

# HELPING TEACHERS TO THINK ABOUT THEIR DESIGN PROBLEM: A PILOT STUDY TO STIMULATE DESIGN THINKING

Davinia Hernández-Leo<sup>1</sup>, Shirley Agostinho<sup>2</sup>, Marc Beardsley<sup>1</sup>,  
Sue Bennett<sup>2</sup>, Lori Lockyer<sup>3</sup>

<sup>1</sup>*ICT Department, Universitat Pompeu Fabra Barcelona (SPAIN)*

<sup>2</sup>*School of Education, Faculty of Social Sciences, University of Wollongong (AUSTRALIA)*

<sup>3</sup>*Graduate Research School, University Technology Sydney (AUSTRALIA)*

## Abstract

Designing learning experiences for students is a key responsibility of teachers. This involves designing stimulating and engaging tasks, selecting and creating appropriate resources, and deciding how best to support students to successfully complete the tasks. This is a complex process in which many factors need to be considered. Learning design research and tooling is focused on how to support this teacher design work. Existing learning design tools support the authoring and sharing of learning activities, which - if represented computationally - can also be enacted in virtual learning environments. An important part of the learning design process is thinking about what it is that students are to learn. This then informs the design of the learning activities. However, research on how to support this early phase of the learning design process is scarce. Indeed, an emerging finding from research investigating teacher design practices is that teachers' design work exhibits some characteristics synonymous with the broader field of design. Specifically, teachers formulate and work with a design problem. But, teachers generally don't consider their work in terms of design. Thus there is scope to encourage and support design thinking in teachers along the whole learning design process, including in the initial phase of identifying a design problem. This paper reports on a pilot study where a learning design Problem Generation Tool was created, in the form of 20 stimulus questions, to generate deeper thinking about the design problem. The stimulus questions are based on 3 foci, which are to be considered in an iterative way to think about and generate the problem: Understand the nature of the design problem and your goals (e.g. What kind of problem is this? Why is this design being done?) Map your context (e.g., Who are the students? How will the course be taught? Who will teach in this course?), Plan your design approach (e.g., What preparation do you have to do? What is your initial plan or steps you will follow for your design process?) The tool was incorporated in the Integrated Learning Design Environment (ILDE), a community platform that integrates a number of learning design tools supporting conceptualization, authoring and implementation of learning activities. The Problem Generation Tool integrated in ILDE was used with eight participants, who were already familiar with ILDE, in a workshop setting in a postgraduate program at a local University in Barcelona, Spain. Participants had between one and five or more years of teaching experience. Results showed that participants found the Problem Generation Tool helpful. The level of perceived usefulness by question varied across participants, while a few questions were not sufficiently clear and need to be revised. Overall, there was evident elaboration of the participants' design problems thus suggesting design thinking was stimulated and identification of the design problems scaffolded.

Keywords: Learning design, teacher design thinking, technology, pilot.

## 1 INTRODUCTION

Designing for effective student learning is one of the key responsibilities of teachers. This involves designing stimulating and engaging tasks, selecting and creating appropriate resources, and deciding how best to support students to successfully complete the tasks. This is a complex process in which many factors need to be considered. The research work in the field of learning design has been focused on how to support this design work. Learning design is defined as both a process; the means by which a teacher creates a (technology-supported) learning experience for students, and a product; how the pedagogical design is described and documented in such a way that it can be shared with others [1, 3].

Recent discourse in learning design research is conceptualizing teacher design work within the broader field of design [1, 2]. That is, a teacher is essentially a designer whereby they identify learning-related problems they wish to address with their students and they craft solutions to these problems in the form of learning experiences [3]. Findings from research focused on better understanding teacher design practices (see [4] for a detailed explanation of this particular research agenda) support this notion of teacher as 'designer'. For example, the study by Bennett, Agostinho, and Lockyer [2], which examined teacher design practices of Australian university teachers, found similarities between university teachers' design work and characteristics of design thinking evident in other discipline fields such as architecture and engineering. Design thinking within the broader design literature refers to a systematic yet iterative process of solving problems [5, 6, 7]. Research on design thinking conducted by Cross [5] and syntheses of literature about design thinking by Retna [6], and Razzouk and Shute [7] explain that design thinking is a complex process where a design problem serves as a starting point for exploration; the problem and solution then develop together. Moreover, it is a creative and iterative process exhibiting particular kinds of 'thinking' characteristics such as (see Table 2, p. 336 [7] for a detailed list of design-thinker characteristics):

