after they saw the exhibition. Our research specifically looked at the possible implications of the method on the interaction of subjects in the exhibition context and worked to identify new knowledge and types of data derived from the first-person perspective MET, also in combination with other methods, such as interviews. The groups were invited to participate in the eye-tracking study before their first visit to the exhibition. After the eye-tracking interaction in the PULSE exhibition, group members participated in short un-structured group interviews (Kvale, 1996) with questions about the perceived theme of the exhibition and the perceived knowledge-gain from interacting with the installations. Interview data were categorised in a grounded theory process (Corbin & Strauss, 2008). Eye-tracking glasses recorded audio, video and gaze point from the test subject’s point of view during the group’s interaction in the exhibition. Data from the eye tracking were applied to investigate how interaction with a specific exhibition installation could be related to knowledge building. Findings of the study have been reported on and published elsewhere (Magnussen, et al., 2016).

3.2 Eye-tracking method

In the eye-tracking study, one adult in each family group and one child in each school group was invited to wear eye-tracking equipment. The use of eye tracking in this context relies on the idea that human physiological capacity to obtain, or sample, visual information from the surrounding environment is inherently limited by the structure of human eyes, which can only receive high acuity visual information from a very narrow visual angle at any given point (Land, 2014). Perceptual processing capacity is also inherently limited and, consequently, there is a high correspondence between the locus of overt attention and the direction of the gaze. Thus, tracking where a person is looking on a moment-to-moment basis provides rich information about what material is being sampled and used in visually guiding the activities that people are engaged in as well as in situated learning and social communication processes (Lauwereyns, 2012). In this study, we implemented eye tracking using MET glasses (SMI ETG 2w 60hz, SensoMotoric Instruments GMBH, Teltow, Germany). The MET device uses non-invasive recording technology that illuminates the eye with safe-intensity infrared lamps and tracks the position of the moving eye using an infrared camera. The SMI ETG 2w system is built into sports glasses (about the size and weight of ski goggles) and uses a smartphone with custom software to record data. The system was worn by participants in the same way as sports glasses are worn and the data recorder was worn in a small belt pouch. Thus, the system provided high mobility, allowing participants to move freely and interact with the surroundings in a nearly unrestricted way (apart from the slight limitation of peripheral vision by the eyeglass frame and the limited conscious effort on the part of the participant to avoid damaging the equipment). The output data were a gaze overlay colour video with 1280x960 pixel 24 fps of the subject’s point of view (the camera was positioned approximately between the eyebrows) with the position of the gaze indicated by a marker in each frame. Gaze position was estimated by the eye-tracker firmware from a 60hz recording of the eye position matched to the position of the gaze within the recorded field of view. Gaze overlay video also contained an audio track recorded via a microphone mounted in the glasses, thus recording what the participant was saying and some surrounding sounds (e.g. what another person standing close said in a conversation). Recordings using eye tracking began with explaining the equipment to the participant, fitting and calibrating the eye tracker and starting the recording, after which the participant moved freely around the exhibition until deciding to stop participation (40 minutes on average, which was the amount of time needed to see most of the PULSE exhibition). Data were qualitatively analysed by reviewing the gaze overlay videos and matching the locus of overt visual attention with the participants’ utterances, following procedures described in Holmqvist et al. (2011).

4. Methodological results: Three levels of understanding eye-tracking methods

The eye-tracking studies described in this section were conducted with families and grade-school students visiting the science centre Experimentarium in Copenhagen, Denmark. The current study specifically focused on developing methodological approaches for MET studies on group interaction in the informal e-learning context of a science centre exhibition. Our research specifically looked at the possible implications of the method on the interaction of subjects in the exhibition context and worked to identify new knowledge and types of data derived from the first-person perspective MET, also in combination with other methods, such as interviews. Next, we present how the eye-tracking methods influenced the research on the: 1) interventional 2) data and 3) analytical level.
4.1 The interventional level: Eye tracking as an intervention in the intervention

The interventional level concerns the role eye-tracking equipment plays in knowledge building in informal settings, in this case, in the test person’s interaction with the exhibition. As described in the methods section, one adult in each family group and one child in each school group were asked to wear eye-tracking equipment during their visit, before entering the PULSE exhibition. Adults were chosen primarily based on the assumption that the equipment would be less of a distraction for them. They were provided with information and shown how what they were looking at would be visible on a computer screen. Notably, no one declined to participate after receiving an explanation about the study and the equipment and many expressed excitement about being in the study. We did a short interview after each group was finished with their visit to obtain qualitative data on their thoughts about the themes of the exhibition.

With regard to the interventional aspects of the glasses, it turned out that not following the groups around ourselves also provided useful data. The glass wearer or others in the group commented on the glasses when we were not nearby and we were able to hear these comments in the recordings. This allowed us to gain additional articulations from among the participants in the social groups. The recorded dialogue provided insight into how the physical presence of the glasses was perceived, how the knowledge of measurement affected the participants and how the glasses, as a foreign object, affected a social group.

4.1.1 The physical presence of the equipment

One of the ways the glasses interfered with the experience was by the sole issue of wearing them. While visiting the exhibition, a father in one family said: “I don’t want to have these glasses anymore. I want to take them off now.” Even though he had been informed that he could take them off at anytime, he did not come to a researcher to have them removed and went through another activity before asking to have them removed when a researcher came to calibrate them. In the post-exhibition interview he said that getting used to wearing the physical equipment affected him the most. Interviewer: “What was it like to wear them? Were you affected by it?” Father (with glasses): “No, you had to get used to wearing them but otherwise I certainly think it was fine” (Magnussen, et al., 2016). Hence, the subject stated that, for him, the intervention had more to do with wearing the physical equipment than the awareness that his gaze was being tracked. When asked, one of the school students also emphasised the physical discomfort of wearing the glasses, but not the intrusion of having their gaze tracked. Interviewer: “How does it work to have these glasses on?” Student (with glasses): “So, it’s fun, but actually it hurts a little bit, but it’s fun (laughs)” (Magnussen, et al., 2016). In general, the groups spent a fair amount of time in the PULSE exhibition, many spent up to an hour. One mother said several times to her family that the bag holding the smartphone and battery for the glasses was hot but she did not ask for assistance either (Magnussen, et al., 2016). This is a possible indication that using eye tracking in exhibitions for an extended period requires clearly explaining that participants are more than welcome to have the glasses removed or adjusted. We told the participants that they welcome to get the glasses off at any time but few of them did so before finishing the exhibition. Most people were quite enthusiastic about the research and technology, their belief in the necessity of gathering complete data perhaps allowing them to better tolerate the heat from the bag or skin irritation from the glasses. When asked by the researcher, the families and students did not report any self-awareness or discomfort about the fact that their gaze was being tracked. However, as will be demonstrated in the following, the subjects made statements to other group members that indicated a sense of self-awareness about this.

4.1.2 Obtrusiveness of measurement

Another interventional quality of the glasses is the self-awareness that one’s gaze is being tracked. Mayr et al. (2009) argue that the obtrusiveness of measurement was not a relevant factor in their study, as only one participant (the one wearing the glasses) was allowed in the exhibition at a time. However, they recognise that this might be a factor in a more natural setting, especially considering the highly social aspects of visiting a museum (Mayr, et al., 2009). In the PULSE exhibition only one participant at a time wore glasses, but they saw the exhibition in groups, while other visitors were simultaneously present. The intrusiveness of the glasses was evident in some dialogues in the data. In a school group of three girls, the girl wearing the glasses talks with a classmate about the embarrassing fact that the direction of her gaze is being monitored while waiting in a queue for an activity. Student (with glasses): “It’s embarrassing that they can always see who I’m looking at and stuff.” Classmate: “Yeah, if you look at someone’s butt or something.” Student (with glasses): “Yeah.” Thus the knowledge of having her gaze tracked made her uncomfortable and potentially careful about where she looked. In one family, the mother stated that there was a correct, or intended, way for the husband (wearing
the glasses) to look around. Mother: (laughs) “Now you have to look in the right directions.” Father (with glasses): “Well, where should I look? I can only look where I usually look. Should I take a look at you and your nose?” (laughs) (Magnussen, et al., 2016). As opposed to the mother the father said that he can only look where he usually looks. His wife, however, even though she was not the one wearing glasses, demonstrated an awareness of the fact that the gaze of a person in the group was being monitored, which overlapped with the social facts described in the next section. Thus, the argument that the obtrusiveness of measurement would indeed be present in a natural social museum visit is confirmed in the context of the present case study (Mayr, et al., 2009).

4.1.3 Foreign object in a social group

Another interventional factor of the glasses occurred with the other members of the group experiencing the exhibition along with the participant who was wearing the glasses. In the family groups, it was mostly the children who asked the parent about the glasses during their visit. In another family, a girl about seven years old showed discomfort about her father appearing differently:

Girl: “Dad, when are you going not to have those [the glasses] on?”
Father (with glasses): “How about in ten minutes? Don’t you like them, Silvia?”
Girl: “No, I’m not used to seeing you with something like that on.”
(Transcripts from eye tracking recordings of Family 3 interacting with the PULSE exhibition)

Another girl of around five years of age in a family group had a more curious approach and asked: “Why are you wearing that thing Dad?” Father (with glasses): “It’s because I’m helping them make an experiment.” When using eye tracking, the presence of equipment is more obvious when the recording device is literally on the participant’s face in comparison to a more subtle camera mounted in a corner (Mayr, et al., 2009); the children in particular pointed this out. Not all children expressed concerns about the glasses and those who did were often the youngest ones. In the school classes, many of the teams knew each other and walked around the exhibition simultaneously. This meant that, unlike the family groups, the student groups were not only familiar with their own team members, but also with other teams crossing their path. One group of school boys were so conscious of the glasses that they generated very little data that did not involve statements like “look at me.” or interacting with the glasses (attempts to make the wearer look at specific places). For instance, one boy wearing the glasses stated: “I mean it, they [the glasses] are very fun to wear, something scientific (...), while in the middle of an activity. Likewise, when walking by classmates he said, for example: “It’s seriously fun this with these [the glasses] on; it’s seriously weird.” The classmates would try to get him to look at them and comment: “Nice glasses!” when passing by, thus overtly noting the presence of the glasses (Magnussen, et al., 2016). Overall the two groups of school students, to a much higher degree than the eight family groups, mentioned and interacted with the glasses. The high level of attention given to the presence of the glasses could have been influenced by age. In Denmark, sixth graders are about twelve years old putting them in early adolescence, a period of greater self-conscious than adults (Larson & Richards, 1994). Likewise, the glasses could work as a way to get attention from their classmates. However, the higher number of statements about and interaction with the glasses in the school groups could indicate that the more participants know each other, the more they will talk about and interact with the person wearing the glasses. It is possible that a group of strangers would interact less with the glasses, as the person wearing them would not look as different to a stranger. The school students and the family groups knew each other very well, hence the glasses looked unfamiliar or unusual.

The PULSE exhibition was designed to stimulate a high level of active physical interaction, and we expected an increased awareness of the glasses might lead to the fragile equipment being dropped. However, no data indicated that this was an intruding factor and the glasses never came close to being dropping. Moreover, the study demonstrated that the use of MET in a natural museum setting had to consider the science centre visit as a social and active experience – especially for families (McManus, 1987). As we shall discuss later, MET in a social group had advantages, but the glasses can also affect the participants who are not wearing any, creating focus on e.g. a parent looking unusual or a way to gain attention from the rest of the group.

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4.2 Data level: Detailed knowledge from the participant’s point of view

The second level focuses on the opportunities for acquiring additional data that occurs when tracking the participant’s gaze. In this study, we have far from fully explored and analysed the large amount of available data. Our interest in the project focused on the kind of information the participants acquired from the exhibition and on from what or who they obtained the information (Magnussen, et al., 2016).

The data level involved focusing on understanding what new types of data eye-tracking methods can contribute to studies of knowledge generation in informal settings. In the current study the eye-tracking equipment recorded audio and visual data during the interactions and dialogue, similar to an audio recorder or video camera but, in contrast to these traditional methods, it also recorded data on the direction of the subject’s gaze. This type of visual data provided new knowledge about visitor interaction.

One example was recordings of a group of 12-year-old students playing a ball game at an installation. Data from the student wearing the eye-tracking equipment showed that additional information for the game was visible only from her point of view. The activity involved throwing balls in holes that light up on two opposite sides, causing the team to work together. The teammate wearing the glasses yelled, “Freja there’s light over there!” even though the lit-up hole was on the teammate’s side and not her own side. Looking at where the participant’s gaze rested allowed us to see that, at her height, she could look directly through the holes on her side, which allowed her to scan the holes on the opposite side when she had finished her own without success (see figure 1).

Figure 1: The eye-tracking data revealed that the girl playing the game was able to look through the holes on her side of the activity, enabling her to tell the teammate to throw the ball in the lit-up hole on that side.

Hence, tracking the gaze point allowed us to discover that some participants played the game watching both sides and told their teammate(s) on the opposite sides where the light was if the teammates did not initially find it themselves. As a result, the glasses provided additional data on the direction of gaze and revealed other types of visual input the students could build knowledge on.

Mayr, et al. (2009) point out that one of the benefits of gathering data with MET in the museum context is the added level of detail obtained. The current case study focused on information and knowledge gained by the participants and, likewise, we found that details about how the participants sought and found knowledge were rendered clearer through MET. One example was a participant who walked toward a new activity in the PULSE exhibition and asked: “What are we supposed to do here?” In the gaze recording it was clear that for a short time he looked directly at a sign on the wall of the activity and it is very possible that he was seeking the information about what to do on the sign (see figure 2.).
Several factors about the setup made this kind of data information possible. First, we allowed the museum visit to be a highly social context in a natural environment. While others have chosen to restrict the visitors to one-at-a-time in an exhibition while using MET (Mayr et al., 2009), this exhibition could only be used in teams, thus every participant wearing MET was accompanied by a team. If the person in figure 2 had been alone he would most likely not have wondered out loud about what to do in the activity. Hence, the social context of the group provided additional auditory data about navigation and rationalisation in the exhibition. Video recordings have been a widespread method for conducting visitor studies (Vom Lehn, Heath & Hindmarsh, 2002), but linking the question of what to do with the gaze point on the sign was only possible with video containing the first-person point of view and basically is not possible with the other method due to the brevity of the gaze. He does not find the information that he sought on the sign and proceeded to the activity with his family, where they spent the beginning of the activity talking about what to do. This information allowed us to present additional findings to the developers of the exhibition by pointing out how to better provide information on finding the way in rather complex activities.

One practical challenge was the difficulty in ascertaining who was talking if the MET participant was not looking directly at them, possibly compromising the analysis of group dynamics of interest. One solution would be to give all participants a microphone and to have an additional camera filming the group from the outside. This approach would, however, add to an already time-consuming pool of data.

### 4.3 Analytical level: Relationship to traditional qualitative analytical approaches

On an analytical level this paper aims to understand how eye-tracking data analysis can contribute to traditional social science analytical approaches. In the case study, all members of the family and student groups were subsequently interviewed to understand how the group experienced the exhibition, what they saw as the thematic focus and if they thought they had gained new knowledge from the activities (Magnussen et al., 2016). The interview data was analysed drawing on a grounded theory approach and resulted in the following categorisation of various themes to describe the participant perspective on the topic of and the knowledge presented in the PULSE exhibition:

- Collaboration
- Exercise/fitness
- What the body is capable of:
  - Knowledge about the body on the inside
  - A physical activity previously assumed to be impossible to achieve, e.g. how high one can jump and how fast one is
The grounded theory analysis of the interviews created what can be defined as an analytical map of focus points that the further analysis was based on. In a second analysis, gaze points were analysed to determine how they correlated with the specific themes the participants identified. The eye-tracking data thus provided more background information on the participant’s focus compared to what would have been possible with more traditional analytical methods with regard to the categories defined. Data available from an interview helped define the theme “What the body is capable of”:

Interviewer: “If everyone had to try to explain what this exhibition is about what do you then think it’s about?”
Girl: “I think it’s about technology and what you’re like inside your body.”
Interviewer: “What are you like inside your body?”
Girl: “Yeah, you find out what you’re like inside.”
Interviewer: “Can you try to explain what you mean?”
Girl: “Well, for example, what you can do that you weren’t aware of, like that thing with cycling and heart rate for a minute and things like that.”
(Transcript from interview with Family 2 after visit to PULSE exhibition)

To investigate the experiences that influenced the girl mentioning knowledge in relation to understanding her own body, data from the family’s visit to the bicycle installation (see figure 3) was reviewed to identify the possible sources of information. The family cycled together on four adjacent exercise bikes equipped with sensors in the handlebars to measure their heart rates. In front of the bikes was a large screen showing a film simulating a family bike ride to the beach. Participants were instructed to cycle and then to rest to see how fast their heart rate decreased to a resting rate. Information about who took the lead and the different member’s heart rates was also displayed. The eye-tracking studies on Family 2 focused on understanding what influenced building knowledge about the body on the inside and “what you can do that you weren’t aware of”. Family 2 had three members: a father and two girls, one 6-7 years old and the other 9-10 years old.

Figure 3: Screen shot from eye-tracking studies of Family 2. The father in Family 2 (wearing eye-tracking glasses) watches another family use the Bike Shed while waiting with his daughters to try it. The text on the screen says “Bike Shed” shows the biking time (0:20) and says “Feel your body and see your PULSE fall.” The digits represent the different family members’ (various colors) heart rate per minute. The boxes also indicate who has the lead in the virtual bike race.

Father (with glasses): “It looks fun.” (Bike Shed)
(Watching the family in front of them.)
Father (with glasses): “Should we try this one girls, or should we try something else?”
Youngest girl: “I’d like to!”
Father (with glasses): (Still watching other family.) “See it’s the pulse, it shows the rate at which your heart beats per minute. See, his heart beats 167 times a minute.”
(…) (Family gets on the bikes.)
Youngest girl: “When should we start?”
Father (with glasses): “It reads the pulse. See, it reads our pulse.”
Father (with glasses): “Great, you’re in the lead. Where are the others? It says you have more power. It says give it all you’ve got! Come on! Yes!”
[00:15:34.08] Father (with glasses): “See, it’s our pulse.”
(…) (Interview right after Family 2 tried the Bike Shed.)
Youngest girl: “I’m sweating!”
Interviewer: “I can see why.”
Father: “There’s nothing intellectual about it. It was very physical.”
Girl: “Try to feel how much I am sweating!”
Interviewer: (laughs)
Father: “Yes, it’s wonderful.” (laughs)
(Transcript, eye-tracking studies of Family 2 testing the Bike Shed installation in the PULSE exhibition)

In the above situation the girl and her family acquired useful information from various sources. Before getting on the bikes they saw how to use the installation by watching another family. The father mentions just one of the people in front of them to help explain what is being measured: “His heart beats 167 times per minute”. The interaction between the father and the girls at this installation focused on him physically challenging the girls by encouraging them to bike faster. This is perhaps what the girl referred to later when she said she had gained new knowledge about “what you can do that you weren’t aware of.” After the activity, the girl stated that she was sweaty, referring to what could be called embodied information. She also mentioned new knowledge concerning finding out about the body on the inside. These experiences were covered by the first category, concerning knowledge about effects, in this case the bodily effects the surrounding environment caused that the respondents in Family 2 mentioned. An analysis of how the bike installation supported this understanding showed that the interaction between the bike, the screen and the people biking is focused on providing the audience with technical data about their heart rate and about challenging them to race against each other. This represents a self-monitoring technology that provides feedback on the individual performance compared to other competitors (Magnussen & Aagaard-Hansen, 2012).

