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Empowering Teachers through Design Thinking: Developing Learning Prototypes for Multilingual Students

Empoderando profesores a través de design thinking: Desarrollando prototipos de aprendizaje para estudiantes multilingües

Abstract. This paper argues that developing teachers' design literacy will enable them to better respond to the demands of their work in schools. Our approach involves partnering with teachers and other educators through professional development. They learn design thinking tools from us and apply them to a problem faced at their schools, while we research their progress solving the problem and putting design thinking tools into practice. We present a case of schools challenged by how to support students in the process of learning English. We ask, how might teachers learn and use design thinking to develop effective supports for their multilingual students? The research team used mixed methods to gather data. Overall, we noticed our teacher-partners shift from conceptualizing language learning as vocabulary and grammatical structures, to thinking holistically about the range of challenges multilingual students face in schools. We present two teacher cases that highlight how design thinking was used to cultivate design literacy and help their students develop academic and social language skills. Our research was with elementary and middle schools, but we believe that the principles outlined in our design thinking project could extend beyond grade level and content areas.

Keywords: Design literacy, design thinking, professional development, teachers, teaching multilingual students.

Resumen. Este artículo argumenta que el desarrollo de la alfabetización en diseño permitirá a los profesores responder mejor a las demandas de las escuelas. Nuestro enfoque considera una colaboración con profesores y educadores a través de la capacitación profesional. Ellos aprenden recursos de *design thinking* y nosotros investigamos la manera en que ellos las aplican para resolver problemas en sus escuelas. Este artículo, en particular, se enfoca en escuelas que deben apoyar a estudiantes multilingües en el aprendizaje del inglés. Nos preguntamos, ¿cómo podrían los profesores aprender y usar *design thinking* para implementar apoyos efectivos para sus estudiantes multilingües? Nuestra investigación utilizó métodos mixtos para recolectar datos. Por lo general, los profesores cambiaron sus conceptualizaciones lingüísticas sobre cómo apoyar el aprendizaje de idiomas desde un enfoque centrado en el vocabulario y la gramática hacia una visión integral de los variados desafíos que deben enfrentar los estudiantes multilingües. Presentamos dos ejemplos de profesores que demuestran cómo utilizaron *design thinking*, tanto para cultivar su propia alfabetización en diseño, como para ayudar a sus estudiantes a desarrollar habilidades de lenguaje académico y social. Nuestra investigación se realizó en escuelas primarias e intermedias, pero creemos que los principios descritos en nuestro proyecto podrían extenderse más allá del nivel y las áreas de contenido.

Palabras clave: alfabetización en diseño, capacitación profesional, *design thinking*, enseñanza de estudiantes multilingües, profesores.

Introduction

Teachers are designers of schools and classrooms. Their everyday work includes designing, implementing, and iterating on social, behavioral, and academic practices. Teachers design curriculum, systems of interaction, structures for communication, approaches to pedagogy, and discipline-based inquiry, to name but a few. They even design connections with others outside the classroom, such as families and the school community.

Despite this palette of design practice, teachers do not usually depict themselves as designers or know how to articulate design concepts, processes, or mindsets. Their design literacy is *sub rosa*, mostly partial and intuitive. In the United States, few teachers are explicitly trained in how to design, or to see design as a critical part of their professional practice. Any design training they may receive is usually in service of constructing a lesson plan—a plan of action for teaching specific content to a specific audience, with an emphasis on classroom implementation.

Dorst (2011) considers ways that design practices might be fashioned as essential tools for problem solving and innovating organizations such as schools. The piece examines concepts that underlie professional design practices and discusses how they might best translate to non-design professional organizational contexts. It supports an idea that some concepts could be taken up and put to use for supporting innovation outside professional design. We think this is the space where design literacy could be more broadly realized. We are interested in the possibilities for developing design literacy for schools by working with teachers to put design concepts and related tools in their hands, to support their work with them, and to understand the outcomes. To date, teaching has been a profession where design work is completed by others in the system and handed to teachers who sometimes alter and adapt them for their students through individual “reflective” adjustments (Schön, 1987). Unfortunately, the model of top-down instructional design has not helped teachers or students thrive. It is a model of received design for teachers that ignores core design principles: user-centered, need-based understandings and solutions informed by feedback and iteration.