- Top-down, breadth-first approach; that is, "keep the big picture of the problem in mind while focusing on its specifics" [2, p. 336];
- Iterative and responsive to new ideas; that is, "continually consider how what is being created will respond to human needs" (p. 336);
- Making design decisions; that is, "search competing alternatives before moving to choice making or decision making...find ways to come up with new configurations" (p. 336). This involves reflecting on the design solution.

These three types of characteristics were evident in the study by Bennett et al [2]. However, the participants in this study did not explain their design work in terms of design. This suggests there is an opportunity to develop a 'designer' disposition in teachers. How this can be supported is an area requiring further investigation [1] and is thus the focus of this paper.

Recent research proposes considering a learning design life cycle that goes from conceptualization to authoring and implementation of learning designs [8]. Conceptualization is the process of reflecting about the characteristics of the context in which the learning design will be applied, before the designer starts the actual creation of the design. Authoring is the step in which the ideas for the design are defined using a textual, graphical or computational representation, in a way that the learning design is fully documented and ready to apply in an actual educational setting. The implementation is the delivery of the design with the students, e.g., through the deployment of the design into a Virtual Learning Environment. Learning design research outcomes have offered a number of tools to support the different stages in this lifecycle [9, 10]. However, none of the existing tools support educators in specifically thinking about the teaching-learning design problem they are targeting to solve at the beginning of the life cycle.

A key feature inherent in the design thinking characteristics summarised above is understanding and thinking about the design problem. Learning design research and development work to date has not provided much emphasis and thus little support for teachers in this key part of the design process [3]. This paper reports a pilot study where a prototype tool was created to help teachers engage in thinking about their 'design problem'. The tool was developed based on empirical findings from research investigating both university teacher design practices [2, 4] and school teacher design practices [11]. Referred to as the 'Problem Generation Tool', the tool is comprised of a framework with accompanying questions to help stimulate thinking about a design problem. The tool was accessible within the Integrated Learning Design Environment (ILDE) [12] (<http://ilde.upf.edu/about/>). ILDE is a community platform for educators that integrates a number of learning design tools supporting conceptualization, authoring and implementation of learning designs.

The purpose of this pilot study was to gauge the reaction to this tool in terms of how the framework and its accompanying questions stimulated thinking about a design problem. The pilot was conducted in a workshop setting and the overall research question for the study was:

How did the Problem Generation Tool support participants to think about their design problem?

More specific research questions were:

- How did participants articulate their design problem before using the Problem Generation Tool?
- Was there evidence of an elaboration of the design problem by using the Problem Generation Tool?

- What were participants' perceptions of the Problem Generation Tool?
- What suggestions did participants make for improvement to the tool?

The problem generation tool is described in more detail below followed by an explanation of the methodology and results of this pilot study.

## 2 PROBLEM GENERATION PROTOTYPE TOOL

The Problem Generation Tool provides a framework to help teachers think about and develop a sound understanding of their design problem by supporting them in identifying and documenting the key features of the problem. In the use of the tool, an introductory explanation is important to situate problem generation as a first step in a design process for the development a practical solution for a particular context that will address the particular problem identified. Then a series of questions are provided based on three foci, which are to be considered in an iterative way to think about and generate the problem:

1. Understand the nature of the design problem and your goals: Seven questions are provided in this section (Q1-7).  
Sample questions are: *What kind of problem is this? Why is this design being done? What initial ideas do you have?*
2. Map your context: Eight questions comprise this section (Q8-15).  
Sample questions include: *Who are the students? How will the course be taught? Who will teach in this course?*
3. Plan your design approach: Five questions guide this section (Q16-20).  
Sample questions are: *What do you need to produce? What preparation do you have to do? What is your initial plan or steps you will follow for your design process?*

The list of questions in the template is in Table 1. Fig. 1 shows a screenshot of the Problem Generation Tool integrated as a template in ILDE [8]. The template is shown in Spanish, as used in the pilot study explained below. The complete template can be found integrated in the demo version of ILDE at <http://ilde.upf.edu/about>.

