# Investigating in-service teachers' concerns about adopting technology-enhanced embodied learning

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**Abstract.** Despite the affordances of technology-enhanced embodied learning, its integration in mainstream education is currently at slow pace given that in-service teachers are reluctant to adopt this innovation. This exploratory study investigated the concerns of 31 in-service primary education teachers, who took part in a Professional Development (PD) programme, using a questionnaire grounded in the Concerns Based Adoption Model (CBAM) about the adoption of technology-enhanced embodied learning. The findings of this study indicated that, at the outset of the PD programme, the participating teachers had relatively few personal and management concerns; in contrast, they were highly concerned about obtaining more information, collaborating with other colleagues as well as about expanding the innovation further. Teachers' participation in the PD programme had a significant impact on the mitigation of these concerns. By the end of the PD programme teachers retained only some high-level concerns, which are essential for the sustainability of technology-enhanced embodied learning.

**Keywords:** Technology-enhanced embodied learning, Concerns-based adoption model, Teacher attitudes, Teacher Professional development

## 1 Introduction and theoretical background

Technology-enhanced embodied learning constitutes a contemporary pedagogy of learning, which emphasizes the use of the body in the educational practice. This novel pedagogy is supported by the widespread population of affordable motion-based technologies in combination with the emergence of immersive interfaces, which have opened the doors for the design of embodied digital learning apps [1]. Despite the tremendous educational affordances of technology-enhanced embodied learning, its integration in mainstream education is currently at very slow pace [2], given that in-service teachers are reluctant to adopt such educational innovations, as they lack appropriate training [3]. However, little are yet known about teachers' concerns towards the adoption of technology-enhanced embodied learning, while there is also a lack of Professional Development (PD) programmes supporting teachers on the topic.

This study was based on the Concerns Based Adoption Model (CBAM) [4] to investigate the concerns of 31 in-service primary education teachers towards the adoption of technology-enhanced embodied learning as well as the impact of a PD programme on

their concerns. This study addressed the following research questions: (a) Which are the main teachers' concerns about the adoption of technology-enhanced embodied learning prior the PD programme? and (b) How did participation in the PD programme affect teachers' concerns about the adoption of technology-enhanced embodied learning?

# 2 Methods

## 2.1 Participants & Professional Development (PD) programme

Thirty-one in-service teachers in primary education were the total sample of this study from which twenty-five were female (81%). Our PD programme, which was enacted in the context of the INTELed European project (https://inteled.org/), adopted a cyclical framework, which was based on a prior PD model suggested by Kyza and Georgiou [5]. The framework was organized in two sequential phases: a *Training* and a *Practical* phase. As part of the *Training phase*, teachers assumed the roles of *"Learners"* via experiencing a variety of embodied digital learning apps and the role of *"Designers"* by designing a lesson plan for integrating technology-enhanced learning in their classrooms. As part of the *Practical phase* teachers were involved in school pilots, assuming the roles of *"Innovators"* and *"Reflective practitioners"* to transfer in praxis the knowledge gained during the previous phase.

## 2.2 Instrumentation and data collection

In order to explore the concerns of the teachers as innovation adopters, a revised version of the Stages of Concern (SoC) questionnaire was employed, adapted from de Vocht, Laherto and Parchmann [4]. The SoC questionnaire consisted of 30 items and used a 5-point Likert scale for capturing teachers' concerns as they moved through a developmental series of 6 stages about technology-enhanced embodied learning: (a) Information, (b) Personal, (c) Management, (d) Consequence, (e) Collaboration and (f) Refocusing. Agreeing with most items, presents a high concern in each concern stage. An open-ended question was also appended to the questionnaire focusing on teachers' needs in relation to adopting technology-enhanced embodied learning, to shed more light in the quantitative data collected. The questionnaire was administered in 3 different timepoints to capture the trajectory of teachers' concerns during the PD programme: (a) at the outset of the PD programme (Pre-test), (b) after the completion of the Training phase (Post-test) and (c) after the completion of the Practical phase (Pospost-test).

## 2.3 Data analysis

Descriptive statistics were used to investigate the pre-test concerns stage intensities collectively. Subsequently, for the comparison of teachers' concerns at the different timepoints of the PD programme (pre-test, post-test, postpost-test) the Friedman test was employed. The Wilcoxon signed-rank test was also employed on the different combinations of the related timepoints, to investigate when the differences actually occurred. Finally, the data collected by the participating teachers at the open-ended

question were analyzed using a top-down thematic analysis approach. That is, our thematic analysis was theoretically driven by Concerns Based Adoption Model (CBAM) and it was guided by our research focus in classifying teachers' self-reported needs according to the stages of concern.

# 3 Findings & Discussion

## 3.1 Teachers' initial concerns and concerns' profiles

Overall, according to our findings the stages of collaboration and interest had the highest intensity. In contrast, the personal, management and consequence stages had the lowest intensity. Going a step further, when identifying the SoC individual profiles for the participating teachers by comparing the relative intensities of teachers concern stages, the participating teachers approached the *"Co-operator"* profile. This finding was encouraging, as according to de Vocht et al. [4] "Having many Co-operators at the beginning of the adoption process is productive for an innovation, as these individuals seek information and possess a willingness to collaborate yet have relatively few personal and management concerns" (p.333).

## 3.2 Comparison of teachers' concerns across time

The Friedman test indicated that across time, there were not statistically significant difference in the Personal stage $\chi^2(2)=1.298$, $p=0.593$, in the Management stage $\chi^2(2)=0.689$, $p=0.709$ as well as in the Consequence stage $\chi^2(2)=2.469$, $p=0.291$. However, the Friedman test indicated that there was statistically significant difference on the Information stage $\chi^2(2)=12.094$, $p=0.002$, on the Collaboration stage $\chi^2(2)=8.760$, $p=0.013$ as well as on the Refocusing stage $\chi^2(2)=7.309$, $p=0.026$ across time. Post hoc analysis with Wilcoxon signed-rank tests with a Bonferroni correction applied ($p < 0.017$) indicated that there was a statistically significant decrease in concern intensities in the stages of Information, Collaboration and Refocusing only between the outset (Pre-Test) and the end of the PD programme (Postpost-test). This finding expands research-based conclusions from previous PD projects all pointing to the need to engage teachers in extended PD experiences, which combine not only a training part but also a practical part, allowing teachers to implement educational innovations in their classrooms [5].

## 3.3 Teachers' needs

According to the teachers' responses it seems that, during the PD programme, the participating teachers moved through the developmental series of the six concern stages. In particular, while at the outset of the PD programme teachers' needs were mostly related to low-level concern at the Information and Personal stages (e.g., receiving more information about embodied pedagogy or improving their ICT skills), by the end of the PD programme their needs had mostly to do with high-level concerns at the Collaboration and Refocusing stages (e.g., have access to additional embodied digital learning apps or additional opportunities for continuous PD). This finding also warrants the

success of our PD programme. According to de Vocth et al. [4], while the low-level stages are considered less valuable for an educational innovation, the high-level concerns are essential for the sustainability of an innovation.

## 4 Conclusions and implications

The present study provides some initial empirical evidence of teachers' concerns when adopting technology-enhanced embodied learning. At the same time, it contributes to the identification and tracking the mitigation of teachers' concerns during a PD programme using the CBAM model.

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