

## Exploring teachers' needs for guidance while designing for technology-enhanced learning with digital tools

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**Abstract.** Supporting teachers to represent their teaching ideas has attracted researchers' interest in developing digital learning design tools that provide some form of guidance around the design practice in a Technology-Enhanced Learning (TEL) environment. This paper reports on a study in a teacher education context utilising WebCollage as the learning design tool. The research focuses on teachers' needs on determining resources and technologies while designing for TEL. Our findings convey that teachers' needs converge towards a learning design tool providing flexibility to the designer to either (i) utilise a sound scaffolding mechanism incorporating a taxonomy that follows technology advancements or (ii) determine applying resources and technologies without providing any guidance. These findings may stimulate momentum for further attention to researchers involved with learning design tools' development.

**Keywords:** learning design, learning design tools, technology-enhanced learning, teacher needs, teacher education.

### 1 Introduction

Supporting teachers to represent their teaching ideas has attracted researchers' interest in developing various digital learning design tools [1–3]. Aiming to help teachers shift from an implicit, belief-based approach towards one more explicit and design-based approach, a key facet of all learning design tools is that they attempt to provide designers with some form of guidance and support around their design practice [4]. However, existing proposals regarding the form and degree of guidance are still inconclusive, as learning design tools also need to have sufficient flexibility to support creativity and accommodate teachers' personal design paths and styles [5, 6].

Focusing on the additional expectations of teachers applying Technology-Enhanced Learning (TEL) methods in their practice [7, 8], research should consider how learning design tools may guide teachers into knowing when, how and what learning technologies to embed in their learning designs. Such research should give voice to the teachers as the better we understand teachers' current practice, the more effectively learning design tools will support them [5, 9, 10]. However, studies on

learning design tools have mostly taken on a specialist/researcher (as opposed to a teacher) perspective [2]. Previous research shows that significantly more attention has been paid to developing tools than establishing what teachers designing TEL activities actually need [10].

To this end, our research aims to allow teachers express directly their needs and preferences as TEL designers. We report on an exploratory study in teacher education following a convergent mixed-methods research methodology [12]. As part of broader research addressing several forms of guidance that digital tools may provide, this paper focuses on exploring teachers' needs for determining the resources and technologies incorporated in a learning design.

## 2 Methods

The study took place in the context of two courses offered in a postgraduate programme in teacher education. Participants were 30 teachers, 16 in-service and 14 pre-service. Their academic disciplines were from a broad spectrum of sciences such as informatics, mathematics, engineering, pedagogy, philosophy, sociology and physical education. The majority, 63%, had not used any learning design tool before the study, while 37% had. Each course involved teachers in a learning design project that include authoring a learning design collaboratively. Specifications that the learning designs had to meet were relevant to the courses' curriculum. The course "Digital Technologies in Distance Learning" required that the learning designs: (i) integrate technological resources with Web-based tools, (ii) follow specific principles for developing distance learning content and (iii) support personalised learning. The module "Collaborative Learning with Digital Technologies" required that the learning designs: (i) apply a collaborative learning technique and (ii) integrate technology with Web 2.0 tools to implement the collaborative technique.

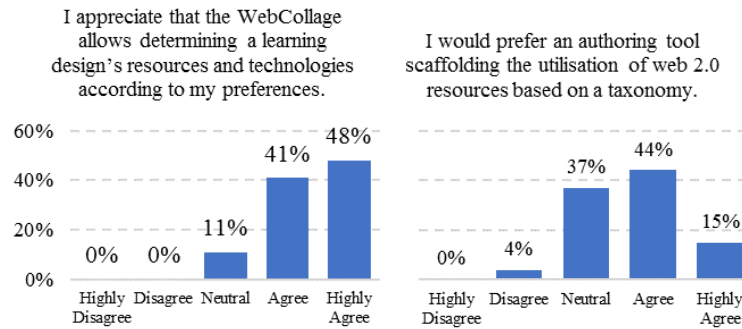
We assigned participants to use the digital tool WebCollage [11] for authoring the designs as we opted to provide them with a design experience in a tool providing mixed guidance to designers. For example, WebCollage scaffolds organising collaborative learning by providing pedagogical patterns whilst, in the case of the resources and technologies utilised in a learning design, it supports a free-form definition.