Table 1. Questions in the Problem Generation Tool.

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### GENERATING THE PROBLEM

#### Understanding the nature of the design problem and your goals

- Q1. What kind of problem is this? Are you designing something new or redesigning something that already exists?
- Q2. Why is this design being done? Has this come about from an institutional process (e.g., from a course review) or is this a problem you've identified from your own reflections?
- Q3. What is the rationale for this design? For example, will it fill a gap in an existing course, or offer students more choice?
- Q4. What do you want your students to achieve from this course? This includes official learning outcomes, but also broader aims and goals.
- Q5. What is the course description? Are there required content, tasks or activities?
- Q6. What do you want to get from this course as a teacher? Is there something new that you want to learn or try?
- Q7. What initial ideas do you have?

#### Map your context

- Q8. Where does this fit within a broader course of study?
  - Q9. Who are the students who will take this course? What are their characteristics? Are there different groups? How many students will take this course?
  - Q10. How will the course be taught? This might include face-to-face, online, blended,
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- multi-campus etc. What spaces are available? What tools will support?
- Q11. Is there timetabling or timing issues to consider?
- Q12. Who will teach this course?
- Q13. What approach/philosophy will guide the teaching approach?
- Q14. Are there any other important features of the context you need to consider?
- Q15. Are there any particular constraints (time, resources etc.)?

### Plan your design approach

- Q16. What is your timeframe?
- Q17. What do you need to produce?
- Q18. What preparation do you need to do? Is there anything that you currently don't know that you need or like to find out?
- Q19. What resources and supports are available? Who will you work with? Who can provide advice?
- Q20. What is your initial plan or steps you will follow for your design process?
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Generando el problema

Only you can edit  
All users can read

Share... Save Save & Exit or Cancel

Tags: [Click here to add tags to the design](#) Completeness: 0 Granularity: 0

Source

Styles - Normal - Font - Size - B I U abc x<sub>2</sub> x<sup>2</sup>

Entender la naturaleza y los objetivos del problema del diseño

Planifique su propuesta de diseño

Mapa del contexto

**Entender la naturaleza y los objetivos del problema del diseño**

- ¿Qué tipo de problema es? ¿Está usted diseñando algo nuevo o rediseñando algo que ya existe?
- ¿Por qué este diseño? Ha llegado a esta situación a partir de un proceso institucional (por ejemplo, a partir de una revisión del curso) o se trata de un problema que ha identificado a partir de sus propias reflexiones?
- ¿Cuál es la razón fundamental del diseño? Por ejemplo, va a llenar un vacío en un curso existente, o va a ofrecer a los estudiantes más posibilidades de elección?
- ¿Qué desea que logren sus estudiantes a partir de este curso? Objetivos y metas mas allá de los requeridos oficialmente.
- ¿Cuál es la descripción del curso? ¿Hay contenido requerido, tareas o actividades?
- ¿Como profesor, qué es lo que desea obtener de este curso? ¿Hay algo nuevo que desea aprender o intentar?
- ¿Qué ideas iniciales tiene?

**Mapa del contexto**

- ¿Dónde encaja esto dentro de un curso más amplio?
- ¿Que estudiantes tomarán este curso? ¿Cuáles son sus características? ¿Hay diferentes grupos? ¿Cuántos estudiantes realizarán este curso?

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Generando el problema Support Document + Add document + Attach files

Figure 1. Screenshot with the Problem Generation Tool (in Spanish) integrated as a template in ILDE.