In our studies, the grounded theory analysis and resulting themes led to a map of focus points for our studies. In combination with this, the analysis of the eye-tracking data contributed detailed information about sources of knowledge that could be coupled to themes defined based on grounded theory analysis. The eye-tracking data analysis provided an indication of what aspects of the exhibition influenced audience knowledge. Analysis of eye-tracking data allowed us to triangulate self-reported data on the expressed audience experiences from interviews with results from gaze points and audio recordings of dialogue recordings from the eye-tracking glasses. In the analysis we were able to pair results from the grounded analysis of interview data with results from eye tracking on both how participants received information about how to use the installation and what kind of information the installation provided them with as part of the interaction.

5. Discussion and conclusions

The aim of the current study was to methodologically explore the possibilities and limitations of MET for studying visitor experience and learning in the setting of the health promotion exhibition PULSE at science centre Experimentarium in Copenhagen. MET has been widely applied to studying the interaction with an exhibit of a single individual at a museum (Mayer et. al. 2009). This has, however, been criticised for compromising the study of what visitors experience at a museum and their social interaction, which is an important part of the natural environment of exhibitions and the museum experience (Coffee, 2007). This paper described the methodological potential and limitations of MET when applied as a method for studying informal e-learning in family and school groups in an authentic exhibition setting. Based on the findings of a previous study (Magnussen, et al., 2016), we divided the methodological reflections into three levels: 1) interventional, 2) data and 3) analytical.

At the interventional level we presented how, in the social setting of the PULSE exhibition, MET becomes an intervention in the intervention. In contrast to what Mayr, et al. (2009) reported, the results in the current paper showed that various test persons or group members interacting with test persons said they were aware that their gaze was being monitored.
The MET equipment intervened at both the individual and social level. Comments from visitors on what it was like to wear the eye-tracking glasses were possibly connected, in part, to the context of the studies. PULSE is a highly interactive exhibition focusing on activities that require a high degree of physical activity. The eye-tracking glasses became an intervention in the interaction with the exhibition, which involved jumping, dancing and cycling. One possible means that can be employed to minimise the perception of the glasses as an intervention is to reduce 30 to 60 minute intervals spent in the PULSE study. Socially, the intervention resulted in positive and negative responses, specifically in family groups. Comments by participants not wearing the glasses indicated that the glasses affected them because, for example, the parent looked unusual or they drew extra attention from the rest of the group. The obtrusive aspect of the method is difficult to minimise when working with family groups with younger children, who may react more to them as a foreign, unfamiliar object. The glasses and visual data on gaze point were thoroughly introduced to the various family members before the adults wearing them did the test. Our results indicate that the obtrusiveness of the MET measurement is more present in an authentic social museum context compared to more controlled studies, where the test person wearing the equipment visits the exhibition on his or her own (Mayr, et al., 2009). Based on the implications of the cases presented, we argue for a continued study of how to minimise the intervening factors of MET equipment, including the reactions of family members, especially younger children, to the parents or guardians wearing the unfamiliar equipment.

At the data level, this paper examined how the MET method can contribute new types of data and perspectives on analysing how audiences develop the knowledge mentioned during their post-visit interview. At the data level it became clear that the MET method can offer new types of detailed data on sources of knowledge from the visitor’s point of view that would potentially not be available with other data collection methods. Being able to track the test person’s gaze and direction provided valuable knowledge only visible from the first-person perspective. The method also revealed detailed information about what sources of knowledge visitors overlook, for example, vital information on PULSE exhibition signs. Due to its ability to provide this type of detailed data, the methodology is well suited for conducting future research on exhibition screens and digital platforms. The methodology thus offers great potential for future studies of visitor interaction with various types of learning technology in exhibitions due to the fact that it is possible to follow actions such as reading and other information processing in detail. One of the difficulties in the social groups, however, was that it was difficult to distinguish respondents from one another if the test person wearing the MET glasses was not looking directly at the person speaking. Future studies should taken this into consideration when determining how to develop the method.

At the analytical level, the study showed that the methodological choices in the combined interview and eye-tracking data collection also have implications for the analytical approach and generation of results. At the analytical level we discuss the approach for analysing and connecting findings from the different types of data in the study. In the current study short group interviews were conducted after each group was finished with its visit to the PULSE exhibition. The aim of the interviews was – in addition to and separately from the eye-tracking data – to understand what knowledge the audience gained from the exhibition. This allowed us to pair interview data with the eye-tracking data to investigate what interaction and activities led to the knowledge described in the interviews. Eghbal-Azar and Widlok (2013) report on conducting interviews with participants after the visit while simultaneously showing them the recording of their gaze points during their visit, thus providing the opportunity for participants to comment on actions at specific times and places. In accordance with Mayr et al. (2009), our analysis of eye-tracking data clearly shows that just because participants are looking at a fixed point, it does not mean their attention is focused on that specific exhibition item, for example, when visitors overlook information about exhibition features even though they looked at it. One way to improve the data and expand the analysis of whether the object and the visitor’s attention coincide would be to do more extensive individual interviews with questions on knowledge gained and specific gaze points during interaction with the exhibit installations. The MET approach generates a large amount of varied data that can be useful in analysing a large variety of issues. Apart from gaze data, hours of accompanying audio recordings can serve to indicate the general focus of the test person’s attention, making it possible to analyse their utterances and interaction with the people near them in relation to research themes of interest.

Overall the study contributed new knowledge to understanding the methodological potential of the MET approach in an authentic social science centre context at all levels of visitor research. At the interventional level, MET equipment becomes an intervention in the intervention in a social context, where both subjects wearing the equipment and the group members they interact with are highly aware of the gaze being
monitored. Future studies involving MET methods should focus on this interventional factor and develop study designs to minimise it. The MET approach, however, also provides new types of data and valuable new knowledge, specifically due to the fact that it records the gaze from the first-person point of view, leading to new types of analyses concerning what aspects of digital platforms and physical surroundings contribute to informal e-learning in the social exhibition setting. Our study thus showed that the MET method allows an analysis of specific areas based on tracking, in detail, knowledge and actions such as reading on screens and interaction with other learning technologies in exhibitions. The methodology, however, also proved to have limitations, specifically due to the interventional aspects of the MET equipment. As a result, future studies should further explore the analytical potential and interventional implications to a greater degree.

References


Moving Outside the Box: Researching e-Learning in Disruptive Times

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Abstract: The rise of technology’s influence in a cross-section of fields within formal education, not to mention in the broader social world, has given rise to new forms in the way we view learning, i.e. what constitutes valid knowledge and how we arrive at that knowledge. Some scholars have claimed that technology is but a tool to support the meaning-making that lies at the root of knowledge production while others argue that technology is increasingly and inextricably intertwined not just with knowledge construction but with changes to knowledge makers themselves. Regardless which side one stands in this growing debate, it is difficult to deny that the processes we use to research learning supported by technology in order to understand these growing intricacies, have profound implications.

In this paper, my aim is to argue and defend a call in the research on ICT for a critical reflective approach to researching technology use. Using examples from qualitative research in e-learning I have conducted on three continents over 15 years, and in diverse educational contexts, I seek to unravel the means and justification for research approaches that can lead to closing the gap between research and practice. These studies combined with those from a cross-disciplinary array of fields support the promotion of a research paradigm that examines the socio-cultural contexts of learning with ICT, at a time that coincides with technology becoming a social networking facilitator. Beyond the examples and justification of the merits and power of qualitative research to uncover the stories that matter in these socially embodied e-learning contexts, I discuss the methodologically and ethically charged decisions using emerging affordances of technology for analyzing and representing results, including visual ethnography. The implications both for the consumers and producers of research of moving outside the box of established research practices are yet unfathomable but exciting.

Keywords: qualitative research, socio-cultural contexts, ethical issues, critical theory, visual ethnography

1. Introduction

These are disruptive times. In a recent nationwide discussion on the benefits of higher education, a panel of young students, aspiring professionals about to graduate from their respective university programs, were asked about the key take-away, in their views, of the years they had spent in the various well-respected institutions they attended. Their unanimous answer could be considered surprising. They concluded that the value of those years was not what was learned, indeed, many claimed they recalled nothing with respect to facts or information that constituted their courses. Instead, it was the strategy of how to learn that they saw as the most vital gain they made from those years of study. It seems in this fast-paced, technology-driven world in which we as educators live and work, our focus is often on the what, when, why and where of learning that takes precedence. Stopping to reflect about the how to learn, in other words the tools and strategies that influence us and the ways we learn seems to be a luxury for which most of us find little time. Researchers are no exception.

In this paper, an opportunity is provided to do just that. Pausing to consider how we as researchers learn and others who depend on our work, involves critically examining the research tools, methodologies and methods that we consider are able to lead us to new knowledge and insight. In pausing, we not only need to ask critical questions about where we have come from in terms of tools, methodologies and methods for conducting research. It is also imperative to examine where we are going, given the emerging use of ICT both in our research of e-learning spaces and the digital tools at our disposal for conducting these activities, particularly in the changing field of education. Underpinning an aim to take time to stop and question is, first of all, the growing call for grounded theory to inform technology-based learning design and development (Calic and Resnyansky, 2015; Hill et al., 2009). Secondly, it is the need to disrupt current orthodoxy and challenge fixed categories in how we conduct research and what constitutes legitimate in terms of research knowledge in order to effectively respond to that call. In others words, what are we missing in terms of our understanding of how to learn in e-learning spaces, by relying predominantly on numbers-driven research approaches? Or expressed in another way, what knowledge that is essential to our understanding of e-learning lies undiscovered by adopting a narrower view of what constitutes value in terms of data, research findings and approaches?
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The paper is intended to be a critical reflection of the methodological challenges facing e-learning research during its brief history. I begin this reflective process by providing some background stories of researching e-learning spaces that I have conducted alone or with others over the last fifteen years. The decision to present these stories at the outset followed by the theory and historical references that can help to explain them rather than the reverse is meant to be reflective of the heuristic process that my own path in researching e-learning has taken. This decision is also based on the belief that by casting light on the normative in each of these research settings and unpacking the intricacies within, we are better placed to enable a critical perspective (Darvin & Norton, 2013) towards what was occurring in these situations. My aim in recounting these stories is to reveal concrete examples of how some of the quantitative/qualitative paradigm struggles that have arisen over the last twenty years have negatively influenced the development of e-learning practices. From my perspective, continuing in this trajectory will ultimately limit us from generating critical knowledge in the field. My goal is not only to build a case for greater respect for qualitative research methodologies in the evolving field of e-learning research, but also to provide a basis for further theoretical discussion on the need for change in the narrative in terms of researching e-learning spaces in the years to come.

2. The Development of E-learning Research – a personal experience

In 2001, when I first began researching the implications of technology in learning sites, I raised the point that the research that was being conducted at the time was failing to answer the questions that were arising in my own and fellow teachers’ practices. For example, while we were attempting to understand why initial enthusiasm among learners to use technology tools for learning was waning after 5-6 weeks, scholars were focused on producing numbers-based results to support greater accessibility to the very same tools. Or in the same vein, while we were beginning to unravel the need for more social-learning based tools to give agency to learners in their learning process, many researchers in ICT were, and arguably still are, attending to the affordances of ever more powerful information-transfer-based technologies and those for repetitive practice (Chapelle, 2003). We witnessed all too clearly how these technologies inevitably placed learners at the periphery of the learning process and as receivers of information rather than agents and generators of knowledge production. Indeed post-structuralism theories are showing “real” learning takes place precisely in contexts where communication to construct knowledge among individuals is fostered. Our focus at the time was on the influence of emerging social networking technologies that enable learners to interact with others while engaging in and building community (Lave & Wenger, 1991). We were convinced that these communities could provide agency and support our learners’ creative process of socially constructing knowledge. It is clear that our efforts were, albeit unconsciously perhaps, closely aligned to 21st century social cultural theories.

Looking back from our current vantage point to these contradictions and armed with a deeper theoretical understanding of what we were experiencing at that time, I realize that the tensions that I personally was sensing while researching within the field of e-learning were rooted in diametrically opposed epistemological and ontological beliefs. From Hofer (2002, p. 4) I understand one’s epistemology as reflecting a belief about “the definition of knowledge, how knowledge is constructed, how knowledge is evaluated, where knowledge resides, and how knowing occurs”. Ontology on the other hand, explains one’s view of the nature of human beings and their relation to one another and to their tools. For example, in simple terms, a quantitative researcher’s perspective of knowledge about human behaviour in an e-learning situation can be explained with statistical results from individual responses to a survey or their reaction to stimuli in a decontextualized experimental situation with a strong emphasis on discovering causality (Hammersley, 2013). On the other hand, a qualitative researcher might feel justified claiming to understand behaviour once armed with rich detailed data gained through a complex combination of extensive observation of and testimonies from human beings interacting in ‘real’ technology-embedded situations, as well as rich contextual information from those e-learning spaces. Heigham and Croker (2009) explain that for qualitative researchers “[the] research focus is on the participants – how participants experience and interact with a phenomenon...in a particular context...” (p. 7).

Thus, depending on one’s stance with regard to philosophical beliefs about knowledge and human behaviour, one is necessarily drawn to different perspectives of technology, its pedagogical use and even the means, i.e. methodologies, employed to examine that use. The tensions that ensue from these various standpoints have traditionally been explained, as in all human interactive activity, by struggles of power (Bourdieu, 1991) and the conditions within such interactions that set up unequal access for being heard. An unpacking of the power
relations that seemed to be clearly at play in the sites in which my early studies in technology took place, I believe, can serve as examples of these power struggles. A common characteristic of these various contexts points to the hegemony shown to be exercised in these institutions of learning that influences not only e-learning practices but also how they are researched. By hegemony, I reference Hinkleman and Gruba (2012) and the way institutions privilege certain practices, concepts and tools that support their own, most often economic and sometimes ill-conceived, agendas.

In the next section, I weave together some further personal narratives of my research experiences and the critical theoretical lens through which I have chosen to frame them. I ask myself what insights they can offer to our discussion and exploration of research practices, as well as their acceptance and dissemination, especially in view of a burgeoning field of e-learning research and increased journal publications in this area. In posing this question, I acknowledge my position as a researcher who seeks with each project I conduct to promote human connection. It is within these connections that I see the greatest potential for learning. I also understand along with Bonk & Graham (2006) that education and technology are the main tools that we have in our globalized realities with which to confront and overcome the uncertainties and changes in the world that can rob us of control over our lives.

One of my earliest studies (Charbonneau-Gowdy, 2009) took place in the context of a NATO language immersion program, where military officers from former Soviet countries came to Canada to increase their skills in English. The program design included not only classroom teaching, but also exposure to a multi-million dollar Canadian government-funded and in-house developed, multimedia language learning courseware. There were many complaints from teachers and learners in the NATO program about the structured nature of these tools, the questionable value of their information-transfer pedagogical basis and the fact that they were not culturally aligned to the realities of former Soviet military. Yet, the power of IT selection policies on the part of the government to ignore these complaints was ever-present. The strong evidence generated and backed by substantial qualitative findings in the longitudinal Action Research study that I conducted indicated the lack of effectiveness of this multimedia software in terms of developing the language learning and self-directed learner identities of these military. Not surprisingly, these findings were ignored. It was made clear from reactions to the results of the report that a more numbers-driven, quantitative research approach was expected and any alternative was of marginalized interest.

A second example of power and hegemony infiltrating the practices of e-learning research can be found in a further study I conducted in Canada within a government department mandated to provide French and English second language training to federal public servants. The qualitative 6-month study (Charbonneau-Gowdy, 2009) consisted of researching an innovative distance-learning program that offered language learning-in-use to small groups of geographically dispersed public servants living outside urban areas and cut off from essential face-to-face SL practice. The sessions were supported technically by a robustly-powered videoconferencing technology considered as state-of-the-art at the time and developed for the sessions by a small independent start-up tech company. Through an international exchange agreement between Canada and the Czech Republic, the sessions were also provided to undergraduate military students in a university in the Czech Republic. A fellow researcher in the Czech Republic simultaneously conducted a quantitative study with the Czech participants (Cechova, 2010). Both studies' results uncovered significant evidence of the strong pedagogical value of the distant ESL program.

Meanwhile, within the Canadian context, the government was constructing an ILMS site that would support a costly in-house language learning’ program that was being specifically designed to resemble commercial online Second Language (SL) programs, despite the lack of research supporting the effectiveness of these commercial programs at that time. The project was driven by government’s aim to reduce the need for language teachers and yet justify that the department was meeting its SL training mandate. In the Canadian government ILMS-based program, an in-house department-led quantitative study was complimented by my 5-month qualitative study. Results of both studies were conflicting; the qualitative showing far less encouraging results. Ironically, the commercial programs consisting of stand-alone, information and practice-based software on which the ILMS were based have subsequently been shown to lead to such high rates of attrition that measures of learning advances were impossible to determine (Nielson, 2011).

While strong evidence from the rigorously conducted research of the distance learning video-conferencing sessions indicated their positive value in terms of learning and identity construction, the ILMS program with
conflicting results prevailed as the official government choice. The subsequent decision to terminate the distance videoconferencing sessions in Canada and for the Czech Republic after two years, despite its obvious sustainability, although disappointing on the part of many learners, was not surprising. Complex power structures embedded in that decision making were evidently intertwined with other priorities. Research is always political. Now years later, there is anecdotal evidence that the government has decided to return to traditional forms of classroom language teaching after years of poor results from their previous ICT choice.

Following is a third example to illustrate the current conflicting views of what constitutes valuable knowledge and also to highlight a further example of the power structures that influence research practice in the field of e-learning. This example is based on numerous studies I have conducted with others in the context of an EFL teacher education program in Chile. In this context, the various qualitative inquiries and projects I have led over the last five years have aimed at instilling an interest in, and initiating a dialogue about e-learning. To continue to push for qualitative research has constituted a significant challenge given the traditional research and pedagogical environment that exists in Chile (Sadler and Arancibia, 2015). This traditionalism is evident not only in the pedagogical practices of many educators but also in the propensity within the Chilean educational community for valuing quantitative over qualitative research practices, especially at the tertiary and national government level. After almost 5 years of working and researching in this context, it has become apparent that qualitative research remains under valued and e-learning at the rhetoric level, except in the efforts of a few maverick innovating educators, researchers and pre-service teachers (Charbonneau-Gowdy et al. 2015, Sadler and Arancibia, 2015). The challenges that stand in the way of a broader view of research in e-learning seem to lie in a pervasive perspective that equates learners to customers, i.e. statistics, that just need to be satisfied and retained. This perspective is also characterized by a view of technological infrastructure as an add-on tool, the purpose of which is to cater to the knowledge transmission practices of a majority of faculty.

All technological systems including the e-research approaches with their different modalities that seek to understand them, are embedded in “political webs of significance that tend to remain invisible”. (Hornborg, 2008, p.4; Feenberg, 2002). In each of the three narratives related above, it is clear that military, government and university decision-making officials, have chosen to ignore the robust qualitative evidence that supported their investment in the use of social learning technologies and the effective teaching/learning practices that were being promoted through their use. One could easily conclude from these not uncommon scenarios that senior policy makers’ decisions concerning e-learning reflect the complex ‘invisible’ agendas of large institutions to which most individuals, educational researchers included, are often not privy. Yet, scholarship in education based on critical theory reminds us of the important value of examining such educational scenarios and decision-making for our understanding of how to promote change despite the barriers that we confront. According to this scholarship, only through research processes that are preoccupied with contextualized data generating and that are human rather than object oriented (Hendry, 2007), as within the qualitative research paradigm, can we seek to disrupt such decision-making.

