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Changing Teacher Beliefs through ICT: Comparing a Blended and Online Teacher Training Program

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Abstract: Teachers' beliefs towards learning, teaching and ICT may have a strong impact on how learning opportunities are designed and implemented. However, research has shown that providing effective opportunities for teachers to develop skills and competence with ICT tools in order that they effectively redesign their learning environments are not straightforward. In this study we examined two teacher training programmes, both multidisciplinary, that aimed to use and develop understanding of learning and teaching as well as ICT as it related to practice of teachers. In Study 1, 74 teachers from eight higher education institutes in the Netherlands participated in an online teacher training module. In Study 2, 31 teachers from one higher education institute in the UK participated in a blended approach. Data were gathered by using the Teacher Beliefs and Intentions (TBI) instrument of Norton et al. (2005), in a pre-post test design, in order to measure changes in the participants' beliefs and intentions towards knowledge transmissions and learning facilitation.

The results indicate that the teacher beliefs and intentions in the online programme have not substantially changed during the module, although the beliefs towards knowledge transmission were lower in the post-test. In contrast, participants in the blended programme have significantly increased their beliefs and intention towards learning facilitation. Future research should assess the long-term impact of blended and online teacher training programmes on students' learning experiences.

Keywords: Teacher beliefs, teacher intentions, comparison of teacher training programs, blended vs. online learning

1. Introduction

Given recent and wide-spread governments cuts across Europe, academic scholars in higher education are under increasing pressure to be productive, effective and cost-efficient members of society (Adcroft, Teckman & Willis 2010; Marginson 2006). That is, scholars are expected to be excellent researchers, who successfully apply for research grant-funding and deliver high-quality teaching (Adcroft, Teckman & Willis 2010). As pressure builds, cutting corners in teaching may seem to be an attractive solution to gain additional time for research, particularly in institutions where research is perceived of as developing greater prestige for an individual (Marginson 2006; Kinchin, Lygo-Baker & Hay 2008). At the same time, in both the Netherlands and UK, most new lecturers are obliged to follow some form of formal professional development training in order to enhance their teaching skills.

In the last ten years three major developments in higher education have added to the complexity of the role and increased the (perceived) workload of, and pressures on, academic scholars within their teaching. First, the type of students entering higher education has significantly changed in the last ten years. Due to increased mobility the student population has a more diverse cultural and socio-cultural background (Jindal-Snape 2010; Rienties et al. 2011a). In addition, several researchers have found that secondary education does not provide the knowledge and skills that universities expect (Brouwer et al. 2009; Tempelaar, Rienties & Giesbers 2009). As a consequence, teachers need to be able to adapt and adjust their teaching to address a wider diversity of learners' needs (Jindal-Snape 2010).

A second important development that challenges the focus on cost-efficiency in higher education is that research evidence has shown that traditional teacher-centred forms of education, such as lectures, do not provide an optimal learning experience for all types of learners (Biggs & Tang 2007; Nicholls 2001). In student-focussed teaching, the role of the teacher changes from a teacher-centred approach or knowledge transmission orientation to a student-centred or learning facilitation orientation (Kember & Gow 1994; Biggs & Tang 2007). The implication is that teachers need to have a greater range of strategies available to them to meet the demands of a diverse group of learners.

A third important development in higher education is the increased possibilities brought by Information Communication Technology (ICT) that if used effectively can be a powerful learning experience for
learners (Tempelaar, Rienties & Giesbers 2009; Brouwer et al. 2009). For example, ICT tools like discussion forums, Wikis, or web-videoconferencing can provide a rich and valuable learning experience for students to acquire knowledge and transferable skills (Giesbers et al. 2009). A consequence may be that traditional methods become questioned as expectations change within the student population in particular (Garrison & Vaughan 2008). In addition, it requires academic staff to engage with potentially new learning environments and adds to the complexity faced.