### 3 PILOT EVALUATION: METHODOLOGY

A three-hour workshop was conducted with eight participants as part of a Master's degree program in Communication and Education at a university in Barcelona in September 2016. Six of the participants identified themselves as teachers (Education), while two identified themselves as being from the field of communications or media (Communication/Media). The practical teaching experience of participants, as determined by their responses to the question "How many years of teaching experience do you have and in what context/sector (primary, secondary, university, industry)?" differed among participants. The diversity of experience among participants included three participants with less than a year of teaching experience and five participants with five or more years of teaching experience (See table 2).

*Table 2. Background of workshop participants.*

<b>ID</b>	<b>Profession</b>	<b>Teaching Years</b>	<b>Teaching Experience</b>
1	Communication / media	7 years	Higher Education
2	Teacher	5 years	Secondary
3	Teacher	6 years	Primary
4	Communication / media	2 months	Internship (language teaching)
5	Teacher	5 years	Secondary
6	Teacher	2 months	Internship (language teaching)
7	Teacher	* 1 year (3 months)	Primary, secondary
8	Teacher	7 years	Secondary

Participants were already familiar with ILDE. Previously to the workshop, in the context of the same master's program, they were introduced to ILDE and completed a Jigsaw collaborative activity in which each group had to select two tools in ILDE (one conceptualization tool and one authoring tool) and analyze them in terms of reading their documentation, viewing examples of designs created with the tools, interacting with their features, and explaining the tools analyzed to other groups. In another activity, the participants had to use ILDE for the design of an innovative learning scenario relevant to a learning context of their interest using two of the tools integrated in ILDE.

The workshop comprised the following sequence:

- Introduction to the workshop: It was explained that the purpose of the workshop was to explore a new tool in ILDE as part of a research pilot. Participants consented to participating by signing a form.
- Thinking about a scenario: To start, participants had to think about a teaching and learning scenario they could do with students. They could build on the teaching/learning scenario they had already defined in ILDE (in a previous activity in their master) or propose a new scenario.
- Thinking "openly" about the problem they aim to solve in their scenario: In a blank text document within ILDE participants were asked to write their ideas about the problems in their scenario. They were not asked to follow any particular structure.
- Thinking "using the Problem Generation Tool" about the problem they aim to solve in their scenario: Using the Problem Generation Tool template, participants went through and answered the proposed questions.

Data collected comprised three sources:

- Artefacts produced in ILDE: results from using the 'blank page' tool to first document the design problems, and the completed Problem Generation Tool template.
- Responses to a questionnaire designed in Google Forms, with questions about the overall experience of participants in documenting the problem and using the Problem Generation Tool, and questions about the aspects considered in the tool (e.g., which were the most helpful questions for problem generation from their perspective, which were difficult to understand, if they miss questions that could be relevant for the problem generation purpose).
- Observations documented by the research team.

Data analysis was conducted by the research team (comprised by Spanish and Australian members), following this procedure:

- Data was firstly translated into English.
- The initial problem statement and responses to the problem generation tool were coded. A summary table was compiled to facilitate the analysis of each participant's responses.
- A coding framework was established inductively by generating codes from the data by reading the summary table. The codes were checked by the research team and any discrepancies were discussed by the research team to determine inter-rater agreement.

## 4 PILOT EVALUATION: RESULTS

The findings are provided in this section in the form of key themes evident for six participants randomly selected. A cross-analysis of quantitative data for the eight participants is discussed next.

### 4.1 Findings as key themes

#### ***Marta elaborated on the design problem by focusing on the solution***

Marta's background is in communications and online education. She has seven years of teaching experience in higher education. Her learning activity scenario was focused on storytelling, particularly teaching students the structure of a story. Marta initially described her design problem from a teacher perspective, by explaining she wanted to use multimedia to create an interactive learning experience so her students could make their own stories online and in doing so learn about storytelling.

Marta answered 19 of the 20 questions in the Problem Generation tool. Her responses in the Problem Generation tool elaborated on her ideas for her design solution. An example of this is her response to Q1: What kind of problem is this?: "The problem lies in that the teacher needs to have knowledge and skills of some interactive program to adapt a story to a multimedia design program in order to convey the issues that have to be addressed in class." Thus her design problem was a need for an interactive multimedia resource to help students learn about storytelling. Marta did not explain her reasoning of how and why she thought an interactive multimedia tool was an appropriate solution.