To understand this view requires a first brief look back at the history of qualitative research in education, followed by an explanation of the critical and ecological perspectives that exist within this field. Through the lens of history and these perspectives, I underline the significant contribution that qualitative research has made to our understanding of the emerging essential and complex role that technology is and could play in formal learning sites.

3. A Brief History of Qualitative Research in Education

A perusal of recent journals on education and technology and/or e-learning demonstrates the lack of qualitative research that exists in this emerging field. This paucity in representation reflects a similar one that occurred in broad educational research in the early 80’s. At that time, Paradigm Wars that were waged between positivists and post modernists centred on arguments that rested on notions of incompatibility of qualitative and quantitative methods and the fundamentally different worldviews that existed between qualitative and more traditional researchers (Donmoyer 2006, p. 23). But by the mid 1980’s, as a result of these wars, qualitative research managed to position itself as a respected form of inquiry. Emerging Vygotskian-based views of learning from a sociocultural perspective were also necessitating a research focus on the contexts of learning. Guba and Lincoln report (2005, p.191) there was an explosion of qualitative studies and the proliferation of qualitative inquiry led the way for a “distinct turn in social science research
toward more interpretive, postmodern and criticalist practices and theorizing”. Indeed, qualitative research predominated as a basis for inquiry in the field of education for over twenty years. Then shortly after 2000, Denizen (2008) explains, subsequent to 9/11 and the rising fears in the Western world fueled by global political and economic instability, government and institutional accountability structures responded. Their response led to a resurgence of a preference for a new positivist scientific ideology and a re-opening of the questioning of qualitative research in education as a legitimate method of knowledge generating. The current marginalized status of qualitative research that exists in the field of e-learning today seems non-coincidental considering that e-learning journals began to emerge precisely at the time of the re-opening of this qualitative/quantitative debate. The institutional roadblocks that I confronted and explain above through my research stories, occurred around the same time and are arguably a further reflection of this period of controversy over the legitimacy of various knowledge sources.

In light of and in response to these ensuing debates, the choice qualitative researchers have been facing has been to join the call to reignite the Paradigm Wars (Hatch, 2006, for example) or from others (Guba and Lincoln, 2005) to participate in initiating a paradigm dialogue. In view of the conflicting tension, still other researchers have chosen a middle road and combined the two approaches under a mixed methods paradigm. Yet, given the relatively young field of e-learning wherein many qualitative researchers’ passion to research and promote change lies, constructive discussion seems to be the ideal place in which to put one’s efforts. Through such discussion (Lincoln & Denizen, 2003), there is a forum to document how qualitative research, combined with the various ethnographic tools available in this approach, has the potential to unpack constructions of social reality in digital spaces that are still undiscovered. These discoveries could permit us to enrich our understanding of the human condition in these unique spaces. Such discussions beg attention particularly in the context of learning where new emerging technologies are involved. Within these human activity sites, as illustrated above, the inherent presence of power can either limit or allow the freedom of others to learn and develop. Indeed, many qualitative researchers in Second Language Education (SLE), the research field within which the research stories above are located, frame their inquiries on critical theory (Darvin & Norton, 2015; Warschauer, 2011, Cutrim Schmid, 2006). In the next section, along with critical theory I explain how within qualitative research we find the tools, including new technology-based ones that are essential for uncovering these power structures. In this explanation, I draw from SLA literature to provide a further argument for working within this paradigm and the value of the exploratory processes it supports.

4. Tying Qualitative Research and Technology to Postmodernist Theoretical Issues

In my early years of researching emerging social networking technologies, I often expressed the hope that these new and increasingly powerful technologies could offer a “third space” or what human geographer Lefebvre (1991) calls ‘espace vécu’. By third space, I was envisaging a virtual space lived through social practice where learners could resist dominant discourses that are present in more traditional formal learning spaces. I saw hope for technology-supported learning as a site for individuals to connect in order to learn and develop their potential through communication with others. These hopes represented at the time, and still today, a stance that reflects a postmodern perspective of technology. Postmodernists seek to question assumptions of knowledge and practice (Pennycook, 2006). Working from a postmodern perspective, Feenberg (2008) developed a critical theory of technology that has been useful for my own inquiries. The theory asserts that technologies are socially constructed practices-in-action and not objective entities as many researchers who research in technology and e-learning seem to assume. His theory is critical in the way that it confronts deterministic views that hold that technology can dominate and control human action as well as utilitarian or instrumental views that regard technology as simply a neutral tool that supports the learning process (Hinkleman & Gruba, 2012).

In the field of language education, for example, Warschauer (1998) has established that the majority of Computer Assisted Language Learning (CALL) researchers have assumed instrumental views (technology as a neutral aide). He argues that in so doing, researchers have overlooked the power of technology to change language education both by creating new literacies and de-emphasizing the orthodox ones. Underpinning the instrumental view of technology is a corresponding choice of research methods that is objective rather than human-centric and that skims the surface in determining how technologies are influencing learning, and importantly learners, in practice. According to Cutrim Schmid, (2006, p. 27), the downside of prioritizing experimental approaches to research in technology that reflect a deterministic (tool centric) or instrumental (tool minimized) approach to the study of technology is that these approaches decontextualize the technology
in order to study its essential characteristics. In other words, this kind of research promotes a view of the nature of technologies as fixed (an essentialist view) rather than adding to an understanding of the nature of technologies as being dependent on the action in which they are used (relational view). Importantly, she connects the lack of academic status of research in technology, particularly CALL research, to the apparent absence of strong theoretical frameworks in this area. She refers especially to frameworks that fail to stress the necessity of contextualizing technology and understanding its social embeddedness and the implications of its use as it is integrated into a context.

Conducting more research that asks questions about the use of technology in context presumes methodological tools that lead the researcher to focus on human beings and what happens as they appropriate technology into their learning. Tools within the qualitative paradigm are designed precisely to unravel the stories of such contexts. As Bruce (1997, p.12) points out “in order to understand what technology means, we must examine how it is designed, interpreted, employed, constructed, and reconstructed through value-laden daily practices”. To get at the multiple areas in “value-laden daily practices” involving new emerging technologies with their expanding capabilities, qualitative research offers multiple tools that simply are lacking in experiential research paradigms. Indeed, the growing importance being placed on teacher reflective practice and classroom-based research (Borg and Sanchez, 2015) are leading to an increasing number of teacher/researchers taking advantage of these tools. Following are two examples from the field of SLA research that exemplify the value of qualitative methods and classroom-based research to lead to new understandings of technology use in context. Through the iterative process of conducting such research I believe there is a beginning to see new sources of understanding, and importantly, openings for using ever more powerful technologies to support qualitative research practices.

The first example is a study conducted by Hinkleman and Gruba (2012). The qualitative longitudinal study conducted in tertiary education institutions in Japan used action research and ethnographic tools to examine the blended learning practices involving electronic technologies in these institutions. The inquiry benefited from an insider/outsider positionality account of the learning environment along with extensive data generated through interview transcripts, teaching journals and institutional documents. Through the voices of the teacher participants and using postmodern, critical, and ecological perspectives of technology, they explored the hegemony in facility planning (online vs. face-to-face), control of materials development (publisher-based vs. teacher-based authorship), and development of software designs (proprietary ownership vs. distributed teacher initiatives). Their findings emphasized how power was redistributed through the blended learning design, which allowed face-to-face teaching, teacher-authored materials, and locally-designed software to take on greater prominence. Important to our arguments for the power of qualitative research to uncover new knowledge, the Action Research led to important changes in the program design. The findings also revealed that the management structure of the teaching faculty involved in the study was of more significant influence on the design of blended environments than techno-centric, experimentally-driven CALL studies could have suggested.

A second qualitative study that supports the arguments I am raising here, was conducted by Cutrim Schmidt (2006) in Germany. In her study, she examined the use of interactive whiteboards (IWB) in teaching multi-disciplinary groups of international students enrolled in college ESL programs. As teacher/researcher in the study she was in a privileged insider position for collecting a large quantity of rich ethnographic data from a variety of data sources: classroom observations and feedback from critical colleagues, teacher’s field notes, video recording of classes, an online discussion forum, classroom discussions, semi-structured interviews with students, and pre- and post-course student questionnaires. In adopting critical theory in the analysis of the data, she reveals through the voices of her students how various individuals and groups appropriated and reconstructed the technology depending on the social dynamics and their learning processes. She argues that the new ways in which the affordances of the IWB were exploited and adapted in favour of a more learner-centred and discursive pedagogical approach, underline the relational view of technology. This view along with a comprehensive theoretical analysis of the social and pedagogical issues involved in the use of the IWB uncovered novel and innovative ways that the technology was transformed in practice. She concludes that her findings constitute important forms of knowledge that would have remained unavailable with an experimentally designed research study based on efficacy- and instrumental-oriented forms of analysis.

Both of these studies highlight the pragmatic use of qualitative research in unpacking the complex social cultural contexts of technology use and its implications for learning. The implications of social cultural theories
for knowledge generating in the field of e-learning have been well documented (Hill et al., 2009). According to Hill et al. (p. 88), the most important of these implications for web-based learning environments (WBLE) are the knowledge they provide to us in terms of: a) learners’ individuals characteristics in WBLEs b) strategies for promoting social interaction within WBLEs, and c) informing design principles for effective practices in WBLE.

5. Projections for the Future – methodological and ethical

While joining with others (see Levy, 2015, for example) in making a strong case for increased recognition of and activity in qualitative research in the field of e-learning, I am cognizant that there are unique ethical and methodological challenges within digital spaces that need to be considered in responding to this call. Some growing concerns have been expressed about the limitations of traditional qualitative tools to explore socio-cultural based issues in complex learner interactive digital spaces (Thorne et al., 2015). The growth of distributive learning in higher education, especially massive open online learning courses (MOOC’s) and the influence of large data sets offers an example of these challenges (Levy, 2015). Given the sheer numbers involved in such courses, the reality of uncovering rich data to attain a deep understanding of learners’ perspectives that is typically sought in qualitative studies seems to render this aim unattainable. And yet without the salient features of these particular mediated environments available to us through a range of ‘learners’ eyes, how can we hope to improve their obvious ineffectiveness in terms of attrition?

Thorne et al. (2015, p.224) recognize these methodological challenges and especially in their research on identity, which post-struturalists consider key to understanding the process of learning. Their recommendations to meet these challenges include: incorporating self-reports into the research design, routinely conducting strategically-timed semi-structured interviews throughout the study rather than just at the end, adding open-ended questionnaires. By using an interpretive phenomenological analysis of the participants’ experiential accounts, uncovered through interviews, they suggest that more extensive data about online experiences can be gained. Additionally, there is a potential to improve the interpretation of the learners’ experiences, particularly in providing a deeper understanding of what they choose not to do online. This information is essential to capturing a sense of the identities learners are constructing in online sites. I would add that the sophisticated learning analytics tools used increasingly by higher education institutions to inform student retention issues, could also serve in these situations. By leveraging the affordances of these powerful tools, thematic areas in the various data sets could be drawn out and then addressed in online focus group interviews.

Gathering an understanding of the setting and its contextual details as a means to uncovering the nature of learners’ experiences is key in the work that qualitative researchers do. Levy (2015, p.554) remarks that “It is in the unpacking of what students actually do moment-by-moment in ...tasks and activities that best illustrate the strengths of qualitative methods in enhancing our understanding of mediated learning and thereby driving productive research agendas.” Levy cites O’Rourke’s (2008) defence of data collection methods that involve capturing video files as an effective response to the many data sources that are being neglected in e-learning. Visual ethnography has been a key tool in qualitative research in the field of sociology for over a decade (Pink 2001). Recently, I have chosen to include visual ethnography as part of data collection in a study of a large-scale online language learning program offered to faculty and employees in private higher education institutions across Latin America (Charbonneau-Gowdy, 2016). In the analysis of the video data collected during the videoconferencing interviews with participants I uncovered salient themes with regard to identity and investment as the participants related their experiences in the distant courses. The paralinguistic and non-linguistic behaviours – gestures, spoken utterances, posture, data I collected as we mediated meaning in the oral interviews added to an understanding of the meaning making that took place in the distant courses. It was clear that this understanding would have been “impoverished” (O’Rourke, 2008, p. 236) had we relied solely on the numerical data from questionnaires or the audio transcripts of the interviews. As formal and informal learning moves increasingly online, our research needs to feed into those spaces and exploit them for the knowledge sources they can provide.

Of course, exploring new spaces and forms of data collection while studying e-learning spaces raises new ethical issues. Many of these issues are already being confronted by the commercial use of the Internet where copyright and privacy issues abound. It is a complex area of concern especially to qualitative researchers for whom the major driver in their work is protecting the rights of those who traditionally have been overlooked or denied a voice in experimental research approaches. Yet, at the same time as conserving strict ethical
consent procedures to protect participatory research practices, it is vital to consider scholarship that cautions that an over-preoccupation with these issues in a struggle for control and power can be the demise of qualitative research as a movement into e-learning spaces (see Denizen’s, 2008, explanation of an earlier result of such over-emphasis). Instead, we see answers to these ethical concerns in viewing the challenges as opportunities for acknowledging the richness of human conditions as we sort out creative ways and practices to protect “Others” in the ever-shifting, complex contexts where technology advances human connections.

6. Conclusion

When we cross the line from believing that learning is a process of information transfer to an understanding of learning as a complex co-constructive dialogic process of persons and cultures in communication that leads to cognition (Vygotsky, 1978; Bakhtin, 1981), I believe we must also take a further step. That next step is for us to accept the fact that the ‘objective’ analysis of numerical data cannot hope to replace, although complimentary to, the subjective interpretation and understanding of interpersonal communication. In Geertz’ words, (1973, p. 5), we must be prepared for the ‘complex webs of significance that we ourselves have spun’. Indeed, in the virtual world in which increasingly human beings work, play, conduct commerce and learn, i.e. live out their realities, those ‘webs’ have become all the more numerous, shifting and complex. We must be prepared. In 2015, fifty percent of the world’s population registered a connection to Internet, over one-third of these in the developing world. Experts say it will reach two thirds of the population in the near future. In light of this trajectory, I join Bettez (2015, p. 939) in raising the question: If qualitative research is a way to uncover and then represent various constructions of social reality as a means to enriching our understanding of those spaces, including e-learning spaces, then how can we best go about this and for what purpose? In this paper, I have attempted to answer those two questions, but in reverse.

First of all, I have examined the “for what purpose” or why we need to expand our efforts to conduct qualitative research in the field of e-learning. As a researcher, I have witnessed what Grgurovic et al. (2013) calls a “publication bias”, i.e. a preference in technology journals for statistically significant findings. Space limitations that are imposed generally favour means and standard deviations reporting and not lengthier qualitative representations of research. I sense the frustrations of some of my teaching colleagues with the results from numbers-driven experiential approaches in responding to the complex questions and challenges they face as they attempt to incorporate the socially networked technologies into their practices. I harken their need for quality classroom-based research that is theoretically supported and that provides understandings that can be applied and tested in their own teaching.

To further support an argument for a greater acceptance of qualitative research in e-learning, I have documented the historical significance and prominence that this research paradigm has earned in a cross-disciplinary range of fields in education for over twenty years. I have located the theoretical basis for my arguments in postmodernism and critical theory. Based on this theory, I have justified support for a qualitative research approach as a unique means of addressing issues of power, identity and investment that are inherent in all social meaning making contexts, and including e-learning ones (Darvin and Norton, 2015). Increasingly scholars in education are agreeing on the critical importance of considering these constructs in understanding and adapting traditional learning contexts, and as learning moves online. Along with other researchers, I have argued that virtual learning spaces proliferating online, require an open-ended, reflective interpretive approach to data generating. This approach is unique in the possibilities it offers to provide pragmatic understandings to yet unimaginable affordances, issues, and reconstructed practices of technology tools that can be expected to evolve when learners and teachers mediate meaning in digital spaces. In these contexts, I see the vital need for qualitative research that can uncover systems of power such as those in the accounts of my research in military, governmental and higher education institutions, powerful systems that evidently continue today. Recognizing is the first step in changing.

Through the testimonies of students and maverick educators, I also hear a cry for grounded, reflective research that can interpret ways that technology can be employed in practice as a means of empowerment in their teaching and learning. I see a response to these cries in rich accounts of research situations that are described with relevant detail and told reflectively. From first hand experience and scholarship, I am convinced that these kinds of accounts are critical for fostering other practitioners to draw parallels in their own practice (Charbonneau-Gowdy, 2014; Pavlenko & Lantolf, 2000). In this way, I believe we can move effective e-learning from the periphery, i.e. at the discourse level, to the level of practice.
Secondly, in order to respond to the application or “how to” of qualitative research, I have highlighted the uniqueness of e-learning spaces. As James and Busher (2009) point out, there is now a rich body of literature in the social sciences illustrating how the Internet has become a site where the construction of practices, meanings and identities of individuals and communities can be researched in ways that may not be possible in the physical world. I have mentioned only a couple of examples of increasingly more powerful technology tools that can support the examination of the issues that preoccupy most of us in coming to terms with the challenges we face in e-learning teaching and research.

While admitting the disadvantaged position in which educators and researchers find themselves today in facing the many challenges in e-learning research, both methodological and ethical, I view this disadvantage also as a position of power. Borrowing from Norton’s (Darvin and Norton 2015, p.48) explanation of the concept of Bourdieu’s (1986) “sens pratique” that she uses to provide a guide for learners in their negotiation of the complexities and mobility of the digital age, I see parallels for those contemplating qualitative research for e-learning. A ‘practical sense’ when it comes to researching online from a qualitative perspective involves: 1) working at understanding and uncovering the rules, discourses and norms that are governing technology spaces; 2) shifting our practices and methods by making use of, for example, the code-based theory building software programs and learning analytics tools to organize and analyze large quantities of qualitative data that can be generated in digital spaces (Lee and Esterbuizen, 2000), of course with ethical caution; 3) exploring innovative ways for data generating and for representing and reporting on the multiple contextual issues that are involved in researching humans interacting in digital spaces for learning.

I have cited scholarship in visual ethnography as an example of the powerful new technology resources available, yet still for the most part unexploited in e-learning research. Perusing online journals in e-learning, not to mention this paper itself, one quickly realizes how representations of knowledge conform to traditional orthodoxy and continue to grip onto the authority of word-based text and numerical graphs in research accounts. This disconnect between the research world and a 21st century digitalized world where there is a complete reliance on the visual for making sense and understanding human realities (Kress, 2003), is another wake-up call for a reconsideration of how we practice and represent research about and with technology use. Qualitative research can offer an opening for such alternative ways of “seeing [and doing] in different ways.” (Fahey and Prosser, 2015).

Raising critical questions about the current statute quo always carries with it implications. In this paper, I have sought to challenge common current conceptions about how e-learning research is conducted and what is valued in terms of the knowledge that it propagates. Harkening this message involves publishers, institutions, educators and researchers. In all cases, a greater openness and less resistance to social-based research approaches, the same perspectives that we have faced and many of us have begun to adopt with regard to using social networking technology for learning, is in order. Of course, the limitation in the discussion here with its restrictions in length and breadth undoubtedly could leave some readers eager to pick up this challenge yet wanting more in the way of practical examples of the logistics of conducting qualitative research in “the third space”. Further well-grounded research in e-learning using a qualitative approach and supported by key stakeholders in this field is the obvious response to that need.