Despite an increased understanding of how students learn (Ferla, Valcke & Schuyten 2009; Fyrenius, Wirell & Silén 2007) and recognition of the effectiveness of student-centred learning facilitated through ICT, challenges remain. Many innovations in higher education, and ICT in particular, have not delivered the fundamental changes in higher education that many teachers and researchers hoped for (Rienties et al. 2011c; Resta & Laferrière 2007; Mishra & Koehler 2005). Recent research has highlighted that the application of ICT in education does not necessarily lead to improved learning experiences for students or enhanced learning processes, study performance or retention (Giesbers et al. 2009; Valcke & Martens 2006). This has been attributed to a lack of organisational embedding of innovation and ICT in particular (Resta & Laferrière 2007; Rienties et al. 2011c), a lack of understanding of the essential parameters for effective teaching with ICT (Rienties et al. 2011c; Mishra & Koehler 2005; Valcke & Martens 2006), and finally a lack of appropriate teachers' training to effectively design and implement powerful learning and teaching experiences for students (Lawless & Pellegrino 2007; Löfström & Nevgi 2008).

Several researchers have suggested that higher education institutions (HEI) should provide adequate training and support for teachers in order to increase their awareness of the complex interplay between technology, pedagogy and the cognitive content in their disciplines (Lawless & Pellegrino 2007; Löfström & Nevgi 2008; Rienties & Townsend 2011). In particular, it is important that training provided to teachers is embedded into their daily practice (Löfström & Nevgi 2008; Lawless & Pellegrino 2007).

However, research has shown that providing effective training opportunities for teachers to learn how to effectively redesign education by incorporating ICT is not straightforward (Lawless & Pellegrino 2007). Therefore, in this paper we investigate the impacts of two teacher training programmes specifically designed to change teachers' beliefs and intentions towards teaching. In Study 1, 74 teachers from five higher educational institutes in the Netherlands participated in an online module specifically considering how teachers can integrate a technological pedagogical content knowledge model (TPACK: Koehler & Mishra 2010; Mishra & Koehler 2005) into their daily practice. In Study 2, 31 teachers from a UK HEI participated in a blended setting, which was based on a broader educational science perspective, bringing process and content learning together using ICT as a method to share and exchange knowledge and expertise.

2. Designing a powerful teacher training learning environment

2.1. Teachers’ beliefs and attitudes towards teaching and learning

It is believed that teachers who have a more student-focussed approach to teaching are more likely to achieve conceptual change amongst students, while teachers who have a more teacher-focused approach to teaching are more likely to aim at the transmission of information and knowledge to students (Prosser & Trigwell 1999; Norton et al. 2005). Previous research has found that teachers adopting a more student-focussed approach to teaching are more likely to stimulate students to adopt a deep rather than a surface approach to their learning (Gow & Kember 1993; Prosser & Trigwell 1999). In addition, Kember and Gow (1994) and Prosser and Trigwell (1999) found that the ‘culture’ of an institution, the complex set of factors that bring together the usual sets of actions in each institution, influences how teachers teach. Institutions where the culture is believed to value teaching, provide teachers with (relatively) small class sizes, and provide teachers with control over what and how their topic is taught induce a more student-focussed approach to teaching and learning (Chickering & Gamson 1987; Prosser et al. 2003; Prosser & Trigwell 1999).