Recent calls in education for the growth of students’ 21st century competencies include fostering design literacy. As such, teachers are expected to become literate in design processes and mindsets to meet current educational aims. Efforts to establish training and research on design in other professions including education have proliferated (Cross, 1982; Goldman & Kabayadondo, 2016; Pacione, 2010), but much of this work on the need for design literacy is student-focused. Fortunately, some design scholars have begun chronicling teachers as both key constituents and gatekeepers for design learning advocacy. At a time when U.S. and international standards (Council of Chief State School Officers, 2010; OECD, 2018) ask teachers to develop students’ design and innovation skills while teaching to content standards (Goldman & Zielezinski, 2016), it stands to reason that teachers must be given opportunities to develop the same fluency (Davis, Hawley, McMullan, & Spilka, 1997).

Several studies show that as teachers learn design thinking, they begin to work and teach more collaboratively and with more positive mindsets

(Diefenthaler, Moorhead, Speicher, Bear, & Cerminaro, 2017; Goldman & Zieleski, 2016; Henriksen, Richardson, & Mehta, 2017). Working with teachers on empathy and culturally-responsive teaching increased teachers' user-centered practices (McAllister & Irvine, 2002). Retna (2016) showed that teachers perceive many positive effects of design thinking for students while highlighting the difficulties for teachers to shift to new ways of teaching.

A handful of organizations are already supporting teachers to become design literate. The d.school at Stanford University, for example, trains school teachers and leaders in design thinking. The U.S.-based Partnership for 21st Century Skills aims to prepare teachers and students for future-oriented competencies and skills. The IDEO design firm's publication, "Design Thinking for Educators," and The Teachers Guild ask what design can do for teachers' practice and the future of education. Still, while the training of teachers in design thinking is a trend, the numbers impacted are currently modest and research on this process is still nascent.

Our research team aims to understand how design literacy develops for teachers. We promote a vision of teaching that makes the methods and mindsets of design thinking a central feature of teachers' literacies. For three years, our team has been working in partnership with teachers and administrators from five elementary school districts in California to develop design literacy for teachers of multilingual students. Together, we are exploring the question: how might teachers learn and use design thinking to develop effective supports for their multilingual students? In this article, we describe how design principles such as empathy building and iteration empowered teachers to create prototypes that supported their multilingual students' academic success and emotional well-being.

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Background

Our project uses design thinking to address the erroneous perception that students who are learning English are not able to achieve academically at the same level as their peers. We refer to these students as "Designated English Learners" (DELs). DELs are a heterogeneous population that make up approximately 10% of public school students nationwide (MacFarland et al., 2019). They include new immigrants with little to no English exposure before coming to the United States, as well as U.S.-born children whose families do not speak English as their primary language. Many school systems have taken to calling these students "English Learners," but we emphasize that they are "Designated" as such, as a reminder that labels can obscure the rich cultural, linguistic, academic, and life experiences that these students already possess (and of the irony that, in U.S. schools, we are all English learners to some degree) (Walqui & Bunch, 2019).

DELs are present in nearly every district, yet not all schools have specialized programs or personnel to serve them effectively. For schools where fewer than 10% of the students are DELs, this problem is particularly acute (Hopkins, Gluckman, & Vahdani, 2019). Even some of the most well-funded districts struggle to support DELs in developing their language skills and academic achievement (Armas, Lavadenz, & Olsen, 2015). Yet, surprisingly, neither research nor policy has focused on how best to support small numbers of DELs in classrooms or schools.



Figure 1. Project and Research Activities.
 Authorship source.

Eager to be responsive, a group of teachers, administrators from five school districts in Northern California, and our research team began tackling the challenge. Our collective question is: how might teachers learn and use design thinking to develop effective supports for their multilingual students? Each year, we partner with 20 to 30 teachers from these districts to help them develop personalized interventions for their DELs, using the principles and process of design thinking as well as research on language development and instruction. Together, we are learning how using a design thinking approach and helping teachers put it into practice can result in innovating practices for serving DELs.

Methodology

Our approach is grounded in the research-practice partnerships model, a form of applied research in which researchers and educators partner to understand and innovate school processes and explore outcomes of those innovations (Coburn, Penuel, & Geil, 2013). In our partnership, we are mutually concerned with what teachers are learning about DELs and their challenges in school, what teachers learn about design thinking as an approach for innovating on behalf of students and their learning, and how teachers develop fluency with design skills that impact their work.

Our partnership method and the questions we ask oriented us to a design-based research (DBR) approach (Brown, 1992). DBR is constituted through reciprocal relationships between teacher learning, applied design work, and iterative research studies to understand what is accomplished (Goldman & Jimenez, 2016). Using DBR allows us to trace the development of our teacher-partners’ design and design literacy through ongoing inquiry and analysis cycles. Each year, we begin a new DBR cycle that engages the teachers with design thinking and professional development, and we collect multiple data sources to learn about the impacts their work has on them and their students. In this article, we report on our second year (2018-2019) of implementation and results (see Figure 1 for an overview of project and research activities).