Yet in the end, the answer to challenges posed in this paper is quite simple. In returning to the interview of the Canadian university graduating students, I am reminded of a valuable lesson that can be drawn from it for those of us who are concerned, no passionate, about learning in e-spaces. Without exception, virtually all of the university students interviewed considered the myriad conversations that took place both inside and outside the academic classrooms as key sources for their most valuable learning. In situating their comments within the focus of this paper, I recall the observation of Denizen (2008, p. 45), himself a seasoned scholar and researcher, who has witnessed the tensions and evolutions in research approaches over many years. Denizen sees answers for current methodological debates not in returning to the ‘wars of the 80’s’ but rather in conversation, i.e. dialogue. His insight, like that of the graduating students, and his call for “a bigger tent” metaphorically but vividly underlines how dialogue will open the door to what can become an inclusive rather than an exclusive research context where we can learn from, support and evolve with one another.
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References


Workshops as a Research Methodology

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Abstract: This paper contributes to knowledge on workshops as a research methodology, and specifically on how such workshops pertain to e-learning. A literature review illustrated that workshops are discussed according to three different perspectives: workshops as a means, workshops as practice, and workshops as a research methodology. Focusing primarily on the latter, this paper presents five studies on upper secondary and higher education teachers’ professional development and on teaching and learning through video conferencing. Through analysis and discussion of these studies’ findings, we argue that workshops provide a platform that can aid researchers in identifying and exploring relevant factors in a given domain by providing means for understanding complex work and knowledge processes that are supported by technology (for example, e-learning). The approach supports identifying factors that are not obvious to either the participants or the researchers prior to commencing the workshop process. This paper also discusses the facilitator’s different clinical and ethnographic roles and highlights the risks and ethical issues involved during both the workshop process and the workshop data analysis. As such, these collaborative and immersive aspects frame workshops as a research approach that has the potential to advance meaning negotiation between researchers and participants.

1. Introduction to scope and research methodology

This paper explores what can be learned from using workshops as a research approach in various organisational contexts, namely, how this approach can inform the research domain, learning design, and organisational practices.

The domain in question is video conferencing (VC) and how it relates to teaching and learning practices, as well as to participants’ experience of a shared place, as opposed to the experience of space separated into physical locations, online data transport, and objects, such as monitors and loudspeakers. The experience of place (Dourish, 2001; Hedestig and Kaptein, 2005) allows participants to experience a community of practice (Wenger, McDermott, and Snyder, 2001) distributed across distance.

In the VC teaching setting, we defined the third room as the ‘a mutually shared feeling of closeness – that is, of being and doing something together in an individually and mentally constructed merging of near and remote locations through VC mediation’ (Levinsen, Ørngreen, and Buhl 2013, p.252). This understanding allows us to bypass the individual perspective limitations referred to as telepresence (Draper, 1998), thus expanding the perspective to encompass the participants’ mutual experience. We find this to be valid in VC settings and third room experiences in general, not only with regard to teaching situations. The workshops have a dual purpose. The first is for the teachers to develop their practice and become capable of managing the third room in their everyday practice – in other words, teacher professional development (TPD). The second is to use the workshops as a research method that enables us to investigate the phenomena supporting a third room experience’s construction or deconstruction; this topic is the focus of this paper.

This dual purpose is similar to the iterative process of design-based research (Cobb, et al., 2003; Magnussen and Sørensen, 2011) and action research (Argyris and Schön, 1996; Reason and Bradbury, 2007; Nielsen and Nielsen, 2010). The workshop as a research approach is an explicit method choice that allows us to iterate, and thus refine and moderate, our research design over time and in different contexts.

This paper relies on five studies examining upper secondary and higher education teachers’ professional development, specifically in the following settings: an adult learning centre (VUC), a biomedical laboratory analysis (BioLA) bachelor programme, the Royal Danish Academy for Music (RDAM), a university learning lab and in-service training facility (LL), and, a European Conference on eLearning (ECEL) workshop.

The research design and analysis are rooted in an understanding of learning as situational and contextual, with priority being given to participants’ ability to act (agency). Consequently, in our data interpretation, it was vital
to investigate emergent and dynamic practices and trajectories (Orlikowsky 2000), as well as to rely on the participants’ conveyed experience-based knowledge (Flyvbjerg 1998). Thus, workshop effectiveness was assigned value based on reported changes, how well the workshop theme was anchored to the organisation, and the entire experience as continually interpreted by the researchers.

We present the five cases’ empirical findings and analyse the research design in accordance with the basic methodological questions raised in the call-for-papers invitation for this special issue:

- How to choose a particular methodological approach, and what are specific arguments that are important to consider with when choosing the research design in e-Learning contexts?
- How do we identify and qualify criteria for the construction of research designs according to current themes in e-Learning?
- How do we achieve reliability and validity in e-Learning research - and how do we manage blind spots and links between research objectives and relevant findings?
- What are the options for the generalisation of findings and are there special concerns in e-Learning research?
- How are the criteria for research design and research findings negotiated in the various research communities (paradigms) and our field of e-Learning?
- Are there new instances and new uses of e-Learning that lead to a need for new research designs and new research methods, tools and techniques?

The objective here is to identify the properties, criteria, and practices constituting this workshop-based research form. The aim is not to discuss or present the data analysis of each of the five cases; however, in order to ensure the transparency of the empirical material, upon which the findings rest, we have inserted references to further readings on the cases. As such, this paper presents the type of questions and knowledge that this kind of research study can procure and discusses the method’s limitations.

2. Workshop as a methodological frame

Originally, *workshop* meant ‘a place where things are made or repaired’ (Merriam-Webster, 2016). Today, *workshop* means an arrangement whereby a group of people learn, acquire new knowledge, perform creative problem-solving, or innovate in relation to a domain-specific issue.

How ‘workshop’ came to label these arrangements appears untraceable, but according to Isaksen, Dorval, and Treffinger (1994), the format goes back to Osborn, who in 1948 first described methods for creative group problem-solving. Creative problem-solving (CPS) became commonly known as ‘brainstorming’ in the wake of Osborn’s book, *Applied Imagination* (1953). According to the Danish Dictionary (2016), the use of the term ‘workshop’ exploded in the early 1960s, as Osborn’s and related social (constructivist) ideas spread to a wide range of domains at various complexity levels – for example, policy-making, societal challenges, technology, organisational change, innovation, and design. While Osborn’s CPS approach is still in development (Isaksen, Dorval, and Treffinger, 1994; Vehar, Firestien, and Miller, 1999; Puccio, Murdock, and Mance, 2007), a wide range of workshop formats has emerged. Some examples include domain-specific workshops like TPACK (Misha and Koehler, 2006) and the Community Building workshops (Peck, 1990); integrated methodological system elements, like the future workshop (Müllert and Jungk, 1987); SWOT analyses (Jackson, Joshi, and Erhardt, 2003); soft systems methodologies (Checkland, 1981; 1998), particularly the rich picture method (Avison, Golder & Shah (1992)); participatory design (Ehn and Kyng, 1987; Beyer and Holtzblatt, 1998); and participatory rural appraisal (PRA) (Chambers, 1983; 2002). Since the 1990s, the term ‘workshop’ has often been seen in conjunction with the term ‘participation’ (Cornwall and Jewkes, 1995; Kensing and Blomberg, 1998). Today, ‘workshop’ has become a part of our everyday language and requires no further explanation, though the workshop as a concept is weakly defined from an academic perspective, since its formats and uses developed within authentic contexts (workplaces, arts, politics).

Our research applies the more explicit (not everyday) use of the term ‘workshop’. The literature search’s point of departure was its objective to reveal which factors and elements are at play in how the term ‘workshop’ is used today, as well as which nuances exist in applying workshops as an explicit chosen phenomena. The circular search strategies applied traced interesting phenomena as they emerged in our readings, for example, tracing the participatory workshop method’s origin and current use. Therefore, the objective has not been to
uncover and analyse the full body of workshop literature, but rather to identify and work with the different
approaches at play, and through this, to illuminate their differences and similarities with respect to goals,
outcomes, phases, roles, and organisation.

2.1 Perspectives on workshops

The literature analysis led to the identification of three distinct perspectives representing three levels of
workshop knowledge, which will be elaborated on in the following section. These are: workshops as a means,
workshops as practice, and workshops as a research methodology.

Workshops as a means are authentic workshops aimed at domain-specific issues and represent a large body of
literature in which the workshop is seen as a means to achieve a goal. This literature is typically divided into
two types. One type, like cookbooks, focuses on the heuristics, frameworks, guidelines, and instructions for
how to design, orchestrate, conduct, and facilitate workshops (Müllert and Jungk 1987; Bobo, Jackie, and
Steve, 2001; Chambers, 2002; Misha and Koehler, 2006; Soneryd and Amelung, 2016). The other type reports
outcomes regarding participants’ new competencies, practices, knowledge, or ideas as a result of participating
in authentic workshops (e.g. in service training, design processes, workplace development, or societal
development) (Street, 1997; Durance and Godet, 2010; Axmacher, 2013).

Workshops as practice focus on investigating the relationships between the workshop and its form and
outcomes. The literature represents an extensive body of authentic workshop case studies, in which we found
two major perspectives: one investigates the workshop as a format (e.g. Cornwall and Jewkes, 1995; Phaal,
Farrukh, and Probert, 2007; Mor, Warburton, and Winters, 2012; Wiek, et al., 2014), while the other
investigates participants’ domain-specific outcomes (e.g. Putnam and Borko, 2000; Koehler, Mishra, and
Yahya, 2007; Jaipal and Figg, 2010). Workshops as practice have a development dimension, as the participants
create something (often immaterial, such as a design or work process). Findings from these studies indicate
that workshops as a means are an authentic practice within the domain in question and generate guidelines on
how to innovate and incorporate workshop frameworks into future situations.

Workshops as research methodology focus on the study of domain-related cases using the workshop format
as a research methodology. In these studies, the workshop is, on one hand, authentic, as it aims to fulfil
participants’ expectations to achieve something related to their own interests. On the other hand, the
workshop is specifically designed to fulfil a research purpose: to produce reliable and valid data about the
domain in question (Darsø, 2001; Wakkary, 2007; Rossi and Sein, 2003; Jaipal and Figg, 2010; Yurdakul, et al.,

Shared features across workshops

Based on the literature review, we found a variety of basic shared features. For example, workshops are
arranged events of a limited duration targeted to participants who either share a common domain, e.g. work in
the organisational change domain (Darsø, 2001; Jackson, Joshi, and Erhardt, 2003); work in the same field,
e.g. education (Putnam and Borko, 2000; Koehler, Mishra, and Yahya, 2007; Jaipal and Figg, 2010); or share
agendas, such as rural development (Chambers, 1983), soft system methodologies (Checkland, 1981; 1988), or
participatory design (Ehn and Kyng, 1987; Beyer and Holtzblatt, 1998). Workshops are conducted by people
with experience within the domain, and they promote genuine participation. The participant group is kept
small to allow everyone personal attention and the chance to be heard. The participants are expected to
actively participate and influence the workshop’s direction, as well to as practice the relevant techniques,
skills, situations, and so forth. Additionally, workshop participants and organisers expect an outcome (e.g. the
generation of new insights, suggestions, or (re)designs of a product, process, or innovation).

Workshops are specifically designed to fulfil a pre-defined, though not predictable, purpose. We have
identified three approaches to designing workshops. The first is the use of cookbooks and guidelines for
various workshop formats derived within specific domains. In this approach, choices are legion and formats
can be adapted or mixed (e.g. Bobo, Jackie, and Steve, 2001; Chambers, 2002). The second is the use of
conceptual formats, which prescribes phases, pre-designed activities, roles, and progression. This category
includes, for example, the future workshop, which involves preparation, critique, phantasy, and
implementation phases (Müllert and Jungk 1987), and the scenario workshop, which is a further development
of the future workshop in which the critique phase is based on pre-designed scenarios (Street, 1997; Soneryd
and Amelung, 2016). Additionally, larger frameworks like the soft systems methodology, which focuses on ill-
defined problem situations within social activity systems (Checkland, 1999); the MUST-framework; and methods for organisational context design within the participatory design tradition (Kensing, Simonsen, and Bødker, 1996) incorporate workshops as part of the practice toolbox. The third is the use of open formats, which allows participants and facilitator(s) to negotiate and influence the format during the workshop. This form enables the facilitator to intervene on-the-fly as the workshop develops and unforeseen phenomena emerge by introducing challenging participant activities from a conceptual format repertoire (e.g. roleplays, artefacts, scenarios, and obstructions). To this category belongs Darsø’s Edge of Chaos (2001); the collaboratorium in participatory design (Buur and Bødker, 2000); participatory pattern workshops (Mor, Warburton, and Winters, 2012); the Collaborative E-learning Design (CoED) method (Ryberg, et al., 2015); and the World Cafe method (Brown, 2002).

Workshops often evolve around exemplary activities staged as roleplays or scenarios. While scenario workshops take their outset in realistic and recognisable scenarios (Soneryd and Amelung, 2016), the PRA uses exemplary roleplays to facilitate participants’ acquisition of the participatory behaviours necessary for introducing and spreading participatory practices in rural areas (Kumar, 1996). Similarly, TPACK workshops use the TPACK method to disseminate TPACK practices (Baran et al., 2014; Yurdakul et al., 2012; Jaipal and Figg, 2010). The workshop can be self-contained in that participants do not have to study before or after the workshop to acquire the outcome (e.g. Chambers, 2002). Others plan with a workshop format that aims to generate progression over time through a series of workshops (Öberg and Hernwal, 2016).

Workshop design often employs various forms of obstructions that disturb and challenge the participants’ domain preconceptions in order to provoke reflection and new recognition. As a specially designed event, the workshop is already an obstruction that removes participants from their everyday context. Participants’ habitual practices can be obstructed and innovation can be provoked through the use of unfamiliar practices – for example, having illiterate Indian farmers draw maps (Cornwall and Jewkes, 1995), requiring participants to act in theatre or produce visual art (Darsø, 2011; Tanggard and Stadil, 2014), or hosting workshops in unfamiliar places, such as the collaboratorium in participatory design (Buur and Bødker, 2000).

Workshops as research methodology

As the paper focuses on the workshops-as-research-methodology perspective, we will take a deeper look at the literature addressing this dimension. However, we found this perspective to be far less extensively represented than the other workshop perspectives.

Workshops as a research methodology aim to produce reliable and valid data about the domain in question regarding forward-oriented processes, such as organisational change and design. The findings feed back into the domain theory, the methodology, and/or the practices regarding future agency. E-learning conducted in the third room over VC constitutes both a phenomenon and practice of organisational change (implementation and use) and relates to e-learning design. That is, using workshops as research methodology is an especially useful approach in studies that are emerging and unpredictable, or that are, as Darsø elaborates, characterised by ‘real-timeness’, ‘thrownness’, interaction, and prospects (Darsø, 2001, p.203).

As a research design, the workshop is designed to amplify certain elements while reducing others. From the perspective of authentic workshops, the researcher acts as the facilitator who prioritises participant needs. From the research perspective, the participants, along with their expected and performed agency, become part of the research design and the data-producing apparatus. The researcher focuses on the research quality, while the participants become objectified. Accordingly, workshops as research practice, with its dual purpose, contain inherent contradictions with regard to roles, expectations, and interests, which can emerge unexpectedly in real-time as researchers and participants are ‘thrown’ into mutual interactions. With respect to participation, we follow Biggs, Cornwall, and Jewkes (1995), who distinguish four participation modes: contractual, whereby people are contracted by the researchers to participate in inquiries and experiments; consultative, whereby people are consulted regarding their opinions before interventions are made; collaborative, whereby researchers and participants work together, but with the researchers in control; and collegiate, whereby researchers and participants contribute in a mutual process controlled by the participants. In workshops used as research methodology, only the collaborative and collegiate participation modes are optional. With respect to the researcher’s role, we follow Darsø (2001, p.216), who (with reference to Edgar Schein) distinguished between the ‘clinician’, who focuses on participant needs, and the ‘ethnographer’, who focuses on the research. Cornwall and Jewkes 1995), together with Chambers (2002), pointed out that
researchers tend to forget the clinician role and instead treat participants as contractual or consultative research objects, leaving them without influence. Durance and Godet (2010) argue that this can lead to conflicts of interest and raise ethical challenges. Accordingly, researchers have to carefully balance acting as clinicians and ethnographers during workshops in order to avoid conflicts of interests or downright participant abuse. However, the balance can also impact the research data’s quality, as the clinician is often invited ‘backstage’, while the ethnographer ‘is only allowed to see the front stage’ (Darsø, 2001, p. 218, with reference to Edgar Schein). Accordingly, the roles’ complementarity poses a methodological strength, as well as a challenge. Therefore, Darsø stresses the importance of the researcher being accountable for and constantly aware of the roles and their different scopes and influences during research practice.

While the literature is informative regarding various workshop setups that facilitate participants’ openness and creativity, it is equally non-informative regarding methodological issues, such as how to produce and document data or how to argue the data’s reliability and validity in relation to analysis. With reference to John Heron, Darsø (2001, p.220) distinguishes between primary and secondary data. Primary data are produced or emerge in real-time, while secondary data are retrospective representations and accounts of ‘what happened’. With respect to secondary data, Darsø follows the general methodological claims for qualitative research (Creswell, 2009; Newby, 2010), arguing that primary data and cannot be kept and that the immediate quality depends on the person who experiences something. This provides a challenge for workshops as research methodology. Darsø suggests documenting primary data in terms of personal thick notes (with focus on bifurcation points and the reasoning behind choices/deselections), symbols and mind maps; inter-subjective interaction video-recordings; and collections of artefacts and representations produced during the workshop. In the analysis, it makes a difference whether or not the analysts were originally present. Kumar, Yammiyavar, and Nielsen (2007) suggest a method called ‘MindTape’ using ‘stimulated retrospective verbalisation, which involves the use of a stimulus’. The stimulus could be any documentation of primary data exposed to inter-subjective analysis. In our experience, the use of MindTape in plenary workshops allows for methodological transparency that can support primary data quality and analysis prediction power.

3. Five studies that applied workshops

As mentioned in the introduction, our research relies on five studies examining TPD at the upper secondary to university level. In the following sections, we will briefly introduce each study, describing each project’s context, objective, method, and exemplary findings. As VC teaching and learning researchers, we have acquired workshop experience through many projects and teaching situations. However, we will discuss five specific studies that illustrate how research knowledge emerges and is prioritised and valued, both within a project and across projects. This will provide a backdrop for discussing how our workshop approach is conducted in a TPD setting within the VC realm and the third room, as well as how it relates to the literature review and design research. This section’s objective is to show where our workshops are similar to the approaches that we have identified from the literature, where they differ, and where we see potentials and barriers when viewing a workshop as a research-based design approach within technology-enhanced learning in general.

**VUC**

In 2011, the adult learning centre VUC Storstrøm launched an HF programme – a higher preparatory examination course or upper secondary general education programme lasting two full-time years – that uses a hybrid VC model. In this model, the teachers and some of the students were present on campus in the classroom, while other students simultaneously participated from their homes using laptops. The students themselves chose when to physically attend class and when to dial in from home. For more details about the specific setup, which the VUC named ‘the global classroom model’, see Weitze and Ørngreen (2014). As researchers, we have collaborated with the VUC since the 2012 fall semester, where workshops have been part of a larger empirical mixed-method approach (Creswell, 2009; Newby, 2010; Johnson and Onwuegbuzie, 2014) together with interviews and observations, as well as a co-funded PhD project using a design-based research approach. In this paper, we report on the workshops taking place from autumn 2012 to spring 2014. Two issues arose that had not been discussed earlier in the project, and that did not arise in the VC teaching and learning literature.