While some believe that institutional culture is not identifiable or useful as a notion, because it is not readily described (Kogan 1999), others have suggested that it may have a strong influence on how teachers teach (McNay 1995). Certainly it has been argued that within each institution there are substantial differences in how teaching occurs (Norton et al. 2005). Teachers' beliefs, and how these impact on action as a consequence, can have a strong impact on how learning opportunities are designed and implemented (Kember & Gow 1994). Based upon an inventory of 170 teaching staff, Gow and Kember (1993) distilled five conceptions of teaching which could be located on a continuum from a totally teacher-centred, content-orientated conception of teaching to a totally student-centred and learning-orientated conception of teaching. The full continuum reads: teaching as imparting
information; teaching as transmitting structured knowledge; teaching as an interaction between the
teacher and the student; teaching as facilitating understanding on the part of the student; and
teaching as bringing about conceptual change and intellectual development in the student.
Norton et al. (2005) note that there is an apparent ambiguity in “approaches to teaching” used by
Kember and Gow (1994), as teachers’ beliefs towards teaching are not necessarily the same as their
intentions. In a review of literature on teachers’ actions, beliefs and intentions, Norton et al. (2005)
found that teachers have both “ideal” conceptions and “working” conceptions of teaching. Based upon
an adjusted version of Gow and Kember’s inventory to approaches to teaching, 556 respondents from
four UK universities across three broad academic disciplines (arts, science and social science) were
compared in relation to their beliefs and intentions (Norton et al. 2005). Teachers in that particular
study were found to have significantly different beliefs and intentions, indicating that their own ideal
conceptions of teaching differed from those played out in practice. Across the four institutions and
three disciplinary areas these teachers had relatively similar beliefs towards teaching, but significantly
differed in their intentions to teach, in particular interactive teaching, training for jobs and motivating
students (Norton et al. 2005). This implies that while teachers in general have a similar belief of what
good teaching should be, their intentions are substantially different.
While a large number of studies have argued that formal training can enhance teachers’
understanding of their practice (Prosser et al. 2003), no significant relationships were found with
formal training in the study by Norton et al. (2005), which backs up previous research by Gibbs and
Coffey (2004). Therefore, in line with previous research, Norton et al. (2005) argue that genuine
development of teachers’ approaches to teaching come from addressing their underlying conceptions
increasing number of researchers have argued that formal training of teachers should be embedded
in their daily practice, in particular when referring to the integration of technology into teaching
(Löfström & Nevgi 2008; Lawless & Pellegrino 2007). However, to our knowledge only a limited
number of studies have addressed how this integration of daily practice into formal teacher education
can be effectively established. Much of the focus has been upon developing opportunities for
conceptual change through some form of reflective practice (Young 2008). So, rather than engaging
directly within practice, teachers are asked to look at past actions and how these could be modified
within future actions. Our interest was in considering whether ICT could help to harness a more
reflexive approach which enabled teachers to consider how they acted, why and the intentions implied
or enacted as they occurred.

2.2 Comparison of conceptual framework of two programmes

2.2.1 Study 1 Conceptual framework of online programme: MARCHET
In Study 1, 74 teachers from eight higher educational institutes in the Netherlands volunteered to
participate in an online teacher training program. As a primary learning objective, teachers were
expected to develop a redesign of their own teaching module (Rienties et al. 2011b). With all teachers
an intake interview was taken, whereby particular attention was focussed on challenges that teachers
experienced in their classroom. Afterwards, teachers had to implement the redesign into their
teaching practice as well as completing the module. Participants from a range of academic disciplines
were mixed into groups of 4-7 participants and worked for a period of 12 weeks, with a workload of 25
hours. On average, participants met each other online during four web-videoconferences of one hour.
In addition, participants were able to contact each other and share knowledge and expertise using
discussion forums. Participants did not meet each other face-to-face because the travel time between
sites would have been significant. In line with recommendations of Lawless and Pellegrino (2007) and
Biggs and Tang (2007), teachers were actively encouraged to reflect on how their teaching practice
could be redesigned based upon the topics discussed in the module. Furthermore, participants were
actively encouraged to critically discuss and reflect upon the redesign within their group. The
sequence of the learning steps was as follows:

Step 1. Orientation on the subject, ICT tools and the teacher’s practice
This step had three purposes: 1) to provide participants with a basic understanding of the main
subject matter (e.g. how can teachers facilitate learners working together in discussion forums); 2) to
discuss the advantages and disadvantages of ICT tools used; 3) to provide participants a first-hand
experience of the discussed tools.

Step 2. Make a relevant technological and pedagogical choice for the teacher’s practice
In the second step, participants explored the information about the tools and were encouraged to elaborate what would be the most effective ICT tool(s) and pedagogical approach(es) for their respective educational setting. This selection was discussed with their peers during one of the web-videoconference meetings.

Step 3. Redesigning the teacher’s practice
The third step required participants to apply the issues discussed in the module to the context of their own teaching practice. Participants started to redesign their module, changed their educational setting and used the selected ICT tool(s). While participants were redesigning their own teaching practice, they had to critically reflect on the alignments between content, pedagogy and technology. Furthermore, they received feedback from other participants in their group and provided feedback on the designs of other participants.