Marta thought the questions most useful were questions 1-6, 10, 13, 17 and 18. The question she had difficulty understanding was Q7. Marta did not make any suggestions for additional questions.

#### ***Kenet's design problem description become somewhat clearer but many questions were not answered***

Kenet has 5 years of teaching experience as a high school teacher. His scenario for a learning activity was about teaching students, who speak Spanish, scientific terms in English. His initial design problem was described considering both the student and the teacher. For example, he made reference to the nature of the content and the challenges students would face in learning the content, e.g., "Complexity of scientific terms within the program. Lack of prior knowledge of the English language". He also noted a lack of resources available to teachers and students to facilitate this specific language practice, eg., "Lack of digital tools that facilitate language practice". Whilst he made these statements, his overall initial problem statement was vague making it difficult to understand his design idea/problem.

Kenet answered 10 of the 20 questions in the Problem Generation tool. His responses in the Problem Generation tool showed he made some elaboration to the design idea/problem. This was mostly in the

responses to the first section: Q1-7. Particularly, his response for Q4 provided insight into the problem beyond the initial problem statement by explaining what students would achieve from the design: "Students acquire new technical tools. Expand English language scientific terms knowledge. Carry out a complex English language practice by using technical terms". Four of the 8 questions in "Map your context" were not answered, yet his response to Q10 (how will the course be taught) indicated the participant had a solution in mind: "The best alternative is carried out in a hybrid way (Blended)". Three of the 5 questions in the 3rd section: "Plan your design approach" were not answered and the responses suggest that some of the questions were they were not clearly understood.

Kenet thought the most useful questions were Q1-7, 9-12, and 17-20. The questions he had difficulty understanding were questions 2, 6 and 18. When comparing his ratings with his responses to the Problem Generation tool, it seems that Kenet answered the questions he felt most useful in sections two and three. Although, he only managed to answer half of the useful questions identified as being useful in section 3. This may indicate that Kenet did not have enough time to work his way through the Problem Generation tool.

Kenet suggested the following additional questions be considered for the tool in Section 1: "Define the population to whom the program is directed." Section 2: "What would be the necessary resources for the student to be able to take the course? Is it necessary to charge a fee?" and Section 3: "An approximate number of subjects intended to teach." His suggested questions reflect what he had written in his initial learning activity scenario with regard to the availability of and access to resources.

### ***Lara elaborated on the design problem, presented a solution, and suggested ideas to evaluate the solution***

Lara has been a primary school teacher for six years. Her activity focused on learning and writing the letters of the alphabet. Her initial design problem was mainly explained using a student perspective, that is, what challenges/difficulties primary school students have when recognising and writing letters of the alphabet. She made one statement that indicated a teacher consideration: "The attention (span) of the students is usually brief". Details of the students and her design solution was not provided in this initial design problem description.

Lara answered all 20 questions in the Problem Generation tool. Her responses reflected a mixture of elaborating on the design problem, describing a design solution, and stating how the solution could be evaluated. She elaborated on her design problem by explaining who are the students: "The course is carried out by 35 students, first grade students of elementary education, 6-7 years..." (Q9). She stated a solution to her problem: "It will offer students the help they need to seize the properties of written language, reducing confusion in the recognition of letters" (Q3) and how students would use this design solution: "use this tool at least 15 minutes per day over a period of 3 months" (Q11). Lara also provided some explanation of how the solution could be evaluated: "investigate students familiarity with ICT, as well as their reading and writing. Investigate their learning processes and how their learning is more meaningful" (Q20).

Lara's responses demonstrate design thinking beyond the initial design problem generation process as she thought of a solution and indicated how the solution could be implemented and evaluated.