Over the course of 1.5 years, various workshop formats were applied, including the initial workshops, which were inspired by the personal approach, SWOT (Strengths, Weaknesses, Opportunities and Threats)
workshops, workshops with the middle and top management, and more hands-on VC workshops that allowed teachers to experiment with different approaches towards activating their students. The latter format, among others, provided the insight that many VC teachers have never ‘put themselves in the shoes of their students’ by logging onto the platform and experiencing learning from a distance. The teachers placed in this situation were clearly surprised about how quickly they fell into a passive learner mode, essentially ‘watching TV’, a position requiring great effort to overcome. The ‘watching TV’-finding has been confirmed by many of our other empirical data, as well as in many projects, but it was the workshop approach that highlighted the teachers’ lack of experience as a VC student and its consequence for their ability to create the third room, namely, the mutually shared feeling of closeness.

Similar findings, though with different consequences, came from our final project workshops. Here, the participants acted as supervisors helping new students choose which educational programmes to follow. Not only did these supervisors often have little or no experience with their own company’s global classroom model, but they often also had very little or no experience with VC in general, making guidance difficult. Some advisors typically recommended that those who find it difficult to be with others choose the global classroom hybrid model. However, teachers experienced with the model found that such students often found it difficult to follow the programme, as the model reinforced their passive behaviour.

BioLA
Similarly to the VUC case, the BioLA bachelor’s programme at VIA’s healthcare university college in Aarhus established a hybrid VC model for one of their classes (i.e. at the time of the project, two BioLA classes were offered each year: one hybrid and one traditional class). In the hybrid model, students were offered a minimum of one online day at home per week, often in combination with a second day for project or homework, allowing students to stay home typically two days per week. As researchers, we facilitated two workshop types in 2012–2013, aiming to investigate and convey robust educational designs and pedagogical methods. As in the VUC case, workshops were a part of the process, which also included viewing recorded teaching, and in collaboration with the BioLA team, we interviewed teachers and conducted a question-of-the-day process with the students via mail, inspired by the mobile probes method. The hybrid programme had been running for one year when we became involved as researchers, though other technological setups had been used prior as well. For more details about the specific setup and its history, see Ørngreen et al. (2015).

The first workshop was held with the project team that facilitated BioLA’s VC implementation process and included active teachers in the programme. With this team, we facilitated discussions on the opportunities and barriers that the project team and the teachers experienced to understand what could be learned and done. We repeated this three times. The process of conducting small-scale workshops served as a mutual learning platform, informing us about the context and aiding us in possible interpretations. At the same time, it gave the BioLA project team insights that they could not have otherwise reached. Together, we found viable ways forward. For example, it became clear that very little was known about what students were doing when they participated from home. We suggested that the students be asked about what they were doing as they were being taught. It is clear in both the VC literature and in our projects that engaging with and activating students are key focus points. However, we found that some BioLA students remained at home because a child was ill, or because they expected to be able to fold laundry while ‘listening’ to the teaching. In our follow-up workshop, we found that VC requires explicit negotiation of ‘how we do VC-teaching’, and that in each module, the teacher must communicate with the class about active participation expectations. This knowledge was useful for the project and for the VC domain in general.

We held the second workshop with all of BioLA’s teachers as part of the yearly Pedagogical Day. This meant that all teachers were present, including those who had already taught in this hybrid environment and those who were about to. On Pedagogical Day, we had, together with the project team, gathered from the aforementioned empirical material examples that were used to facilitate group discussions. Because everyone from BioLA was present, and because some were not motivated to begin VC-teaching, the workshop became a very sensitive albeit constructive environment for discussing all of the fears and not-yet-explicated thoughts that teachers who were about to or who had recently entered a VC arena may have.

RDAM
Since 2009, the Royal Danish Academy for Music has, with help from technical experts, experimented with VC-teaching using advanced technological equipment. The setup involved campus-to-campus VC, primarily for
The workshop invited all teachers who had taught via VC to participate in a discussion facilitated by us as researchers. In the first workshops, we shared our plans for investigating the phenomena in question and presented some of our pilot findings in an open manner. In the later workshops, we had more concrete examples of what the data and our analysis demonstrated, with explicit room for the participating teachers to contribute their interpretations and experience. We learned that these discussions were indeed rare, as this kind of knowledge-sharing very seldom happens across instruments. In fact, several teachers stated that this was the first time that they had discussed teaching practices with people outside of their own group. From the general VC perspective, it was discovered that even in this very audio-sensible music teaching environment where teachers often claimed that audio is all that matters, it turns out that in educational processes, the visual plays a significant role for establishing the third room.

In spring 2014, we conducted a voluntary five-hour TPD workshop for the Aalborg University in-service training centre called ‘Learning Lab’. This workshop was targeted to teachers from all faculties who wanted to explore and improve their performance in the video-mediated third room. The workshop introduced participants to research-based knowledge about third room teaching, as well as provided hands-on practice exercises and teaching scenario roleplays. Throughout the university as a distributed organisation depending on VC-based teaching, the number of participants was low, and we even had to cancel a workshop in 2016. In the workshop, we found factors confirming our other workshops’ findings, such as that the teachers had not logged from the remote student’s perspective, and that they also had challenges when it came to involving students in various ways. Regarding new aspects, the workshop brought forward some of the organisational issues pertaining to TPD in general, namely, how to organise and motivate senior university teachers to engage in formal professional development activities.

In order to follow up on all of our findings, in autumn 2014, we invited participants from the Copenhagen ECEL to participate in a three-hour workshop aiming at exploring and sharing experiences of the possibilities and challenges with creating and maintaining the individual telepresence experience in distributed or remote locations, which is necessary for constituting the third room. In this workshop, we used the LL-workshop format, using roleplay and hands-on exercises to explore how to act and perform in a video-mediated, synchronous teaching and learning context, discussing ways to activate students in the third room and allowing participants to experience what it is like to be ‘on the other side’, in the learner’s position. Most of the 20 participants were experienced VC practitioners with a variety of cultural and practical educational experiences. They came from nine countries, with broad representation from Europe, Africa, and the Middle East, as well as South and North America. Consequently, the dialogue brought forward cultural similarities and differences, for example, how to interpret interaction signs.

4. Analysis and discussion

In relation to the workshop-as-research-methodology perspective, the five studies’ various workshops brought different knowledge and factor types into play, including some in areas that we could not have predicted beforehand.

As the literature review shows, the existing research dominantly focuses on how to conduct workshops and present findings. Meanwhile, articulation of how to produce and analyse data is practically absent. For example, Darsø (2001) provided details on roles and formats, reflecting upon their meaning when workshops are applied to creative processes. Similarly, Öberg and Hernwall (2016) stated that they analysed the four workshops that they presented, but they did not show how this analysis was conducted. In our approach, the
workshops’ frame and intentions were produced through collaboration and written down. Though we adopted a semi-anthropological approach that relied on event recall, we also used recordings and note-taking to support our retrospective inferences. When possible, the note-taking and video-recordings were produced by a researcher or assistant. As part of the research design, we applied small, in-the-background discussions while participants were busy preparing, for example, a roleplay. These small discussions provided an overview and helped us stay proactive during the workshop and continuously interpret the factors at play.

In our analysis, we contemplated our formal reflections on the five studies, both individually and together. When evaluating workshops as a research approach, we also placed value on our own immediate experiences, as noted in our discussions following each workshop. It is clear from this analysis that one of the research-method benefits is that the workshop form helps uncover participants’ unrecognised or unacknowledged blind spots. We also have a clear sense that the same findings would not have emerged in other research designs. For example, in the RDAM case and with regard to the issue of lacking both formal and informal knowledge-sharing spaces, it was not only the researchers who saw and understood the problem; it became an openly debated issue among the teachers as well. This debate moved the RDAM organisation and participants towards a mutual recognition and equipped them to act on this issue in the future. The debate also provided us as researchers with greater insight into the problem definition and the involved factors.

We found, in accordance with, for example, Darsø (2001), Phaal, Farrukh, and Probert (2007), that workshops play a specific role in identifying, articulating, and exploring ill-defined or fuzzy challenges in research areas involving technology, such as in the e-learning and video-conferencing research field. Many local workshop participants (with participants from the same organisation) have difficulty talking about technology. This is due to the lack of a common language, the immaterial nature of some e-learning technologies, and their human-computer interfaces. A workshop with hands-on activities in a safe environment can help bring technology into play. As all participants are ‘doing’ the same thing, and as both the participants and the facilitator can pause the activity, the workshop form enables the building of a common language, making the technology and the factors involved more ‘visible’ and easier to verbally address. From a workshop-as-a-research-methodology perspective, we gained new knowledge regarding how to enhance teachers’ technology acquisition in their teaching practice. From a workshop-as-a-means perspective, the participants often acquired a more confident and experimental attitude towards the technology involved, and we therefore argue that the workshop form can raise participants’ technological understanding.

Our literature review identified the collaborative and collegiate roles in workshops as a research methodology (derived from Biggs in Cornwall and Jewkes, 1995), as well as revealed the pitfall whereby some researchers forget the clinical role and treat participants contractually or consultatively, leaving participants without real influence (Chambers, 2002; Cornwall and Jewkes, 1995). This can affect both research quality and participant outcomes. In our studies, we found examples of participants, as well as participating organisations’ management, pushing the research project towards a more contractual or consultative project than was originally intended. For example, in the VUC project, it became obvious that a layer of management and pedagogical consultants had defined the project’s activities with the researchers. The participating teachers had not been ‘sworn-in’ to the activities to the same degree. The teachers were not reluctant, per se, and some were very engaged, but they did not feel the same level of ownership, and some felt none at all. Consequently, they implicitly re-negotiated the project into a contractual role by asking the management and the researchers about how many hours they would receive from participating in the workshops. In the RDAM project, we found that the vast majority of participating teachers did feel a great deal of ownership and engagement in the activities, including the workshops. These roles could be defined as collegial, as we as facilitators/researchers were experts in e-learning and video-conferencing, and they were experts in conservatory-level music. However, during the process, it also became clear that the management often framed all activities in the project using linguistic marks, negotiation and role positioning (i.e. including – and sometimes in particular – the workshops) as more of a consulting activity, where researcher involvement was linked to a form of ‘seal of approval’ on their video conference setup. In both projects, VUC and RDAM, it took some effort to push these boundaries ‘back to the intended’ collaborative and collegial setups. We thus argue that, in workshops, the definition of the roles, setting, and form is done by many parties, not just the researchers, particularly with longitudinal projects. This means that, as researchers using the workshop as research methodology, one must be aware of these factors and (as pointed out previously in the literature review) of the conflicts of interest as a source of ethical challenges (Durance and Godet, 2010), as well as be
accountable for and constantly aware of the roles and their different scope and influence during practice (Darsø, 2001).

In workshops where participants came from the same organisation (particularly with the VUC, BioLA, and RDAM studies), we found a basis for understanding the contextual factors that would influence video-conference learning and teaching through both micro, inside-the-situation management and macro management of the situation in the organisation. Had we not used these in the international ECEL workshop, we could have found it more difficult to involve participants who did not know each other in the discussion at such a detailed level as we managed. We did this by using experiences from various organisations (VUC, BioLA, RDAM, and LL) together with the roleplay situation as motivators. Thus, we used the workshops to identify, clarify, confirm, and even dismiss research findings across studies.

We argue that the presented workshop information, activities, and roleplays sparked two different kinds of debriefing discussions, depending on the setting and the participant types. With the VUC and LL teachers who participated in workshops as co-workers in a TPD setting, the discussions became inwardly focused, asking ‘how does or could this apply in my teaching/organisation’. In the ECEL workshop with researchers and learning experts as participants in a knowledge-sharing setting, more general discussions on ‘what does this mean’ occurred. This indicates that explicit workshop participant choices are necessary when deciding the research design. For example, in an area where some research knowledge already exists, it may be advantageous to begin with local workshops involving co-workers as participants. Repeating these workshops in different local contexts brings forward new aspects and nuances to the existing knowledge, as well as allows for identifying the research findings’ blind spots. As this knowledge matures and continuously emerges, workshops with researchers and learning experts (who are not co-workers but who share a common agenda) support a process of validating and making research findings reliable through participatory meaning negotiation. In these expert/researcher workshops, detailed information from the previous local workshops is presented and close-to-real roleplaying is applied. On the one hand, here, the debriefing discussion becomes more evaluative in nature. On the other hand, in areas where little or no research knowledge exists prior to the workshop’s commencement, the reverse research design could be applied. In these more immature research areas, initiating a workshop with researchers and learning experts could aid in exploring the domain in question, enabling facilitating researchers to identify areas of interest to be used afterwards in local workshops. In any case, a workshop’s investigated phenomenon will change over time from broad, open questions of which factors are at play in certain situations to specific questions, like: What triggers this specific factor, and into what directions? Can we see this specific factor playing the same role in other contexts? Which nuances of this phenomenon or factor exist?

Because of the context and workshop-design variations, we not only know more now about the third room domain and practice, but we also know more about how TPD workshops regarding video conferences can be designed and conducted, as well as where the pitfalls and opportunities are. Therefore, even though we have identified the workshop as research methodology as our investigative purpose, it is noteworthy that as the workshops matured and the knowledge we precipitated stood out, we learned more about the guidelines’ effectiveness (workshops as practice) and are in a better position to carry out workshops as a means activities within the video conference domain with the objective of supporting others conducting video conference sessions for third room learning.

The kind of knowledge and empirical data that workshop-based research brings forward is profoundly different from that of both interviews and observation. As such, the workshop as a research methodology can be a constructively provocative and liberating activity where knowledge is explicaded (as in Öberg and Hernwall, 2016, where action research and participatory-oriented workshop approaches are used). While observations provide first-hand evidence of what people do and interviews offer access to inner thoughts and the reasons for actions, workshops combine a little of both without being either. By describing scenarios and/or acting them out in a simulated and facilitated environment, and by having facilitated discussions, the group dynamics can work productively to open up the issues (though this can also, in some situations or for some people, be counterproductive). The workshop co-constructs a place for collaborative negotiation of meaning – not only between participants, but also between facilitators (the researchers) and participants, who both during and after the workshop adopt and adapt to what is being discussed, performed, and learned. Through this, workshops bring us close to practice without being in practice. In our experience, we find that, in larger
research projects, workshops work well in combination with other methods in a mixed method approach (Creswell, 2009; Newby, 2010; Johnson and Onwuegbuzie, 2014).

In the previous paragraphs, we hinted at the research method’s limitations, which are often related to the quite immersive and collaborative environment that both the facilitators and the participants are ‘thrown’ into. For some people, such an environment places them in a more passive, lurking position. When this happens in a workshop discussion activity, there are ways for the facilitator to try and activate the participant or to work around it in order to obtain the person’s opinions and experiences, similar to what is seen in focus groups (Halkier, 2002). However, in the technological, hands-on activities, activating people who are reluctant to participate can be both a difficult quest and a risky endeavour. The workshop results rely on the researcher’s ‘clinical’ performance to create a good atmosphere, facilitate the sense of giving each other space, and be sensitive to verbal and nonverbal communication. A gentle push to try something out has proven successful in many of our workshops. However, there is a fine line between researchers’ ‘clinical’ and ‘ethnographic’ performance, which corresponds with participants feeling that they are being gently pushed as opposed to feeling forced against their will. Another factor that can influence the balance is the participant composition from the organisation. We have experience with both workshops where participants were co-workers on the same team and from different teams, and where participants consisted of both teachers and their managers. However, we have not found that a hierarchical relation (employer-employee) always entails tension with ‘what can be said and done’. This depends more on the type of organisation, and in our relatively flat power-structure in a Nordic-European context, a more constructive debate was often seen when both parties were present.

5. Conclusion: Lessons learned about workshops as a research methodology

In this paper, we identified from the literature three workshop perspectives: workshops as a means, workshops as practice, and workshops as a research methodology. Focusing primarily on commonalities of the three, as well as on aspects of the latter, we argued, among other things, that workshops work well in domains characterised by being ill-defined and prospective. The awareness and accountability of the researchers’ roles as ‘clinicians’ and ‘ethnographers’ is pivotal. In addition, the researcher’s role intertwines with the participants’ participation modes, whether collaborative or collegiate. We presented five studies that constitute individual research projects or research-based activities, but which together constitute a continuously emerging and evolving research agenda into video-conferencing for learning and knowledge-sharing. In the literature, we found that workshops can be both singular and succeeding event(s) used in a singular case (in an organisational setting or across organisations). However, we did not find much data on the workshop-as-a-research-methodology perspective, and no study explicitly discussed how workshops can be used across research projects and activities as a method for enlightening a domain over longer periods of time. We argue that workshops, both in a single research project and across projects in a longitudinal perspective, inspire new insight into the research domain in question, and that they do so in ways that other research methods cannot. However, we see the approach as particularly resourceful when used in combination with other empirical approaches (mixed methods).

The type of data generated in a workshop is quite different from data produced by observations and interviews, or by interventions into the participants’ actual everyday praxis. It is not as easy to document a workshop process from beginning to end, though one researcher can take on a stronger note-taking role or otherwise record the session with a hand-held device. In a workshop, issues can be presented, experimented with, played out, and discussed. Thus, when workshops are applied as part of a research design, the researcher opts for an immersive and collaborative environment where meaning is negotiated. This can be an opportunity to identify new factors at play and the relationships between them, which neither the participants nor the researchers may not have been aware of prior to the workshop. The researcher needs to be sensitive towards the different ways that people react to the immersive and collaborative nature, as well as strive to stay proactive about his/her facilitation of the process. In the discussion, we presented various strategies for planning with the ‘right match of participants’, and we identified that being aware of and even explicit about the clinical and ethnographic roles is vital for creating a positive collaborative environment.
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Identifying Consistent Variables in a Heterogeneous Data Set: Evaluation of a Web-Based Pre-Course in Mathematics

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Abstract: E-learning has made course evaluation easier in many ways, as a multitude of learner data can be collected and related to student performance. At the same time, open learning environments can be a difficult field for evaluation, with a large variance in participants’ knowledge level, learner behaviour, and commitment. In this study the effectiveness of a mathematics pre-course administered to four cohorts of prospective students at a technical faculty in Germany was evaluated. Deficits in basic mathematics knowledge are considered one risk factor regarding graduation in STEM-related subjects, thus the overall goal was to investigate if the pre-course enabled “at risk” students to improve their starting position. A data analysis was performed, relating students' preconditions when entering university, their attitude towards mathematics, and their use of learning strategies with further study success. The strongest determinant of first year performance were results in a diagnostic pretest, confirming both the importance of basic mathematics knowledge for academic achievement in engineering and the reliability of the chosen pre-posttest design. Other outcomes were quite unexpected and demanded deeper analyses. Students who had participated in additional face-to-face courses, for example, showed less learning gains than students who had participated in an e-tutoring version. It also could be observed that meta-cognitive variables failed to explain successful course participation. Reasons for these outcomes are discussed, suggesting reliability threats and interactions between students’ preconditions and their learner behaviour. A significant and unmoderated impact on students’ learning gains in the pre-course was found for the number of online test attempts, making this variable a reliable indicator of student engagement. The evaluations show that open learning designs with heterogeneous learner groups can deliver meaningful information, provided that limitations are considered and that external references, like academic grades, are available in order to establish consistency.

Keywords: learning analytics, pre-course, mathematics, formative e-assessment, STEM

1. Introduction

The educational backgrounds of students entering university are increasingly diverse, leading to a growing demand for preparatory and bridging courses – not only, but particularly in mathematics (Parker, 2005; Croft, et al., 2009; Faulkner, et al., 2014). A growing number of undergraduates lack basic mathematical skills and are not adequately prepared for the demands of a STEM (Science, Technology, Engineering, Mathematics) degree programme, an issue addressed since the 1990ies as the “mathematics problem” (Howson, et al., 1995). Different reasons for the mathematics problem have been suggested, from abridged school curricula (Lawson, 2000) to a general increase in transfers to tertiary education (HEFCE, 2013) to a higher rate of students from non-traditional backgrounds (Faulkner, et al., 2014). Today, nearly all technical faculties in Germany provide pre-courses in mathematics.