Step 4. Reflection on the teacher’s learning process
At the end of the training programme, participants reflected on their own learning process and their experiences in the module and looked back to the situation when they started. After this step, the group process was finished.

Step 5. Implementation of the redesign into practice and evaluation
Participants implemented their redesigned lesson(s) in their teaching practice and evaluated the effects on learning by students within six months after completing the MARCHET module.

2.2.2 Study 2 Conceptual framework of blended programme: Grad Cert
In Study 2, 31 teachers from one university in the UK participated in a blended teacher training program consisting of four separate modules. The entire programme takes 18 months to complete, but the focus of module 1, the “Theory and practice of Teaching” is more or less comparable to Study 1 if one includes the hours participants in MARCHET spend on redesigning their educational design outside the formal training. As a primary learning objective teachers were expected to develop greater understanding of their role as a teacher within the learning environment (Biggs & Tang 2007). Participants from four broad academic disciplines were mixed into groups of 4-5 participants and worked for a period of 4 months, with an estimated workload of 150 hours. However, the majority of hours were self-study, as only five face-to-face meetings of two-three hours were arranged during the module. At the same time, discussion forums and emails were used to share information and knowledge in between face-to-face meetings. The sequence of the five learning steps in the module was as follows:

Step 1. Orientation and introduction to learning and teaching
This step provided participants with a general introduction to the module based around underpinning theory upon which the learning was to be based. It also provided an introduction to the online aspect of the programme and the rationale for this. After this session the large group was divided into groups of 4-5 participants.

Step 2. Micro teach
The second step required each participant to present a short teaching session on a subject of their choice to their peers in the small group. Before and after the micro teach, participants were expected to reflect on their own and their peer’s micro teach in the discussion forum. The micro teach was videoed for reference and response by the teacher. In addition, discussions were held after each session within the group and reflections posted on line for further online conversation with the view of these helping form the content for future sessions.

Step 3. Reflection on micro teach
Step 3 involved drawing out of the online discussions the questions that had been prompted within the online environment to stimulate further debate and to seek practical solutions and reflect on the supporting theory to assist future practice as this was developed by each teacher.

Step 4. Analysis of teaching practice and choose common theme/problem area
As discussions focussed upon particular topics, such as ‘motivation’ or ‘assessment’, these were further explored online and then in small group sessions with the aim that each group would formulate a structure to explain their learning at the final stage. Discussions and planning continued in face to face meetings and online between participants.
Step 5. Group presentation of understanding of practice
Finally, each small group put forward a presentation which aimed to demonstrate how understanding of learning and teaching was evolving and how they were able to apply this and then analyse the impacts and consequences of the actions taken.

Research questions and hypotheses
Based upon our theoretical framework, we first determined the teacher beliefs and attitudes towards learning, teaching and ICT of participants at the beginning of each training programme. Afterwards, we compared the extent to which the teacher beliefs and attitudes towards learning, teaching and ICT had changed by the end of the training programme. Therefore, the following research questions were formulated:

1. What are the teacher beliefs and intentions towards teaching and learning at the start of the two teacher training programs?
2. To what extent did the teacher training programs lead to a change in teachers’ beliefs and intentions to effectively implement learning, teaching and ICT in practice?

3. Method

3.1 Participants
In Study 1, 74 teachers from eight institutes in the Netherlands participated in at least one MARCH\textsuperscript{ET} module in the period April 2010 – June 2011. The participants were divided into twelve groups, whereby the average group size was 7.55 (SD = 3.85). The average age of the participants was 43.04 (SD = 10.16), while the average years of teacher experience was 7.27 (SD = 7.29). Overall, 64% of the teachers were male.