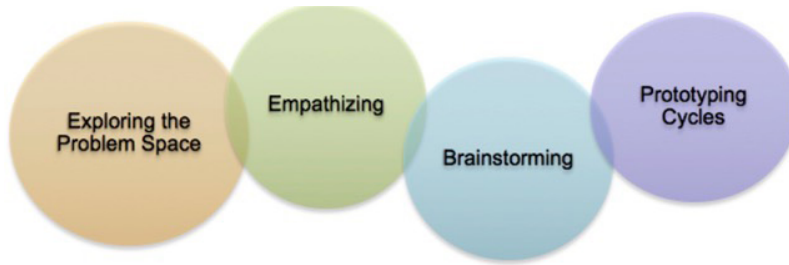


Figure 2. The Design Thinking Process

(Goldman, Stanford University). Authorship source.

Project Activities

We began by introducing teachers to the design thinking process (see Figure 2) and mindsets. The design thinking process starts with exploring the problem space and empathizing, then moving into brainstorming possible solution ideas, and prototyping and iterating based on feedback. Through learning and applying the process, we hoped teachers would practice and develop design mindsets (e.g., work from empathy, take action and learn from mistakes, stay persistent, collaborate). Each participant in the project began with a focal user, a DEL student in their classroom or one that they worked with regularly. The teachers were asked to observe and engage the student in various settings to gain an understanding of the student's interactions, challenges, strengths, and needs. After reflecting and engaging empathy exercises, teachers brainstormed ideas and chose one as a prototype intervention for the DEL student. Over the year, the teachers iterated on these designs based on feedback from their focal students and their colleagues while the research team tracked their progress with each iteration.

In conjunction with the design process, teachers were offered a series of three hybrid (partially online and partially face-to-face) professional development workshops (Rutherford-Quach, Kuo, & Hsieh, 2018) focused on DEL issues. The topics were chosen by the participating teachers through a pre-survey, and the resources and content were co-created with our partners.

Each hybrid workshop had components that built upon the others. In each, teachers reviewed resources such as videos and readings, reflected on their instructional practice, and completed a performance task related to the topic in their classroom or school. At the completion of each workshop, the research team met with teachers in small school/district groups to debrief the content and make connections to their focal students and prototypes. Participants developed knowledge and strategies from workshops and simultaneously engaged them in an empathy-driven design process. The goal was for these activities to dovetail. Thus empathy insights become the foundations for personalized, actionable prototypes based on the focal students' needs that were implemented and revised based on effectiveness.

Lastly, the research team facilitated three large group meetings with all participants. The first was held early in the academic school year to launch the project and start participants on the design thinking cycle. The second was held in the middle of the academic year and focused on prototyping and the introduction of hybrid workshops. The last was held at the end of the year to chronicle the DEL-related design projects that were accomplished.

Data Collection and Analysis

Our research tools were designed to be minimally intrusive while still providing comprehensive documentation of the project activities. We conducted a pre-post survey that allowed us to collect teachers' ideas about design thinking, experience with and perception of DELS, what they wanted to learn about DELS, and demographic information. Each month, we met with teachers to discuss what they were learning from their workshop activities and design projects. We collected written, audio, and photo artifacts of their design thinking steps with students and their reflections. At year's end, we collected videos of the teachers presenting their projects to the other project participants and conducted focus groups to gather final reflections.

In our analysis, we developed and applied codes across the multiple forms of data we collected. By triangulating our data, we identified shifts teachers were making in the ways they talked about their focal students as they engaged in the empathy exercises and designed and iterated on feedback. Herein, we report on general trends we saw in design literacy development, supported by stories of two teachers' design projects that illustrate our key findings.

Results

Development of Design Literacy

Over the course of the year, teachers learned and applied the design thinking process to accomplish a solution focused on helping a designated student. Observational data indicated that the teachers became more able to implement design thinking as a problem solving process over the school year. These observations were confirmed through self-report in the survey data. At the beginning of the year, 44% of the teachers said that they had no familiarity with the design thinking cycles. By the end of the year, 38.5% of teachers said they were *very familiar* and 34.6% said they were *familiar* with the design thinking cycles.