Lara identified questions 1-7, 9, 10, and 13-20 as being the most useful. She did not have difficulty understanding any of the questions. Lara made some suggestions to improve the Problem Generation tool with an emphasis on detailing the solution as she wrote, "I think you should pay special attention to this area of the questionnaire as it will be the one which will allow the creator to mainly structure its proposal. Methodology? Scope and project limitations? How do you plan to evaluate the project results? Self-assessment and feedback, etc."

### ***Sia provided little elaboration of the design problem***

Sia is an early career English/Spanish teacher in China. Her initial design problem was described in terms of problems students have in learning Spanish as a new language, particularly pronunciation and students not being confident to practice speaking in Spanish.

Sia answered 16 of the 20 questions in the Problem Generation tool. She elaborated on the design problem by explaining the problem she had when learning Spanish and thus would like to create a solution to help her students overcome the problem she experienced: "Because I want to solve problems that appeared when I learned Spanish as a new language, I think that there are many

Chinese students who have the same problems.” (2). Her answers to the questions suggest that the design problem is how to include something ‘new’ within an existing course. The new activity is focused on using ICT: “introduce new teachings through ICT in the classroom to facilitate Spanish learning” (Q7) but Sia did not elaborate of what kind of activity this would be.

After answering all of the questions in section 1, Sia only answered two questions from section 2 and two questions from section 3. Thus, it is likely that she had to skip answering some of the questions in the Problem Generation tool due to time constraints. In terms of identifying the useful questions, Sia seemed to rank the usefulness of all the questions per section with section 1 questions being ranked as follows: 2, 1, 4, 3, 6, 7, 5; section 2 questions: 9, 13, 15, 10, 14, 12, 11, 8; and section 3 questions: 18, 19, 17, 16, 20. She had difficulty understanding questions 6, 7 and 14. Sia suggested that the following question be added to section 1 of the Problem Generation tool, “What are the relevant issues in the field of teaching?”

### ***Veronica elaborated on her design problem by providing student details and ideas for a solution***

Veronica has five years of high school teaching experience. Her initial design problem was described in terms of problems students have with communication skills and academic writing. The description was very broad covering a range of literacy skills e.g., “Lack of fluency in the orality using the language, lack of search strategies...lack of vocabulary...lack of...consistency in academic writings”. There was no information provided about who are the students.

Veronica answered 19 of 20 questions in the Problem Generation tool. Her responses show an elaboration of the problem. There was more detail about her students: “My problem arises from the activities and results presented by high school students in a school located in Colombia. I'm taking different options of something that already exists” (Q1). There was some misinterpretation of Q16-17 as she answered this from the student perspective instead of the teacher (designer perspective).

Veronica identified questions 1-7, 9-13, and 15-20 as being the most useful. She identified the following questions as being difficult to understand, 2, 6, 8, 14, and 18. Q14 was the only question that Veronica did not respond to in the Problem Generation tool and was marked by her as being confusing. She did not make any suggestions for additional questions.

### ***Antonio elaborated on her design problem by providing student details and ideas for a solution***

Antonio is an early career teacher with experience in an elementary school classroom. His initial design problem was described based on the student perspective, that is, in order to start an English course, Spanish students need to understand grammatical definitions such as what is a verb, noun, etc.

Antonio answered 19 of 20 questions in the Problem Generation tool. Similar to Veronica, Antonio elaborated on the problem namely in terms of providing more detail about the students: “Students between 10 and 12 years. Hyperactive and anxious children. Must do activities to entertain them before starting the class” (Q9). A potential solution about creating audio-visual materials was mentioned: “Put aside traditional teaching and use audiovisual tools to teach children” (Q7), but no further detail was provided.

Antonio thought the most useful questions were Q4-7, 9-12, 14, and 15. The questions he had difficulty understanding were questions 3, 13, 16, 17, 19, and 20. The only question Antonio did not answer was Q13 which he had also marked as being confusing. Antonio suggested the addition of the following question to the Problem Generation tool, “Do you think that you have to adapt to the context in which children live to teach English?”