When addressing diverse groups of learners the implementation of web-based content may be beneficial; students are free to pace their learning and the course can be accessed by participants who not (yet) live near the campus. With many learner data stored online, the evaluation of these courses has become much easier, and learning analytics seem to offer countless possibilities for statistical analyses. But not all collected data may deliver meaningful results. In distance education, drop-out rates tend to be higher (Ashby, et al., 2011), particularly in open access courses (Pappano, 2012) while answer rates are often lower (Cook, et al., 2000; Fan and Yan, 2010). Web-based university pre-courses thus can be a difficult field for evaluation: access is free for all prospective students but only a section of each cohort participates. In this group, commitment can be very diverse and students often withdraw without giving feedback (Smith and Ferguson, 2005; Street, 2010; Gasiewski, et al., 2012). Technical barriers and data privacy policies may also prohibit a connection between pre-university performance and further academic achievement.

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In this article different aspects of the evaluation of a web-based pre-course in mathematics are reported, with a special focus on the reliability and consistency of the collected data. The pre-course was not mandatory but students were encouraged to take the initial diagnostic self-test in order to identify knowledge gaps. These test results were also considered one important factor in the overall data model. The diagnostic feedback advised students to close existing gaps via self-study or by participating in additional face-to-face or e-tutoring courses. Reliability issues had to be considered regarding the open design and the resulting non-randomized groups of learners. It also had to be considered that some students did not participate at all; it was interesting to compare this group’s academic achievement with the “experimental” group but, again, students’ preconditions and interactions with other variables had to be taken into account.

In order to differentiate between successful and less successful pre-course participation a pre-posttest design was administered and had to be evaluated regarding its consistency. Finally, the informative value of different sets of metacognitive variables, from attitudes towards the subject to the use of learning strategies to measures of student engagement, was investigated regarding their consistency, their reliability, and their potential to predict learning gains in the pre-course. Analyses were based on data collected from four cohorts (2011-2014) enrolled at Baden-Wuerttemberg Cooperative State University Mannheim. Anonymised examination results from the first and final year of the degree programme were added as dependent variable in a multiple regression model. A significant relation to this measure of academic achievement also served as an indicator for each independent variable’s reliability.

1.1 Approach

In the academic field, there has been a growing interest in “educational data mining” (Romero and Ventura, 2010). Based on predictive models, students at risk to fail a course can be identified at an early stage and interventions suggested (Campbell and Oblinger, 2007; Corrigan, et al., 2015). Prior achievement, for example, measured by secondary school GPA (grade point average), has been found a valid predictor of tertiary GPA and of student retention. Students with a high level of domain-related prior knowledge will have it easier to acquire new knowledge, thus in technical degree programmes mathematics grades or mathematics placement test scores have repeatedly been found of particular importance for later study success (Budny, et al., 1998; Zhang, et al., 2004; Warwick, 2007; Ehrenberg, 2010; Faulkner, et al., 2010; Kokkelenberg and Sinha, 2010).

A first approach to evaluate the effectiveness of the mathematics pre-course programme therefore was to confirm these relations with the collected data. It was hypothesized that students with good secondary school grades and a high level of prior knowledge in mathematics would show a higher level of academic achievement in engineering. In this basic model the impact of personal and demographic variables (age, gender, federal state) was analysed, as well, with the overall goal to identify students “at risk” to perform poorly, or to withdraw from the degree programme.

In a second step students’ learning gains in the pre-course were to be measured. Thus a pre- and a posttest in mathematics was developed and administered to pre-course participants. Both tests were designed to be equally difficult, but consisted of different items as suggested for single group pre-posttest designs (Kane, 2013). The gain score, or difference between posttest and pretest results, thus could be interpreted as a measure of change in relation to a student’s pretest result. It was expected that participation in the pre-course would positively affect gain scores of students who had showed poor pretest performance.

It then was investigated which factors most contributed to this gain score, with a focus on the “at risk” group. The impact of different pre-course elements and their combinations – self-study, e-tutoring, face-to-face – was one major interest. Considering the role of affective and metacognitive variables in the learning process, the influence of scales addressing these variables on learning gains of the “at risk” group was analysed, as well (Robbins, et al., 2004; Richardson, et al., 2012). For STEM subjects, Ackerman, et al. (2013) suggested a multiple regression model including cognitive and meta-cognitive variables. The authors reported a strong influence of mathematics placement tests (isolated $R^2 = .21$), but they also stressed the importance of students’ self-concepts in mathematics (their self-confidence and attitudes towards the subject) and their ability to master and organize learning. It therefore was expected that positive attitudes towards the subject as well as an efficient use of learning strategies and a high level of student engagement would be correlated with learning gains. Finally, the impact of the collected pre-course variables on first year achievement was to be evaluated in order to confirm, or disprove, the effectiveness of the pre-course design.
2. Data collection and tool development

Data from five engineering courses (mechanical engineering, mechatronics, computer science, electrical engineering, and industrial engineering) were analysed and evaluated. In a multiphase research design (Creswell and Plano Clark, 2011; Richey and Klein, 2005) repeated evaluations of test results, group interviews, questionnaire data and statistical information were used to revise and successively improve the programme. Throughout the study the learning management system (Open Source LMS Moodle) was used to administer, evaluate, and optimize the different quantitative tools. The finally enacted modular design consisted of an e-learning environment covering the secondary school curriculum in mathematics, initiated and completed by a pre- and a posttest, plus supplementary face-to-face and e-tutoring courses. The first two pre-course evaluations had shown that students’ learning preferences were quite diverse. While many students wanted to learn independently (and alone), others claimed to need additional support and missed face-to-face interaction. Considering the differences in participants’ starting positions and their personal situation in the phase between school and university it was decided to modularize the programme, with different learning scenarios open for self-selection (Jackson and Johnson, 2013). Students now could sign up for weeklong on-campus courses or for an e-tutoring programme that lasted one month. All students had access to the same web-based learning material, but in the e-tutoring course the learning process was structured and monitored by mathematics lecturers. Every week students uploaded a completed exercise sheet and were encouraged to discuss mathematical problems with peers and e-tutors.

2.1 Educational background

From the university’s administration students’ secondary school GPA (leaving certificate) was collected. Other school related variables, like gap between secondary and tertiary education, type of secondary school, or the area / federal state where school was attended were collected from a web-based questionnaire.

2.2 Prior knowledge level in mathematics (pre-posttest design)

Domain related prior knowledge was measured by a diagnostic test. As placement tests in mathematics are not mandatory at German universities, no standardized items were available for the development of the pre-posttest design. Two item sets were developed, covering the secondary school syllabus and structured alongside the ten e-learning modules, and underwent a two-year revision process. The first cohort’s test results served as a database for classical and probabilistic item analyses. An Item Response Theory (IRT) approach was chosen to model each item’s difficulty level and identify extreme outliers (Hambleton and Swaminathan, 2010). In combination with traditional measures, like mean scores and discrimination index, the Rasch model estimates delivered information on each item’s quality and contribution to the test. Items that did not fit the model were revised or replaced, and the analysis was repeated in the following year. After two revisions both tests delivered consistent results (Cronbach’s $\alpha$ pretest = .91 and posttest = .85) and no more outlying items; since 2013 the pre-posttest design has remained unchanged. Pre-posttest similarity was established by comparing pretest results with posttest results of a control-group that had neither participated in the pretest nor in the pre-course. With a consistent pre-posttest design, learning gains in the pre-course could be measured by pre-posttest difference.

2.3 Affective and meta-cognitive aspects of learning

Two Likert scales were administered, one addressing students’ attitudes towards mathematics and mathematics learning, and another referring to their use of learning strategies. For the mathematics attitude scale an item set developed for the “Trends in International Mathematics and Science Study TIMSS” was employed (Kadijevich, 2006; Mullis, et al., 2012). In this inventory, students’ liking of the subject (for example “I am interested in mathematics”) and their self-confidence in learning mathematics are addressed (for example “I learn things quickly in mathematics”). For the learning strategies scale subscales of the LIST inventory were used (Schiefele and Wild, 1994), a German adaptation of the “Motivated Strategies for Learning Questionnaire MSLQ” (Pintrich, et al., 1991). MSLQ is a well-established item battery designed to address students’ use of learning strategies (for example “I have a regular place set aside for studying” from the subscale “Resource management strategies”).

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Both scales underwent a revision process: based on students’ answers an exploratory analysis including inter-item and item-total correlations plus factor analysis was performed on the first version (27 items) and again after outlying items had been replaced or removed (21 items). The final factor analysis produced one common factor describing “attitude towards mathematics”, covering liking mathematics (for example “I am interested in mathematics”; “I enjoy learning mathematics”) and self-confidence in learning mathematics (for example “I learn things quickly in mathematics”; “Mathematics is harder for me than any other subject”). Internal consistency of this subscale was acceptable, with Cronbach’s $\alpha = .82$. The scale describing the use of learning strategies was less consistent, Cronbach’s $\alpha$ was only .71, and only four items loaded on a common factor that could be described with “mastering the self-study process”: these items were related to self-organization and time management (for example “I usually managed to keep to my schedule”).

2.4 Effort

Students’ effort and engagement in the learning process were represented by variables from two different sources: self-reported measures of effort were collected from the evaluation questionnaire (number of learning modules and invested learning time per week) and the LMS log files provided the number of page views per student and the number of completed test attempts. At the end of each learning module students were advised to monitor their progress by taking a self-test, consisting of 10 to 15 randomized items. The data analysis was to reveal which variable showed the strongest explanatory power in relation to learning gains in the pre-course (Macfadyen and Dawson, 2010).

2.5 Academic achievement: first and final year

Overall academic achievement was measured by cumulated GPA at the end of the degree programme; a second measure was the dichotomous variable “graduation / withdrawal”. For the analysis of students’ first year performance a variable was needed that strongly correlated with these measures. Data from the first participating cohort that started the degree programme in 2011 and graduated in 2014 ($n = 660$) were used for this analysis. Nearly all examinations significantly correlated with GPA, but Mathematics I was the first year exam with the strongest correlation ($r = .62; n = 660; p < .01$). The simple linear regression model using Mathematics I as a predictor of GPA was significant and explained 38% of the variance in GPA ($n = 660; R^2 = .38; R^2$ adj. = .37; $F(14, 450) = 405.77; p < .01$). Mathematics I was also significantly related to the dichotomous variable graduation / withdrawal: For every increase in grades in Mathematics I grades the odds of completing the degree programme were 14 times greater than the odds of withdrawing ($p < .01$). Thus the hypothesized relevance of mathematics performance for general academic achievement in engineering was confirmed and Mathematics I grades identified as an early indicator of study success in engineering.

2.6 Dataset final analysis

The data collected for the main analysis were based on the cohort that started the degree programme in 2014 and had access to the revised e-learning programme, consisting of a pretest in mathematics, an e-learning environment open for self-study, and optional e-tutoring and face-to-face courses. The following groups of variables were collected from the LMS:

<table>
<thead>
<tr>
<th>Table 1: Collected variables</th>
<th># items</th>
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</thead>
<tbody>
<tr>
<td>Preconditions when entering tertiary education (traditional predictors)</td>
<td>77</td>
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<tr>
<td>Prior knowledge level in mathematics (pretest mean score)</td>
<td>1</td>
</tr>
<tr>
<td>Demographic and personal variables (final school grades, type of school, mathematics grades, gender, age, gap between school and university, federal state)</td>
<td>7</td>
</tr>
<tr>
<td>Pre-course participation and variables related to effective learning</td>
<td>14</td>
</tr>
<tr>
<td>Type of course attended (self-study, plus e-tutoring or face-to-face)</td>
<td>1</td>
</tr>
<tr>
<td>Attitude scale</td>
<td>7</td>
</tr>
<tr>
<td>Use of learning strategies</td>
<td>5</td>
</tr>
<tr>
<td>Level of engagement</td>
<td></td>
</tr>
<tr>
<td>First year achievement</td>
<td>1</td>
</tr>
<tr>
<td>Results Mathematics I exam</td>
<td></td>
</tr>
</tbody>
</table>

Of 722 first year students, 603 participated in the pretest and the majority answered the associated questionnaire. The diagnostic test feedback informed students about their test results per mathematical field and advised them to close existing knowledge gaps with the related learning material. (Note: the design of the diagnostic feedback was significantly improved by a Moodle plug-in developed by Dreier (2014) for his
bachelor thesis in computer science). 42% of all pretest participants decided to enrol in either additional programme: 119 students visited a face-to-face course and 132 opted for the e-tutoring version. Attrition rate in the e-tutoring course was 14%, so that 113 students completed this course with a certificate. A group of 28 students attended both additional programmes (see table 2). 105 first year students did not participate in the pretest nor the pre-course, but nearly all first year students (n = 708; 98%) participated in the posttest that was taken at the university’s computer labs during induction week. For the regression analysis, data from 613 students who took the first year examination Mathematics I six months later were available.

### Table 2: Pre-course participation and first year students (2014 cohort)

<table>
<thead>
<tr>
<th>Pre-course participants</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire I: personal and attitude scales</td>
<td>593</td>
</tr>
<tr>
<td>Pretest</td>
<td>603</td>
</tr>
<tr>
<td>Self-study*</td>
<td>386</td>
</tr>
<tr>
<td>+ E-tutoring course</td>
<td>85</td>
</tr>
<tr>
<td>+ Face-to-face course</td>
<td>91</td>
</tr>
<tr>
<td>+ E-tutoring and face-to-face course</td>
<td>28</td>
</tr>
<tr>
<td>Questionnaire II: evaluation and learning strategies scales</td>
<td>200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enrolled students</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Posttest</td>
<td>708</td>
</tr>
<tr>
<td>Posttest only</td>
<td>105</td>
</tr>
</tbody>
</table>

| First year performance (Mathematics I)                            | 613 |

### 3. Results

#### 3.1 Students’ preconditions and academic achievement

Standard multiple regression analysis was employed to investigate the power of personal and demographic variables in predicting first year exam results in Mathematics I. In each of the single and multiple regression models, the two IVs final school grades and pretest results showed significant impact on the dependent variable Mathematics I. The type of secondary school attended was also found an important factor, suggesting significantly poorer MI performance for students from vocational schools, or with non-traditional backgrounds (Faulkner, et al., 2014; van Soom and Donche, 2014). Mathematics grades at school were also related to Mathematics I, but this variable showed less powerful results in the multiple model than expected (Zhang, et al., 2004; Ehrenberg, 2010; Faulkner, et al., 2010). One reason might have been that the data, unlike final school grades, was based on self-reports.

Some interactions between variables were identified, for example between gender, age, and educational background. As female students are underrepresented in engineering courses (in this study the average rate was 12%) it is very difficult to separate the influence of gender on academic achievement in engineering (Ackerman, et al., 2013). In the literature, investigations of the relation between gender and performance in mathematics or science have led to mixed results (Zhang, et al., 2004; Xie and Shauman, 2005; Johnson and Kuennen, 2006; Richardson, et al., 2012; Faulkner, et al., 2014). In this study, female students and younger students, on average, had higher school achievement levels, leading to sometimes contradictory effects in single and multiple regression analyses. A descriptive analysis showed that women were often younger and more often had traditional educational backgrounds and very good secondary school grades than male students. After controlling for these interactions gender was unrelated to achievement, as well as age, the length of the gap between secondary and tertiary education, and the federal state in which secondary school was attended.

The complete model accounted for 33% of variance in first year performance (n = 465; $R^2 = .33; R^2\text{ adj.} = .31; F (13, 451) = 16.67; p < .01$). Comparing the two most consistent IVs, final school grades and pretest results, the latter was found the strongest predictor of first year performance. After the removal of pretest results from the multiple model, $R^2$ decreased from .33 to .22. When the IV final school grades was removed from the model, $R^2$ decreased to .30. Note that the predictive quality of the diagnostic pretest was considerably improved throughout the four years of the study, with only 25% of variance explained in 2011. Pretest results were also found significantly related to final GPA in a multiple regression with one complete cohort (first year students of 2011), and both variables were significantly related to student withdrawal in a logistic regression.
These outcomes mirror the literature on academic achievement in engineering, with very stable relations between school performance, prior knowledge level, and success in MINT-related subjects (Budny, et al., 1998; Zhang, et al., 2004; Kokkelenberg and Sinha, 2010; Faulkner, et al., 2014; van Soom and Donche, 2014). Students with poor values in any of the achievement-related IVs, but particularly those with a poor pretest result, had a higher risk to perform poorly in Mathematics I.

3.2 Learning gains in the pre-course

After having verified the importance of prior knowledge in mathematics for study success in engineering factors influencing learning gains in the pre-course were analysed. In 2014, 603 students participated in both tests and achieved an average pretest score of 49.7 ($SD = 15.9$) and an average posttest score of 55.2 ($SD = 17.5$). By comparison, students who had not participated in the pretest achieved a posttest mean score of 47.3 ($SD = 18.2$). In both groups a large variance in test results could be observed. The average gain score (posttest minus pretest) for the 2014 cohort was 5.4 (median = 5.1), with a maximum value of 61.8 and a minimum of -37.5. Students with poor pretest results (mean score < 50), thus considered the “at risk” group, had an average gain score of 8.3 (median = 7.3; max. = 61.8; min. = -23.4).

3.2.1 Course type

The highest learning gains were achieved by students who had participated in both course types, e-tutoring and face-to-face with an average gain score of 9.1 (n = 28, pretest mean score = 44.2). The remaining 85 e-tutoring participants had a gain score of 6.7, in combination with a pretest result of 47.5. The poorest gains were achieved by students who had attended the face-to-face course, only (gain score = 3.5). This group also had the poorest pretest results, with a mean score of 43.7. Pre-and posttest results per course type are depicted in Table 3 and Figure 1. The 19 students who had withdrawn from the e-tutoring course failed to improve, as well (note that this group includes 6 students who later on attended a face-to-face course).

Table 3: Pre- and posttest results 2014: complete dataset in comparison to chosen pre-course type (n = 603) (*6 students participated in a face-to-face course, as well)

<table>
<thead>
<tr>
<th>participants</th>
<th>both tests</th>
<th>self-study</th>
<th>face-to-face</th>
<th>e-tutoring</th>
<th>face-to-face + e-tutoring</th>
<th>e-tutoring withdrawal*</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>603</td>
<td>386</td>
<td>91</td>
<td>85</td>
<td>28</td>
<td>19</td>
</tr>
<tr>
<td>pretest (%)</td>
<td>49.7</td>
<td>52.4</td>
<td>43.6</td>
<td>47.5</td>
<td>44.2</td>
<td>38.0</td>
</tr>
<tr>
<td>posttest (%)</td>
<td>55.2</td>
<td>57.9</td>
<td>47.2</td>
<td>54.2</td>
<td>53.3</td>
<td>39.9</td>
</tr>
<tr>
<td>gain score</td>
<td>5.5</td>
<td>5.5</td>
<td>3.5</td>
<td>6.7</td>
<td>9.1</td>
<td>1.9</td>
</tr>
</tbody>
</table>

Figure 1: Pre- and posttest results 2014: complete dataset in comparison to chosen pre-course type (n = 603) (*6 students participated in a face-to-face course, as well)
Regarding the modular course programme, the strongest effects could be observed for the e-tutoring course, a one-month self-study programme supervised by mathematics lecturers. However, the significance of these results was limited, as students were not randomly assigned but had self-enrolled into the different course types (e-tutoring, face-to-face, self-study, or neither). An analysis of students’ educational backgrounds suggested that students with higher “risk”-level, e.g. poorer school performance, or having attended a vocational school, more often chose the weekly face-to-face courses. Furthermore, variance in gains was high for all groups, so that it could be assumed that other factors had an influence on successful pre-course participation.