In total, twenty projects were reported at the end of the project year and we saw a variety of design foci across the solutions. For example, one teacher developed curriculum, another used a new technology in the classroom, and a third created interdisciplinary classroom activities. Nine of these projects were designed for an individual DEL. Five projects began focused on an individual DEL but pivoted to serve more students (including students without the DEL label) as the year progressed. In some cases, teachers began to collaborate with each other as they iterated on projects, leading to robust designs and positive reports on outcomes. This suggests that (a) design thinking was flexible enough to meet the needs of teachers and their focal students, and (b) the teachers became more comfortable using design methods and incorporated them into their classrooms. We also saw that the empathy and design processes opened teachers to equity concerns.

Empathy-Influenced Responsive Design

Empathy exercises and insights helped teachers reassess their focal students' needs and explore other strategic foci beyond vocabulary and sentence structure. At the start of the project, teachers expressed excitement about learning new "academic language strategies," thinking those were key to DELS' academ-

ic success. About halfway through the year, we noticed most teachers moved to a general focus on creating more “classroom languaging” opportunities—varied use of language(s) and ways of communicating in and across settings (Valdés, Capitelli, & Alvarez, 2011; van Lier & Walqui, 2012). The teachers found support for making this shift from a workshop we offered on “Constructive Classroom Conversations.” In addition, after carefully observing and speaking with their focal students, some teachers identified needs that the students had outside of classroom academics, such as developing study skills or handling feelings of isolation at school. The end of the year survey responses showed a shift in thinking about the needs of students being mostly about academic language to consideration of a range of factors, including the role of the family or how teaching practices can improve the social positions of students in the classroom. This full palette of topics that the designs ultimately addressed indicated how the teachers learned to tailor their designs to their DELS’ needs rather than using received solutions or deciding strategies a priori.

Design Thinking Orients Teachers Towards Liberatory Practice

Through their design work, and in particular the empathy exercising, teachers found themselves working on behalf of marginalized students to shift inequitable power dynamics in their classrooms and schools. The combination of design process and workshops opened space in the school context for the teachers to design with an eye towards improving equity and liberatory change (National Equity Project, n.d.). The teachers shifted from conceptualizing language learning as a process of “tried and true” pedagogical techniques to a consideration of academic, emotional, and social-structural interactions. We saw prototypes that addressed concerns over social structure, such as one where the teacher arranged for an isolated student to have a school staff member as a personal mentor and advocate.

Design in Context: Stories Illustrating Cross-Cutting Design Features

We saw the power of empathy being exercised and iteration and prototyping processes emerge as characteristics of successful designs. To put these principles in context, we present two stories of teachers who expanded their ideas about their DELS’ needs and developed their fluency with design thinking.

Story 1: The Power of Empathy and Relationship Building

Tanya, a reading specialist for middle school students, designed a podcast activity for her DEL students. She began to empathize (see Figure 3) by observing Sasha, a student from Russia. After observing and speaking with Sasha across multiple instances, Tanya determined that Sasha needed more conversation practice. Tanya approached the need by designing a podcast prototype in which Sasha and another Russian-speaking student taught Tanya words in Russian, while Tanya taught them words in English. The podcast project gave Sasha the opportunity to converse with her teacher and peers in an intimate production setting. Tanya’s goal behind the podcast was to encourage Sasha to practice the vocabulary she needed to attain conversational English skills while leveraging her Russian language skills as an asset. By asking Sasha to teach her Russian, Tanya positioned her student as knowledgeable and able to teach the teacher. Simultaneously, she put herself in the role of the language learner, leading to additional insights about Sasha’s situation as a DEL.



Figure 3. Empathy Chart.

Tanya's empathy chart for Sasha. Authorship source.

Content by "Tanya", a participating teacher

According to Tanya, “What followed was the power of making connections and having empathy with students.” After a few iterations of their podcast, the reading specialist saw changes in Sasha. “She began to participate more in class, she wasn’t afraid to ask her peers and teacher for help, and she played with many different children, not just the Russian speaking students.” While Sasha became more confident in her learning and expressed a love for school, Tanya herself changed through this process as she learned the “importance of building empathy and making connections with students.” She expanded her podcasts to include her Portuguese-speaking students and finished the project year with plans to continue recording podcasts to create connections with her future students and enhance opportunities to practice conversational English.

