Profiling Teachers’ Beliefs on Learner-Centered Teaching and Technology in School Innovations

The increasing use of technology in education in combination with growing attention for constructivist learning orientations requires secondary schools to change to more suitable learning and teaching practices. As a consequence, teachers have to change accordingly, whether they perceive the required change similarly or not. In this approach, teachers are treated as objects that must be changed, instead of agents of change. Most classroom teachers use the technology to do what they have always done and choose those activities that will help them accommodate their own perspectives on teaching and learning (Liu, 2011; Orlando, 2013). The problem seems to be how to diffuse innovations aimed at both technology and constructivist teaching taking teachers’ beliefs about teaching and beliefs about technology into account. This study focuses on a typology of teachers based on their beliefs about technology and teaching to support active teacher involvement in technology-enhanced innovations in Dutch secondary schools.
The literature conveys a wide spectrum of teachers’ conceptions of what constitutes effective teaching, with a teacher-centered approach focusing on knowledge transmission at one end and a learner-centered approach emphasizing learners’ constructing meaning at the other (Alger, 2009; Biggs & Tang, 2011; Orlando, 2013). A positive relationship is assumed between the use of technology and constructivist teaching approaches as technology might be better suited to support these teaching activities compared to teacher-centered approaches. However, empirical evidence about the relationship between constructivist beliefs and use of technology in class is not conclusive: teachers’ constructivist beliefs do not always reflect their practices or their teaching with technology has been limited to small additions to the conventional practices of teaching. Mama and Hennessy (2013) found that Cypriot teachers’ constructivist beliefs show inconsistency with their practice of teaching with technology. Similar findings are reported in other research contexts, such as Taiwan and Australia. Yet in other studies (Taiwan and Belgium), a positive relationship has been found between technology use and constructivist beliefs on teaching and learning. Despite the ambiguous relationship, teachers’ beliefs on effective teaching need to be considered as an important factor impacting the successfulness of innovations in teaching with technology (e.g., Chen, 2008; Tondeur, Van Braak, Ertmer & Ottenbreit-Leftwich, 2016).

Purpose of the study

The context of the study reported in this paper is an initiative of the Dutch government to enhance the use of technology in secondary schools in a more learner-centered way. Schools were invited to submit proposals to develop and implement school-based innovations on learner-centered teaching with technology. Fifty-nine secondary schools received finances. The schools’ innovations were in different phases of implementation, ranging from initial developments to continuing innovations that were tried out in earlier years. Yet school principals did not have any information about their teachers’ beliefs, while the success of these innovations heavily depended on the teachers who should apply these in their classes. Therefore, the objective of the study is to provide a typology of secondary school teachers based on their beliefs about teaching and technology. This could support secondary school principals in their decisions to select, match or support groups of teachers linked to the technology innovations they implement in their school.

Earlier studies provide potential typologies, but focused on the implementation of innovations in general (Roger’s classification of innovativeness; Rogers, 1995), centered on only one of the aspects of teaching with technology (e.g., Tondeur et al., 2008) or were based on small-scaled studies (e.g., Mama & Hennessy, 2013). Therefore, we formulated the following research question:

“Which types of secondary school teachers can be distinguished based on their beliefs about learner-centered teaching and attitudes towards technology?”

Method

Participants

Participants were 1602 teachers from 59 secondary schools in the Netherlands (response rate 35%). The sample consists of 850 females (53%) and 752 males (47%).

Instruments

We measured teachers’ beliefs about teaching and learning with 35 items (Questionnaire Beliefs about teaching and learning of Meirink et al., 2009) on four scales: 1) teacher-centered - cognitive (TCC, α = .772), 2) teacher-centered - affective (TCA, α = .783), 3) learner-centered - cognitive (LCC, α = .928), and 4) learner-centered - affective (LCA, α = .888). We measured teachers’ attitudes towards technology with 19 items (Authors, 2013) on three scales: 1) teachers’ positive attitudes towards using technology in teaching (AT, α = .904), 2) their feelings of self-efficacy in the domain of teaching with technology (SE, α = .913), and 3) their perceived social norm of teaching with technology (SN, α = .890). Participants rated their beliefs on a 5-point Likert type scale, with 1= “does not apply at all” to 5= “applies to a large extent”.

Analyses

In order to develop a typology of teachers’ beliefs about learner-centered teaching with technology, we performed cluster analyses with five of the seven scales as input (LCC, LCA, AT, SE and SN). As teacher-centered beliefs about teaching are in many studies not discriminating in predicting teachers’ technology adaptation (cf. Liu, 2011), they were left out in cluster analyses. We used the (squared) Euclidean distance as similarity measure. Seven hierarchical clustering methods and one partitioning method (K-means) were evaluated. In order to ascertain the optimal cluster analysis, we used the Variance Ratio Criterion (VRC, see Calinski & Harabasz, 1974) combined with ω (relative loss of variance explained by using less clusters). This means that the most optimal solution from the cluster analyses has the highest VRC and the lowest ω. Within the solutions with the K-means partitioning method, the three-cluster solution showed the largest VRC and the smallest ω (-44.43) but included a relatively small cluster. The near-best solution was the five-cluster because it showed a lower VRC compared to the three-cluster solution and had a similar ω (-38.18). Moreover, the number of teachers in the five clusters...
was more equally distributed over the clusters. On average, the five cluster-solution explained 54% variance between teacher scores. Based on this evaluation, we decided to use the five-cluster solution for our typology of teachers’ beliefs about learner-centered teaching and technology use.

**Expected Outcomes**

Typology based on teachers’ beliefs on teaching and technology

We summarize the typology of teachers based on their beliefs about learner-centered teaching and attitudes towards technology:

Type 1: Learner-centered teachers with technology (n = 444). Teachers with relatively high mean scores on both learner-centered beliefs and on the technology scales.

Type 2: Teachers critical of technology use in school (n = 296). Teachers with a relatively low mean score on perceived social norm of teaching with technology.

Type 3: Teachers uncomfortable with technology (n = 398). Teachers with moderate mean scores on learner-centered beliefs, but relatively low means scores on attitudes towards and self-efficacy on teaching with technology.

Type 4: Teachers uneasy with learner-centered teaching (n = 344). Teachers with relatively low mean scores on learner-centered beliefs and a relatively high mean score on feelings of self-efficacy in the domain of teaching with technology.

Type 5: Level-1 teachers (n = 120). Teachers with low mean scores overall. The extreme low scores on all beliefs about teaching and technology suggest teachers with what Biggs and Tang (2011) call level-1 theory of teaching and learning. These notions imply that learning outcomes are solely dependent on motivation and prior knowledge of students, not on the way teachers teach.

**Conclusions**

Linked to the school innovations that formed the research context of this study, only about a quarter of the teachers belonged to the favorable teacher type (type 1); for the other teachers their type was less optimal. This finding calls for interventions in schools to select the right group of teachers for future technology innovations in their schools, to match groups of teachers to the particular school projects, to compile teacher teams that implement particular schools projects, or to support professional development of particular groups of teachers as a start of the project.

**References**

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