## **4.2 Cross-analysis and discussion**

Explicitly addressing each research question the results show the following:

There was a variety of ways in which the participants initially articulated their design problem before using the Problem Generation Tool. Two described their design problem solely from a teacher perspective (Marta and David), three solely from a student perspective (Antonio, Sia, and Veronica),



and 3 included a mixture of student and teacher considerations (Jose, Lara and Kenet). This suggests that there is not a common known way/understanding to describe a design problem.

There was evidence of an elaboration of the design problem by all participants. The analysis of responses to the questions in the Problem Generation Tool highlight the following themes:

*Many elaborated on the solution rather than elaborating on the problem.* Some went beyond the problem and solution and started to think how they would evaluate the solution (E.g., Lara, response to Q20). This indicates that the questions stimulated initial design thinking.

Overall, participants found the Problem Generation Tool helpful. Participants were asked to rate each of the three sections of the problem generation framework in terms of their level of agreement with the statement, "I found the questions in the section useful" with 0 denoting the lowest level of agreement and 5 the highest. Overall, all participants selected a level of agreement of 4 out of 5 or higher for all sections – with an overall average across sections of 4.6. The average rating for section 1, "Understand the nature of the design problem and your goals" was 4.6; for section 2, "Map your context" was 4.5; and for section 3, "Plan your design approach" was 4.7. It should be noted that one participant did not enter a rating for section 3. Additionally, observers noted that, once introduced to the Problem Generation tool, all participants began working diligently through the questions for over 30 minutes.

*Participants thought most of the questions were useful:* Fourteen out of the twenty questions were identified as being useful by at least six out of eight participants. Questions 4, 5, and 10 were identified as being useful by all eight participants. In contrast, question 8 was the only question to receive fewer than 5 useful identifications, as it was identified as being useful by two participants. It should be noted that one of the participants wrote all the question numbers but in a non-sequential order which suggests that they wrote their answers in order of usefulness. However, it was not possible to determine whether the question numbers at the end of their sequences were still being identified as being useful to them or not.

*Some questions were not clearly understood:* Overall, eleven out of the twenty questions were identified by at least one participant as being confusing. Question 8 was the only question that had been identified by three participants as being confusing. Questions 6, 7, 13, 16 and 17 were identified by two participants as being confusing. Moreover, in looking at the questions not answered by participants during the workshop, questions 14, 13, and 8 were most frequently skipped with question 14 being skipped by five participants and questions 13 and 8 by four.

*Participants provided feedback on how the tool could be improved by offering suggestions for additional questions:* Six of the eight participants suggested additional questions in response to the prompt, "Please add any additional questions you think should be added to this section." Four of the thirteen suggestions made related to understanding or adapting to students, two were related to the evaluation of the activity, and the remaining related to the designing and implementation of a solution. It is clear that some of their proposed questions relate to different parts of the design process. This provides a bit of further evidence that suggests teacher design has characteristics with the broader discipline of design but much more needs to be explored.

The limitations of this pilot study are as follows. As the questionnaire and workshop were presented in Spanish, it is not clear how much of an effect the translation of the materials had on the ratings provided by the participants and in the interpretation of their responses. Not all participants were able to write answers to all of the questions in the problem generation framework due to the time constraints of the workshop – this may have had an effect on their evaluations of the questions and ratings of the sections. The average number of questions answered among participants was sixteen with only one participant responding to all twenty questions.

## 5 CONCLUSIONS

This pilot represents a preliminary study. Thus, more needs to be done to explore how the formulation of design problem is able to re-frame the characteristics of the learning design crafted to address that problem. It is necessary to conduct deeper investigations in which participants have more time to reflect and go through the whole design process / life cycle – thus go beyond the design problem generation phase. Moreover, in future studies we propose to include an activity where participants will be asked to articulate their perceived design problem once they had thought about it by considering

the questions. That will enable us to compare their initial design problem with the re-worked design problem.

Overall, the results from this pilot show there was a receptiveness to use this form of design support and some evidence of similar characteristics between teacher design and the broader field of design. This suggests there is potential for further exploration about how teachers' design thinking can be stimulated along the diverse phases of the learning design lifecycle.

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