3.2.2 Attitude and learning strategies

It had been hypothesized that mathematics attitude items would correlate with each other, which they did, thus replicating existing results that suggest relations between mathematics liking and mathematics self-confidence (Parsons, et al., 2009). Significant relations with pretest results were also found for nearly all attitude items, so that the presumption that a positive attitude towards mathematics would be related with a higher level of prior knowledge could be verified (Mullis, et al., 2012). A critical point were the often skewed distributions: participants more often expressed positive attitudes towards mathematics, or felt reluctant to express negative attitudes, leading to small case numbers. For example, only 13% \( (n = 77) \) of first year students were on the negative side of the statement “I enjoy learning mathematics” (strongly disagree: \( n = 15 \); disagree: \( n = 62 \)), whereas 63% agreed (\( n = 277 \)) or strongly agreed (\( n = 89 \)).

Not-normal distributions were also observed for the learning strategies scale. Four items addressing a proficient use of learning strategies were significantly related to each other, and to pretest results, indicating that students able to manage their learning process had a higher level of prior knowledge in mathematics, as well. However, these relations were never linear, so that these variables only allowed to differentiate between students who “strongly agreed” to an item like “I usually managed to keep to my schedule” (\( n = 43 \); pretest mean scores = 58.6) and the rest of the sample. Correlations between the attitude and the learning strategies scale were rather weak, as well. With regard to these non-linear patterns analyses of variance were performed for each single item in relation to learning gains in the pre-course. In this process it was found that both scales, students’ attitudes towards mathematics and their use of learning strategies, were related to prior knowledge level, but were more or less unrelated to the variable gain score (posttest minus pretest). Thus students with deficits in basic mathematics knowledge only rarely showed a strong positive attitude or high efficiency in their use of learning strategies, but if so this was unrelated to learning gains.

3.2.3 Effort

It was expected that students who invested a lot of time and effort into the pre-course would achieve a higher gain score (Ackerman, et al., 2013). Four different measures of effort were available for this analysis. In the evaluation (\( n = 205 \)), students had answered how many hours per week they had studied. A first analysis suggested that students with more study time per week had poorer pretest results and higher learning gains. It also could be observed that with an increase in number of reported learning modules learning gains increased, as well. ANOVA estimations for these two items, however, were not significant, and showed a high variance in each subgroup’s gain scores.

Two further variables were collected from the LMS log files. The number of page views per learning module did not deliver significant results. According to the database query, 83% of the pre-course participants (\( n = 603 \)) had visited at least one page (note that page views were counted per login, so that the same page was only counted once per login session). The highest number of page views was 1585 (out of 684), but the majority of cases had no more than 200 page views (median = 121). Only 19 students had a page view count above 1000. An ordinal version of this variable was used for ANOVA, grouped to “no views” (\( n = 101 \)), “1-10 views” (\( n = 83 \)), “11-100 views” (\( n = 145 \)), “101-200 views” (\( n = 77 \)) and “200 and more views” (\( n = 197 \)). Students with 1-10 page views showed poorer gains than the rest of the sample, but otherwise this item did not significantly explain achievement in the pre-course.

Finally, the number of self-tests per student were related to learning gains. Each learning module provided a final self-assessment, consisting of 10-15 randomized items (thus with each test attempt new items were presented and the number of attempts was unlimited). The highest number of test attempts was 83, but the majority of students took four tests (= median). Transformed to a five-step ordinal variable, with “no test attempts” (\( n = 296 \)), “1-5 attempts” (\( n = 167 \)), “6-10 attempts” (\( n = 55 \)), “11-20 attempts” (\( n = 60 \)), and “21 and
more attempts” \( (n = 25) \), this variable significantly differentiated between higher / lower achievement in the pre-course. Students with no test attempts had the poorest learning gains (gain score = 3.8) and students with 21 and more attempts had an average gain score of 12.0.

These results strongly supported the view that study time or number of page views may be unreliable indicators of student engagement in e-learning environments (Samson, 2015). Macfadyen and Dawson (2010) reported weak relations between these measures and performance in an online biology course. They observed a good predictive power for number of tests completed and an even stronger impact of the total number of forum posts (an effect that could not be confirmed in this study due to low and irregular case numbers in discussion forums).

Table 4: Pre- and posttest results 2014: complete dataset in comparison to number of online self-test attempts \( (n = 603) \)

<table>
<thead>
<tr>
<th>participants both tests</th>
<th>number of test attempts</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td>1 to 5</td>
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<tr>
<td>n</td>
<td>603</td>
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<tr>
<td>pretest (%)</td>
<td>49.7</td>
</tr>
<tr>
<td>posttest (%)</td>
<td>55.2</td>
</tr>
<tr>
<td>gain score</td>
<td>5.5</td>
</tr>
</tbody>
</table>

3.3 Learning gains in the pre-course and academic achievement

In the final analysis, learning gains in the pre-course were related to first year academic achievement. Assuming a poor pretest performance being a risk factor, a high gain score was expected to reduce this risk. Accordingly, gain score as well as learner engagement, represented by number of test attempts, were expected to influence Mathematics I results. Thus in the final analyses these variables were added to the multiple regression as described in section 3.1. Table 5 gives a summary of the changes in variance explained \( (R^2) \) when pretest results (model 2), gain score (model 3), and effort (model 4) were added to the basic model (model 1). It can be seen that in the basic model 21% of variance in Mathematics I was accounted for. When diagnostic pretest scores were added, \( R^2 \) increased to .33. Finally, the variables gain score and number of test attempts led to a total variance explained of 36%.
Table 5: Summary of hierarchical regression analysis for variables predicting Mathematics I (n = 465). Model 1: students preconditions when entering university; model 2: plus pretest mean score; model 3: plus gain score (pre-course learning gains); model 4: plus measures of effort (number of page views, number of test attempts) (B: unstandardized regression coefficient; SE B: standard error; ȕ: standardized regression coefficient; significance levels: *p < .05; **p < .01)

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<tr>
<td>$R^2$ (R$^2$ adj.)</td>
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<td>.33 (.31)</td>
<td>.35 (.33)</td>
<td>.36 (.34)</td>
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</table>

Gain score showed a significant impact on Mathematics I and also added to the variance explained (model 3: n = 465; $R^2$ = .35; $R^2$ adj. = .33; F (14, 450) = 17.44; p < .01). It should be stated that with a B coefficient of .014 the influence of this variable was not very strong; however, according to this model, a student with a gain score of 20 was predicted to achieve a Mathematics I exam that was .28 grades above that of a student with otherwise similar preconditions and a gain score of zero (note that test scores ranged from 0 to 100 and that Mathematics I grades ranged from 1 to 5). The number of test attempts, as well, showed a significant impact on Mathematics I results (model 4), confirming the importance of this variable.

Finally, it was investigated if the group of students who had not participated in the pretest or the pre-course programme (n = 105) differed in their Mathematics I results. The multiple model suggested poorer first year performance when a student had not taken the pretest, and this relation was significant, as well (p < .01). In the “at risk” group, the effect of not participating in the pretest led to a difference of -.5 in Mathematics I grades. The effectiveness of the pre-course thus could be established in the multiple model. As a limitation to this interpretation it should be considered that participation was voluntary, therefore groups were not randomized. It may be hypothesized that students who take the diagnostic pretest already show a higher interest in their degree programme, which might result in a better first year performance. Descriptive analyses suggested that the rate of “at risk” students in the posttest-only group was slightly higher, with more students having attended vocational schools and a higher rate of medium to poor school grades. These differences were not significant, with a high variance and a considerable number of very high performing students. Thus non-participation in the pre-course could not be described as a risk factor in itself, but students who were “at risk” in any of the predictive variables certainly would have benefitted from pre-course participation.

4. Discussion and conclusion

In this article different dimensions to the evaluation of a web-based pre-course in mathematics were summarized, relating students’ preconditions when entering university, their learning activities in the pre-course and first year study success. In order to establish a consistent data model the impact of all collected variables on either learning gains in the pre-course or academic achievement was analysed. In this process, the relevance of “traditional” or performance-related variables for study success in engineering could be confirmed. Secondary school grades, for example, highly correlated with later study success, but the most consistent predictor of first year academic achievement were test results in a web-based diagnostic pretest in mathematics. In the multiple regression model this variable significantly influenced first year performance as well as cumulated GPA at the end of the degree programme, identifying poor pretest results as a dominant risk factor. These outcomes confirmed existing literature (Zhang, et al., 2004; Ackerman, et al., 2013; Faulkner, et al., 2014) and indicated that the diagnostic pretest delivered consistent results. The model also showed a significant impact for the variable pre-course learning gains (pre-posttest difference); “at risk” students who were able to considerably improve throughout the pre-course showed better first year performance.
It then was investigated which factors most strongly supported successful pre-course participation. As the course was designed to address a heterogeneous group of learners and allowed self-enrolment into different modules some limitations regarding the interpretation of outcomes had to be considered. The highest pre-course learning gains, for example, were achieved by students who had combined two additional course programmes, e-tutoring and face-to-face, followed by e-tutoring-only participants. Students who had preferred to learn independently with the self-study programme were also able to improve considerably, whereas the face-to-face group had the least learning gains. Effects of course participation could even be linked to exam scores in Mathematics I, with significantly poorer results for the face-to-face group. Three interpretations of these unexpected results are suggested. First, reliability issues had to be taken into account as results were not based on randomized groups. Face-to-face courses appeared to be preferred by “at risk” students (non-traditional, poorer school grades, poorer pretest-results) and although the differences between this group and the e-tutoring group were not significant students’ diverse preconditions may have added up and influenced the outcomes. Second, the face-to-face and e-tutoring course were difficult to compare regarding length, intensity, and concept. It may be hypothesized that the one-week face-to-face was too condensed to have a lasting effect on students with major knowledge gaps. The one-month e-tutoring course allowed for more practice, and with weekly tasks and a final certificate the learning process was monitored more strongly. A third reason might be that face-to-face participants felt less inclined to invest extra time into self-study once they had completed the course. For this group little or no online learning activity could be observed. Concluding, these results called for a revision of the face-to-face course concept, for example by expanding it to a four-week blended learning programme, giving students more time for individual practice.

Affective and metacognitive variables in this study were more or less unrelated to learning gains. Attitude towards mathematics, for example, strongly correlated with prior performance, suggesting that students with good grades also have a positive attitude towards the subject (Kadijevich, 2006; Mullis, et al., 2012). A significant impact on students’ learning gains in the pre-course, though, could not be observed. Even less related to learning gains was a scale addressing students’ use of learning strategies (Pintrich, et al., 1991; Schiefele and Wild, 1994). Distributions were often skewed and many items produced inconsistent results, being unrelated to prior knowledge level, learning gains, or the attitude scale. It is suggested that the weak impact of this scale might have been caused by a lack of representativeness. Only a third of the sample participated in the final evaluation survey and the learning strategies items in particular were often left unanswered, leading to even smaller case numbers. It also may be hypothesized that a superficial answer behaviour in the evaluation affected the quality of the scales (Spooren, et al., 2013). It also has been reported that low-performing students are less likely to conscientiously answer questionnaires which also may have led to skewed answer patterns (Thiessen and Blasius, 2008). Summarizing, the impact of the meta-cognitive scales was disappointing. In order to better understand learner behaviour in an open e-learning environment a qualitative approach might be more beneficial.

One variable, however, led to consistent and unmoderated results: “at risk” students who had repeatedly engaged in online self-assessments achieved higher pre-course learning gains than “at risk” students who had not. Compared to other approaches, like invested time, number of learning modules, or number of page views, the number of test attempts thus was found the strongest indicator of effort, or student engagement. This outcome may be characteristic of the domain of mathematics, but similar observations were made by Macfadyen and Dawson (2010) for a web-based biology course. This variable also showed a significant relation to first year performance in the multiple model, suggesting that students with low prior knowledge level in mathematics were able to benefit from the pre-course, but only if they showed a strong learner engagement.

Concluding, it is stated that even volatile and inconsistent learning environments can produce valuable information, but the described limitations will have to be considered when interpreting the results. In order to identify consistent variables external references should be included in the model, in this case students’ educational backgrounds and academic achievement. In this study, reliable and significant effects were mainly observed for straightforward quantitative measures, like pre- and posttest results. Further research might be needed into the reliability of affective and motivational items collected from web-based courses. Regarding the effectiveness of student learning, the role of practice should be investigated more deeply (Gibbs and Simpson, 2004; Pachman, et al., 2013). Participants of the pre-course appeared to highly appreciate the possibility to practise online. By providing open question banks related to adaptive tests that provide item sets of different difficulty and complexity levels individual students’ learning processes might be supported even better.
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The E-Learning Setting Circle: First Steps Toward Theory Development in E-Learning Research

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Abstract: E-learning projects and related research generate an increasing amount of evidence within and across various disciplines and contexts. The field is very heterogeneous as e-learning approaches are often characterized by rather unique combinations of situational factors that guide the design and realization of e-learning in a bottom-up fashion. Comprehensive theories of e-learning that allow deductive reasoning and hence a more top-down strategy are missing so far, but they are highly desirable. In view of the current situation, inductive reasoning is the prevalent way of scientific progress in e-learning research and the first step toward theory development: individual projects provide the insights necessary to gradually build up comprehensive theories and models. In this context, comparability and generalizability of project results are the keys to success. Here we propose a new model – the E-Learning Setting Circle – that will promote comparability and generalizability of project results by structuring, standardizing, and guiding e-learning approaches at the level of a general research methodology. The model comprises three clusters – context setting, structure setting, and content setting – each of which comprises three individual issues that are not necessarily sequential but frequently encountered in e-learning projects. Two further elements are incorporated: on the one hand, we delineate the central role of objective setting and the assessment of the goal attainment level (guiding element); on the other hand, we highlight the importance of multi-criteria decision-making (universal element). Overall, the proposed circular model is a strategic framework intended to foster theory development in the area of e-learning projects and research.

Keywords: e-learning research, e-learning projects, research methodology, theory development, major project issues, decision-making, new model

1. Introduction

Learning that is enhanced by information and communication technology (ICT) is continuously expanding across scientific disciplines (e.g., language learning, physics, and medicine, cf. Coryell and Chlup, 2007; Martín-Blas and Serrano-Fernández, 2009; Ruiz, Mintzer, and Leipzig, 2006), geographic regions (e.g., Germany, Nigeria, and South Korea, cf. Brosser and Vrabie, 2015; Folorunso, Shawn Ogunseye, and Sharma, 2006; Lee, Yoon, and Lee, 2009), and covers diverse educational institutions and target groups (e.g., primary school, secondary school, and university, cf. Biasutti, 2011; Ho, 2004; Woo, et al., 2011). Also, such e-learning, in its broadest sense, is not tied to specific technological devices but “includes instruction delivered via all electronic media including the Internet, intranets, extranets, satellite broadcasts, audio/video tape, interactive TV, and CD-ROM” (Govindasamy, 2001, p.288). As a consequence, the field of e-learning projects is very heterogeneous and one can only hardly compare different approaches characterized by rather unique combinations of boundary conditions and context factors (hereinafter referred to as situational factors).

Situational factors include, inter alia, technological infrastructure, discipline-specific didactical constraints, curriculum-dependent degrees of freedom, actors involved in the project, and institutional features. For example, the latter comprise national policies, institutional strategies, and available financial support. Indeed, based on a survey of the European University Association, one out of four respondents from 249 higher education institutions across 38 countries stated awareness on national strategies for e-learning in higher education and education in general (Gaebel, et al., 2014). In addition, the “vast majority of respondent institutions (89%) have an institutional or faculty-level strategy, or are currently preparing one” (p.22). Such national policies and institutional strategies are only two situational factors that may lead to rather unique e-learning approaches being too specific to be generalizable. This fact might explain why e-learning projects and corresponding research are often designed and realized in a bottom-up fashion, guided by existing situational factors.

Comprehensive theories of e-learning that allow deductive reasoning and hence a more top-down strategy are missing so far, but they are highly desirable. Accordingly, Pange and Pange (2011) conclude that “e-learning research is still far from stating an explicit e-learning theory and designing an integrated solution with concrete learning outcomes that covers the online learners’ needs” (p.935). In this paper, we will outline first steps that facilitate to overcome the heterogeneity of e-learning projects in favor of a better comparability and generalizability being necessary preconditions for theory development.
2. Why we should strive for comparability and generalizability of project results

We assume that it will be a long way from the status quo to comprehensive e-learning theories and a more top-down strategy for e-learning projects, but the benefits will be worth the effort. In view of the current situation, inductive reasoning is the prevalent way of scientific progress in e-learning research; that is, individual projects provide the insights necessary to gradually build up comprehensive theories and models. In this context, comparability and generalizability of project results are the keys to success. Theories, on the other side, allow deductive reasoning, help to order massive data, describe relations between objects and processes, explicate causal mechanisms, provide predictive power, and can systematically guide interventions at the end. By no means we want to state that past and current e-learning projects are “theory-free”; of course, many projects already refer to aspects of learning theories and consider established knowledge about cognitive processes, but what is missing is a theory of what the inclusion of technology adds to learning. In fact, although e-learning approaches are manifold, they usually try to improve learning by using some kind of technology (Sarsa and Escudero, 2016). Accordingly, the diverse definitions of e-learning seem to converge to this point when stating that “e-learning [...] uses network technologies to create, foster, deliver, and facilitate learning, anytime and anywhere.” (Raab, Ellis, and Abdon, 2002, p.221), that e-learning is “the use of new multimedia technologies and the Internet to improve the quality of learning” (European Commission, 2001, quoted from Alonso, et al., 2005, p.218), that e-learning is “learning facilitated and supported through the use of information and communication technologies” (Clarke, et al., 2005, p.34), or that it should be understood as “instruction delivered on a digital device (such as a desktop computer, laptop computer, tablet, or smart phone) that is intended to support learning” (Clark and Mayer, 2016, p.8). In this sense, the primary goal of each e-learning project is the improvement of otherwise “classic” learning approaches. This goal should be constitutive for e-learning research and theory development.

As a consequence, e-learning research, as an applied science heavily intertwined with practice, needs both valid conclusions about why a specific e-learning project is effective (i.e., improves learning) and a better comparability of alternative e-learning approaches. Unfortunately, conclusions about the effectiveness of individual e-learning projects is a challenging task as “the high number of features involved in e-learning processes complicates and masks the identification and isolation of the intervening factors” (Sarsa and Escudero, 2016, p.337). Similarly, the comparability of different projects is not only threatened by unique combinations of situational factors; even when most situational factors are comparable, the effectiveness of an e-learning approach might considerably depend on the primary actors: teachers and learners. For example, different teachers might differently implement an electronic learning tool into lessons, the tool might be used for different purposes by different groups of students (cf. Kaspar, Aßmann, and Konrath, 2017), and the learners might also differ in media competence (e.g., elementary school versus high school students). Inductive reasoning is a difficult task under such circumstances due to an impaired generalizability and comparability of project results.