In Study 2, 31 teachers from one university in the UK participated in a module between January – June 2011, of which 28 returned the pre-test questionnaire. The participants were divided into six groups, whereby the average group size was 4.66 (SD = 0.51). The average age of the participants was 33.52 (SD = 6.46), while the average years of teacher experience was 3.04 (SD = 2.99). Overall, 28.5% of the teachers were male. Given that the average age of participants in Study 1 was ten years higher and relatively more men participated, we used pair-wise matching of participants in Study 1 to Study 2 on gender and age, leading to 28 participants in Study 1 with an average age of 33.28 (SD = 5.03) and 50% of the teachers were male.

3.2 Pre- and post-test of Teacher Beliefs and Intentions (TBI)
In order to measure the any change in views of the teacher after the intervention of the teacher training, the Teacher Beliefs and Intentions (TBI) instrument of Norton et al. (2005) was used, which consists of 20 belief items and 20 intention items. In the questionnaire, a distinction is made between learning facilitation and knowledge transmission. Within learning facilitation, five factors are identified, namely: problem solving, interactive education, facilitative education, pastoral care, and motivating students. For knowledge transmission three factors are identified, namely training for jobs, imparting information, and knowledge of subject. Cronbach alphas on the nine scales ranged from .408-.627, indicating reasonable reliability.

4. Results
In Figure 1 and Figure 2 the pre- and post-participants’ beliefs and intentions measured of the two studies are illustrated. In both studies, beliefs towards learning-facilitation orientation at the beginning of the teacher training programmes are stronger than knowledge transmission, as is illustrated by scores above 4.0 for the learning-facilitation orientation scales of problem-solving, interactive teaching and motivating students. Training for jobs, imparting information and knowledge of the subject are below 3.8. At the same time, teachers’ intentions are primarily directed towards problem solving, motivating students, training for jobs and knowledge of the subject at the beginning of the training programme

Follow-up paired sample T-test analyses indicate that in both studies teachers have changed their teaching beliefs and intentions when comparing pre-test and post-test scores. For Study 1, beliefs in knowledge transmission are significantly reduced, while all other scales do not change significantly based upon a 5% confidence interval. In Study 2, beliefs in problem solving, facilitative teaching, and training for jobs have significantly increased. At the same time, teachers’ intentions for problem solving and facilitative teaching have increased significantly.
5. Discussion
In this paper, we examine the impact blended and online teacher training programmes may have on teachers’ beliefs and intentions when developed to specifically link theory and practice to learning and teaching to the daily practice of teachers. Using the conceptual approaches to teaching framework developed originally developed by Kember and Gow (1994) and adjusted by Norton et al. (2005), we have compared the teacher beliefs and intentions of 56 teachers across two studies in a pre-post test design. When comparing the pre- and post-test scores in the complete online teacher training programme, the teacher beliefs and intentions have not substantially changed during the module, although the beliefs towards knowledge transmission were lower in the post-test. In contrast, in the blended teacher training programme teachers’ beliefs and intentions towards learning facilitation have increased significantly, as well as relevance of providing students with relevant training for jobs. In other words, a significant training effect was found for the blended programme, while for the online programme only one out of 16 scales of teachers’ beliefs and intentions changed. However, preliminary findings from semi-structured interviews conducted three months after the online programme indicate that participants did change their teacher beliefs and intentions and used more learning facilitation and integrated ICT into their teaching practice.
Do these results imply that teacher training programmes provided blended or face-to-face are more effective than online programmes? Or does this also mean that the process of change needs more time to complete? We urge researchers and training experts to be cautious about over-interpreting our findings. First of all, although we pair matched participants on age and gender, the participants in Study 2 are on average younger than Study 1 and have less teaching experience. As a result, participants in the blended programme may be more open to new pedagogical approaches that are more learner-oriented. Secondly, participants in Study 2 are involved for a substantial longer time duration of 18 weeks, while participants in Study 1 have worked together for only twelve weeks. A possible explanation of only a small change in teacher beliefs and intentions observed at the end of the training programme in Study 1 may be explained by a lack of "incubation time". Research on training programmes has shown that the direct impact of training measured after the programme was limited (Lawless, 2007). More research is needed to prove this. Finally, whether teachers are actually providing a richer learning experience for their students also needs to be tested with further research.

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6. References
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