We applied a convergent mixed-methods research methodology [12], collecting, analysing, and triangulating quantitative with qualitative data. We performed frequency analysis at the quantitative data and content analysis at the qualitative data. Our focus is grounding findings on teachers' experience based on the mixed-methods approach towards a deeper consideration rather than generalising based on quantitative results.

Utilising a survey questionnaire, we addressed several forms of guidance that digital tools may provide to teachers as TEL designers. In this paper, due to space limitations, we present participants' responses in two closed-ended questions as Likert-scaled statements and one open-ended question. As resources and technologies are core elements of TEL, through this data, we address the research question, "*How do teachers prefer determining the resources and technologies of a learning design?*"

### 3 Results

We report the results of 27 valid survey questionnaires. Fig 1 includes the frequencies of the responses to the statements of the two closed-ended questions.



**Fig. 1.** Quantitative Results (n=27).

In the content analysis of the responses to the open-ended question asking participants to argue on their needs either by commenting on issues addressed in the closed-ended questions or suggesting others, we extracted two categories. One category provides a solid argument for preferring a learning design tool like WebCollage that does not scaffold technologies' determination: "*because such a mechanism will be obsolete due to technology advancements*". The other category suggests a flexible approach providing designers with alternative options: "*According to the designer's preferences, either support him to utilise resources and especially Web 2.0 technologies or simply allow him to decide on his own*".

The mixed-method analysis considers as quantitative findings that free determination of a design's resources and technologies is favoured; nevertheless, scaffolding based on a taxonomy also shows a remarkable preference. As qualitative findings, we consider that some participants stand against scaffolding the utilisation of resources and technologies while others suggest being flexible to the designers' preferences. The mixed-method interpretation conveys that participants' needs converge towards a learning design tool that provides flexibility to the designer to either (i) utilise a sound scaffolding mechanism incorporating a taxonomy that follows technology advancements or (ii) allow determining the utilisation of resources and technologies without providing any guidance.

### 4 Discussion and Conclusions

This paper describes a study in teacher education utilising a digital tool to address teachers' needs while designing for TEL. The research focuses on their needs to determine the appropriate resources and technologies for a learning design.

Our findings align with previous research asserting teachers' needs in between guidance and flexibility in structuring a learning design [3, 5] and sheds light on specifically the issue of designers determining the resources and technologies used in designing for learning. In our study, teachers seem open to a tool involving a sound scaffolding mechanism incorporating a taxonomy that follows technology advancements. For example, such a mechanism is the "Typology of Free Web-based Learning Technologies" [13], incorporating 226 technologies arranged into 40 types and 15 clusters. This typology updates the previous "Typology of Web 2.0 Learning Technologies" [14], aiming to support teachers' conceptualising and applying technologies. At the same time, teachers would like to freely apply their preferences, arguing that as technology advancements are soon rendering technologies obsolete, such a mechanism will inevitably not cover all their needs.

Although we conducted the study in the context of a postgraduate programme, the sample of participants, including both in-service and pre-service teachers from several disciplines, may infer findings for all teacher education types. Furthermore, the specifications that the learning designs developed had to meet, including distance learning, collaborative learning and personalised learning under the umbrella of TEL, allows exploring teachers' needs while designing for TEL within a broad spectrum of contemporary learning. This study's context also reports on a rich learning design experience that evolved around two learning design projects over a full academic semester rather than short training sessions and workshops reported in other studies [2, 5, 7] lasting between a few hours up to a couple of days. Consequently, we conclude that the findings of this study may stimulate momentum for further attention to researchers involved with learning design tools' development.

The limitations of this study refer to the small sample of participants, the limited insights provided by the open-ended question, and the utilisation of only one learning design tool [2, 3]. Although our study did not evaluate the tool per se, a future research design may provide participants with a richer design experience if more digital learning design tools are used. Also, it may yield ample insights if qualitative data include apart from open-ended questions and in-depth interviews.

Our future work involves investigating teachers' needs of a learning design's representation regarding other elements, such as the format, the contextualisation, the formalism, and the organisation [5, 6], to achieve an overall perspective of teachers' needs during the learning design process.

**Acknowledgments** The authors acknowledge that the publication/registration fees were totally covered by the University of West Attica. The Universidad de Valladolid co-authors acknowledge funding of the European Regional Development Fund and the National Research Agency of the Spanish Ministry of Science, Innovation and Universities, under project grant TIN2017-85179-C3-2-R, and PID2020-112584RB-C32, the European Regional Development Fund and the Regional Government of Castile and Leon, under project grant VA257P18.

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