It appears obvious that a comparison between alternative learning approaches (not limited to e-learning) is necessary to decide whether to continue, modify, or completely replace specific approaches. Such benchmark analyses are not only desirable from the perspective of teachers and learners but also from an economic perspective; most institutions have to manage their limited resources very carefully, calling for evidence-based decisions about alternative projects and institutional strategies. And, of course, this also implies a political (and sometimes diplomatic) dimension as the promotion of a specific approach (and its proponents) is often at the expense of another approach. Therefore, we claim that e-learning projects and corresponding research would significantly benefit from a more top-down and hence systematic research strategy.

However, we want to emphasize that it would be inappropriate to call for a stronger convergence of diverse e-learning projects at the expense of approaches that optimally fit the situational factors given (some of which are imposed and immutable). We rather propose to make situational factors and related design decisions within individual projects explicit. Figure 1 depicts a schematic decision grid in which each junction represents a specific decision occasion set by situational factors. As far as each decision and its relation to situational factors is adequately documented, one can identify causes of different outcomes in the case of very similar (but not identical) project routes (red vs. blue line) or detect alternative routes producing comparable outcomes (red vs. green line). It is obvious that the precision of effect estimates will increase with an increasing number of (different) projects realizing different routes, calling for an accumulation of empirical evidence. This is only a very simplified model as it neglects, inter alia, potential differences in the weighting of...
decisions (not all situational factors are equally influential) or interdependent decisions. Still, it illustrates that an adequate documentation of situational factors and related design decisions is a promising account. This account would (a) sensitize stakeholders in e-learning projects to potential consequences of decisions, (b) make decision sequences traceable and thereby facilitate the identification of (in)effective intervening factors, (c) allow systematic variation of project characteristics tied to situational factors in order to further improve the learning approach at hand, and (d) enable cross-referencing and accumulation of evidence from similar sub-processes of different e-learning projects. Together, the explication of situational factors and related decisions in e-learning projects will substantiate the basis for inductive reasoning and subsequent theory development.

Figure 1: Schematic illustration of decision routes provoked by situational factors of e-learning projects.

3. Critical decisions in the context of e-learning projects

In order to identify common situational factors and critical decision occasions of e-learning projects, we initially analyzed several process models being applicable in the context of e-learning:

- The idealized e-learning lifecycle with its seven stages: analysis of problem, design of e-learning artefact, prototype of e-learning artefact, design of e-learning environment and conduction of pilot study, refinement of e-learning environment and conduction of full trial, and two final phases of evaluation research on the mature system (cf. Phillips, Kennedy, and McNaught, 2012)
- Design research approaches (e.g., Peffers, et al., 2006; Seufert, 2015)
- The ADDIE (analysis, design, development, implementation, and evaluation) model (cf. Molenda, 2003)
- The international standard ISO/IEC 40180 (ISO/IEC, 2016) providing a reference framework for the description of quality approaches that comprises an initial needs analysis, followed by a framework analysis, a conception/design phase, a development/production phase, an implementation phase, a learning/realization phase, and a final evaluation/optimization phase (see also ISO/IEC 19796-1: Pawlowski, 2007; Stracke, 2007).

As can be seen, the models show some complementary aspects but also some conceptual overlap; for example, evaluation is a central aspect in all models. However, due to their generic nature, the models cannot be simply applied to specific e-learning projects but must be carefully adapted. Moreover, they are too unspecific with respect to some of the critical issues constituting the route of e-learning projects. At the end, we identified eleven major issues e-learning project teams are usually confronted with. We arranged all issues in the E-Learning Setting Circle as illustrated in Figure 2. The circular arrangement indicates that these issues cannot always be addressed in the same sequential order due to their strong interdependence. The guiding element of each project should be the setting of objectives and the related assessment of the goal attainment level. The universal and hence core task is to make the right decisions with respect to each major issue; thus, weighting of each issue is subject to multi-criteria decision-making (MCDM) placed in the circle’s center.
3.1 The guiding element: Objective setting and assessment of goal attainment level

According to the primary goal of all e-learning projects, the application of technology in learning settings should somehow improve learning (see above), but secondary goals may also exist and hence should be defined from the outset. For example, previous studies showed that the usage of tablet computers in the classroom can enhance student performance by creating an interactive learning network that stimulates active participation and provides direct feedback loops (e.g., Enriquez, 2010). We may consider additional positive effects of such an interactive classroom environment in terms of improving social cohesion and promoting inclusion processes, marked as secondary objectives. Similarly, the improvement of ICT literacy often represents a secondary goal. In each case, conclusions about potential improvements require a reference level that must be explicitly defined, either in terms of concrete test values (e.g., the test score should increase by ten points) or by using an adequate control group (e.g., a group that uses an alternative learning approach) to assess the relative effectiveness of the approach (cf. Nikopoulou-Smyrn and Nikopoulos, 2010). Also, it is a key task to select adequate operationalizations of outcome variables being in focus; objective measures (e.g., test performance or processing time) and subjective measures (e.g., self-efficacy, motivation, or satisfaction) should be based on established and well-validated instruments whenever possible. Importantly, one must be careful about the duration and timing of measurements. Some effects occur with a considerable time lag after the intervention, so one has to think \textit{a priori} about timing in order to capture the effect (Ployhart and Vandenberg, 2010). All decisions in the context of objective setting and related post-intervention evaluation should be documented as detailed and comprehensive as possible to facilitate comparability with other e-learning projects and to get one step closer to a theory of e-learning. In fact, insufficient study designs and poor descriptions in published project protocols drastically lower the validity and, respectively, replicability of findings. This appears to be a serious problem in current e-learning research (Sarsa and Escudero, 2016).

3.2 Cluster 1: Context setting

3.2.1 Definition of project scope and status

Context setting includes the definition of an e-learning project’s scope and status within the educational institution. For example, individual projects being separated from the institution’s standard operation nonetheless might be of importance as they act as pilot projects that, in case of success, will sustainably influence the institution’s general education strategy. This may imply many degrees of freedom for the project...
team and the design and implementation process. Alternatively, a specific e-learning approach might be part of the institution’s general education strategy and hence is intended to be implemented on a large scale by means of a top-down strategy, reducing the degrees of freedom for individual project teams. Further scenarios are conceivable. Either way, what is required is the development of a concrete vision of e-learning within the institution, including awareness building to promote commitment of diverse stakeholders (cf. Pawlowski, 2007). The project’s scope can directly affect its route and likelihood of success and should therefore be documented in project reports.

3.2.2 Identification of external and environmental constraints

Constraints of e-learning projects are manifold and comprise available resources such as staff, time, space, technological infrastructure, and budget, but also educational policy and curriculum standards defining, inter alia, examination dates or the maximum number of course members. External and environmental constraints additionally determine the specific target group(s) of e-learning projects (e.g., secondary school students versus university students), including group characteristics such as age, individual needs, didactical demands, level of knowledge, and competencies. Sometimes these constraints even limit competencies available for the project team, for example, when institutions do not employ experts in (educational) technology or teaching methodology (and budget is too low for temporary support). A detailed documentation of these constraints is mandatory as they constitute the room for manoeuvre and hence set the global decision frame for the project (compare the schematic decision grids of Figure 1). Documentation will facilitate comparisons between projects and the estimation of how well a specific project can be generalized in terms of external validity.

3.2.3 Identification of stakeholders and competence distribution

E-learning projects differ remarkably with regard to the number and type of stakeholders involved. In principle, many stakeholders can be part of an e-learning team and hence can influence the route of the project. Stakeholders include, but are not limited to the target audience (e.g., students or employees), teachers, researchers, managers, and numerous specialists (e.g., collaborating teachers from other disciplines, providers and designers of learning material or technology, system administrators, and ambassadors of the education ministry). With an increasing number of stakeholders involved in a project, the necessity of a specification of responsibilities increases. Larger project teams are no obstacle per se, rather they bundle more competencies. However, coordination and alignment of competencies in favor of a successful project is a key task, particularly when conflicting interests are present. Also, if critical design decisions are taken on a democratic basis (i.e., majority decisions), underrepresented perspectives may lose their impact. We hence suggest to explicitly document the structure of the project team, the distribution of competencies, and assigned responsibilities (also in published project reports). Sometimes e-learning projects being comparable with regard to most situational factors take very different routes depending on the composition of the team. An adequate documentation can help to detect such cases and help to explain differences in project outcomes not sufficiently explained by other situational factors.

3.3 Cluster 2: Structure setting

3.3.1 Specification of sequential, parallel, and iterative project components

By project component we mean here individual (but often interrelated) parts of an e-learning project such as, inter alia, an ICT training component, a main learning component, an evaluation component, a technology component, or an assessment component.

It is a mandatory step to specify whether all components of an e-learning project are implemented in a sequential order or whether some components run in parallel. In the latter case, peak intervals may result, where limited resources (especially on the staff level) have to be optimally coordinated (if at all possible) to reduce the risk of low-quality project outcomes. Additionally, it might be that components interact in an unpredictable (and undesired) fashion. For example, imagine a university course in which students create their own personal learning environment (PLE) to structure and learn basic knowledge about cell division processes in biology. For this purpose, they can select out of a range of tools provided by the institutional learning management system (LMS) (cf. Sclater, 2008). Such an e-learning approach requires that all learners exceed a specific threshold of ICT literacy. In an optimal case, necessary competencies are acquired in a corresponding training phase before the focal learning phase begins, but temporal constraints of the project may lead to the decision that these competencies should be acquired during the phase in which the focal knowledge is addressed. As a consequence, learners might select only the simplest tool from a wide range of tools offered,
reducing the quality of their own PLE and (perhaps) learning performance in the focal domain; or, alternatively, students invest too many cognitive resources into learning the use of the technology at the expense of the main learning component.

Apparently, it is important to document such parallel project components to better understand the final project results. Similarly, our analysis of diverse process models (see above) revealed an evaluation component in all models. In most cases, evaluation is scheduled at the end of a project cycle in terms of summative evaluation. However, it might be advantageous if the central phase in which (e-)learning occurs or the subsequent phase in which student performance is assessed are accompanied by formative evaluation. This strategy allows for faster adjustments (or corrections) of the implementation process and reduces the likelihood of failed projects. Finally, sometimes e-learning projects include a component of technology development. For example, students might use a LMS that is under continuous development during a large-scale project over several semesters; the system is continuously updated and adapted to the needs of learners, based on the results of formative evaluations in the form of iterative usability tests (cf. Kaspar, et al., 2010). Thus, observable learning outcomes may depend on the dynamic status of the technology component. Such iterative project components have strong implications on result comparability and generalizability at the end.

3.3.2 Specification of component scaling at macro and micro level

Scaling is a universal issue per se and it directly affects the route of projects. For instance, the project’s scope, external and environmental constraints, and the number and composition of stakeholders are scaling issues in part. However, here we suggest a narrow understanding of scaling limited to the macro level and the micro level of project components. Scaling at the macro level means that, for example, a specific e-learning component – e.g., video-based pre-service teacher education (cf. Blomberg, et al., 2013) – can be used in one university course or many parallel courses as well as in the context of one or many scientific disciplines (e.g., chemistry, geography, or history), constituting the quality and quantity of the sample. The more e-learning instances are available within a project, the more precisely one can estimate the robustness (i.e., replicability) of results and/or their context-sensitivity. A higher number of parallel courses also allows creating quasi-experimental designs incorporating both e-learning intervention groups and adequate control groups. Thus, scaling at the macro level has a direct impact on the generalizability of results and the validity of inductive reasoning. In contrast, scaling at the micro level includes, for example, the number of different tools of an LMS used by learners within the learning phase or the number of different objective and subjective measures used in the assessment phase. It is obvious that more tools allow to assess their relative effectiveness and that more indicators of the learning progress allow to assess the generalizability of e-learning effects across different cognitive domains.

3.3.3 Standardization of implementation phase

As outlined above, even in the case of comparable situational factors, the result of an e-learning approach might be very different depending on how teachers and learners (but also other actors) behave in the implementation phase. In scientific fields such as physics or biology, many instances of a natural phenomenon (e.g., acceleration of objects or cell division processes) can be generalized (and formalized) by experimental observation and measurement. In contrast, e-learning projects are artificial event phenomena strongly determined by situational factors such as time, place, and actors (Phillips, Kennedy, and McNaught, 2012); that is, the results of individual e-learning projects can heavily depend on those people involved in the implementation phase and their unique spatiotemporal needs and interactions, making comparisons and generalizations difficult. Therefore, after designing and producing all materials, the project team should create a manual that guarantees process objectivity for each team member and stakeholder in the implementation phase.

3.4 Cluster 3: Content setting

3.4.1 Referencing to learning and media theories

Whenever and wherever possible, e-learning projects should explicitly refer to evidence-based knowledge of “classic” learning theories that delineate the acquisition of knowledge and specific competencies in perceptual, cognitive, and behavioral terms. According to Pange and Pange (2011), most e-learning approaches can be assigned to one of four main classic learning theories: behaviorism, cognitivism, constructivism, or active theory. Similarly, Klement and Dostál (2016) demonstrated that different e-learning interventions relate to classic learning theories such as programmed learning (behaviorism), cognitive theory
(cognitivism), and constructive learning (constructivism). Therefore, e-learning interventions can and must be (partially) based on classic learning theories, whereby it is particularly important to explicitly describe how the application of technology will support learning in terms of cognitive mechanisms (including motivational, emotional, and sensomotoric processes).

Furthermore, e-learning projects should also refer to media theories to conceptually capture those particular aspects that constitute e-learning – the technological component. Media theories should not substitute but complement learning theories. For example, projects that apply virtual reality-based instructions to improve learning outcomes (for a current meta-analysis, see Merchant, et al., 2014) may consider the context-specific concept of telepresence (Steuer, 1992) when formulating a priori hypotheses about variables that might mediate the expected learning gain. However, the focus should not be limited to media effect theories; sometimes media selection models may add explanatory value: for example, the social influence model (cf. Schmitz and Fulk, 1991) may provide a profound justification why a specific e-learning tool should be prioritized over an alternative tool although the latter is more powerful – because the former tool could be more in line with social norms and shared opinions within the project’s target group. A detailed documentation of which theoretical account guided decisions during the design of an e-learning project would not only substantiate the approach per se, but it would also indirectly mark those project components that are not sufficiently based on a theoretical scaffold. This is valuable information facilitating theory development; in the extreme case, when all components of the e-learning project are already based on established learning and media theories (and the observed outcome supports the corresponding predictions), no specific e-learning theory appears to be necessary.

3.4.2 Description of the relation between technological and didactical concepts

Continuous technological advances provide many venues for e-learning. On the downside, some e-learning projects are too much centered on technology aspects and too little focused on pedagogical and didactical values. Accordingly, Pastor, Sánchez, and Alvarez (1994) concluded with respect to new technologies that “systems are designed and developed first, and possible uses and users are tried to find afterwards” (p.267). Not only in favor of a gradual development of e-learning theories, but also in favor of successful individual projects it is a prerequisite to explicitly describe how technological and didactical concepts are intertwined. For example, it makes a difference whether someone considers PLEs as a didactical concept (e.g., Attwell, 2007) or whether they are understood as a technological concept of how to integrate diverse tools in a coherent system (e.g., Chatti, et al., 2010) that must be additionally enriched by, for instance, the didactical concept of problem-based or research-based learning. This is not only a subtle issue of terminology (see below), but a significant difference in the understanding of the role of technology in e-learning. Project teams that report on how learning objectives and technology are aligned help to understand whether technology is obligatory or additional with regard to the learning component. With respect to the primary goal of e-learning – supporting and improving learning – we need to know how technology may improve “classic” learning approaches and what it qualitatively adds to learning; knowing this will substantially ease theory development.

3.4.3 Application of unequivocal terminology

An unequivocal terminology is one essential prerequisite for the comparability of different e-learning projects as well as for the generalizability of the results of individual projects. Of course, a commonly shared terminology would be the ideal case, but e-learning is used throughout many (or even all?) scientific disciplines (each of which has its own parlance); also, technological terms are often ambiguous – for instance, the term virtual reality may be a synonym for games, simulations, or virtual worlds (Merchant, et al., 2014) but also for head mounted headsets (e.g., Schneider, et al., 2004). Project teams therefore need to reflect about correct and precise wording to avoid any ambiguity. If they meet this criterion, other researchers and practitioners will be able to easily reproduce or compare project characteristics. Similarly, if project teams use identical terms but interpret them very differently, then related evidence becomes partially incompatible across projects. Importantly, one should not assume that even prominent terms in the area of learning are precise. For example, reviews on learner satisfaction and e-learning effectiveness conclude that these terms are neither sufficiently defined nor methodologically specified ( Bahramnezhad, et al., 2016; Noesgaard and Ørngreen, 2015). We propose that learner satisfaction, learning effectiveness, and other central concepts as well as collective terms such as quality are essential terms in e-learning projects; agreements on these terms is a highly desirable goal supporting theory development. In contrast to essential terms, auxiliary terms “add nuances to, alter our understanding of, or enhance our perspectives of those familiar terms” (West, 2004, p.147), such as hyper-learning, interactive learning, or media-rich learning. Auxiliary terms are subject to the
evolution of technology and socio-economic factors in the field of e-learning (cf. Sangrà, Vlachopoulos, and Cabrera, 2012). Hence, project teams should be aware of the temporally limited validity of auxiliary terms. Finally, it should be considered that vague and imprecise terminology might lead to the exclusion of project reports in narrative reviews and meta-analyses.

3.5 The universal element: Multi-criteria decision-making

It is obvious that many of the critical issues outlined above are heavily interrelated. The E-Learning Setting Circle presented in Figure 2 takes account of this. Although (nearly) all e-learning projects are confronted with these major issues, the individual issues (and parts of them) may differ in their importance and hence have a different impact on the project’s overall route. Project teams have to determine the weighting of each (sub-)issue. Also, each issue implies several strategic and design decisions, some of which may be antagonistic. As a consequence, project teams have to handle a bulk of decision criteria. Therefore, decision-making becomes a challenging part of e-learning projects as one has to find optimal solutions for multi-criteria problems. Several multi-criteria decision-making (MCDM) methods have been proposed to assess and examine the effectiveness of e-learning approaches, but they are beyond the focus of the present paper (for a current review, see Zare, et al., 2016). Indeed, the selection of the best method is also a (second) challenging task; this kind of paradox can be paraphrased by the question what decision-making method should be applied to choose the best decision-making method (Triantaphyllou, 2000). However, most of these MCDM methods are demanding in general and require substantial expertise in methodology and statistics. Thus, they might be not practicable for all projects and teams. At least we want to recommend that project teams carefully document which set of criteria they apply to which (sub-)issues, how they weight each criterion, how they address interdependencies between criteria, and how they decide at the end.

4. Conclusion

Contributions from e-learning project teams to theory development should become common practice to allow inferring general statements on how technology may improve learning. Project teams should be aware of the artificial nature of e-learning projects and research. Future progress in theory development relies on that each project team explicitly identifies, addresses, and documents both the situational factors being relevant to the design and realization of e-learning projects as well as all related decisions. The E-Learning Setting Circle presented here proposes three clusters – context setting, structure setting, and content setting –, each of which comprises three individual issues that are not necessarily sequential but frequently encountered in e-learning projects. Importantly, we highlighted two additional issues as being global to e-learning projects: on the one hand, the formulation of primary and secondary objectives as well as related measures of the goal attainment level are constitutive for each project. On the other hand, the project team must decide and document the approach and course of (multi-criteria) decision-making that touches all main issues of the E-Learning Setting Circle. This circular model is specific with regard to the major issues that should be addressed within an e-learning project; the model also provides sufficient degrees of freedom to be adaptable to very different projects. In a nutshell, the proposed model is intended to structure, standardize, and guide diverse e-learning approaches at the level of a general research methodology.

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References

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