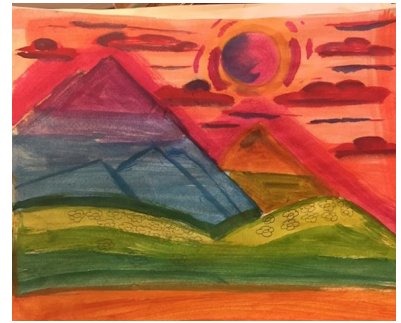
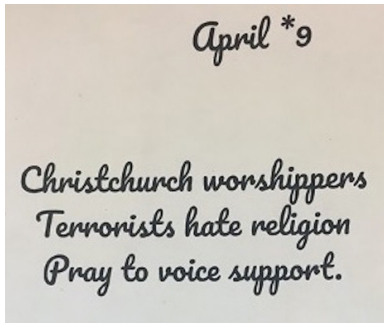
Story 2: The Power of Prototyping and Iterations

The design thinking method of “iterating one’s way to success” can be difficult to adopt in a school environment where teachers as well as their students strive to get correct answers the first time. Yet, an iterative approach can be more effective and friendly to DELS overall. Betti, a DEL provider by training, discovered this in her project to encourage her student Alex to speak and communicate more. She underwent three iterations of her prototype, each building on the results of the previous attempt to smooth out issues that had arisen during implementation.

Like Tanya, Betti started developing her prototype based on insights gained from empathy-building exercises. She learned that making art was important to Alex, so she included an art activity as a key part of the plan. However, the first time she tried an activity with Alex’s classroom teacher that connected art and writing, the results were mixed. The art activity got Alex talking--she noted that Alex “has no trouble sharing what is on his mind when he is comfortable”--but there was friction over the prototype and how it had been implemented. Betti reflected that she needed to communicate more with the classroom teacher, scaffold the questions and prompts for the student peer conversations that were a part of the activity, and observe the resulting student conversations in person.

The second iteration was based on Betti’s insight that “Alex needs a way to share with pride and confidence.” She arranged for a whole-class activity in which students were asked to write and share a story about a celebration in their home cultures. Betti prepared discussion questions in advance and arranged to record students’ conversations about each other’s stories. Though the activity went well and Betti noted that Alex seemed more confident, she remained concerned that student conversations alone were not enough to show the extent of Alex’s language learning to the adults in his life.

The third iteration was to create a poem based on a news story with an accompanying watercolor painting. Betti chose an article about the then-recent mosque shootings in Christchurch, New Zealand, and read it with students. She also taught them the Haiku form, generated prompts for discussion, and recorded how the students presented their work (see Figure 4). The last part of the activity was to bring these poems to Alex’s English teacher, where Alex discussed his work eloquently, demonstrating his oral language abilities. In this



final form, Alex succeeded visually, orally, and through writing, highlighting his social skills and language fluency with his peers and his English class teacher.

Betti: How do you think another person might visually represent your haiku poem? Especially the point that says, 'Pray to voice support?'

Alex: What about praying? People could draw half the sky blue, half red; maybe they could draw the clouds white--some clouds white, not blue. Maybe I could draw another with half the sky yellow, not red. The sky clouds can cover the mountains. The clouds white--that means that people are praying. Clouds came, people praying and showing support. Or, I could even draw... What is that wet stuff? Rain. Yes! The rain can clear the sky.

Discussion

These cases highlight how teachers made use of design thinking to build their design literacy while they engaged in helping their students develop academic and social language skills. When we examined the teachers' design literacy development, we saw it had powerful impacts for them and their students. Below, we discuss three aspects of design literacy we saw emerge in the teachers.

1. Embracing empathy. Teachers learned to engage in empathy work with DELS and used the insights gleaned to set the focus for their designs. The empathy process helped educators see their students in new ways and learn about their needs, strengths, and assets as a part of focusing interventions. Observations of the students' language use inside and outside of the classroom and reflections about their social and academic strengths, interests, and needs provided integral information for jumpstarting a process of new engagements.

Through empathizing, developing a fail forward mindset, and collaborating, our team found a process that built, applied, and reinforced teachers' design literacy (Davis et al., 1997; Goldman & Zielezinski, 2016). The design process worked within the confines of resources to which teachers have ready access and enabled them to design "new" ways to engage students in their learning pathways. Design thinking provided an incremental, low-stakes, empathy-based process for classroom interventions that had us keep the focus on individual students while learning that designs could scale in the classroom.

2. Failing forward. Once the educators identified an area of focus using the empathy process, they planned and tried a first (low stakes or modest) activity to build on the insights (Gerber, 2009). The possibilities were limitless—we have

Figure 4. The Integration of Art with Writing and Discussion Prompts. Authorship source.

Content by "Alex", a student

Note: This figure illustrates how Betti's focal student Alex responded when discussing his work about the shootings in Christchurch and how others might visually respond.

observed a series of podcasts, a project combining writing and art, or morning meetings in the classroom with prompts and peer conversation partners, to name a few. The design process encouraged teachers to try a classroom intervention, examine which parts worked, and reflect on where it could improve. The intervention did not have to be perfect the first time it was tried. Some teachers iterated many times in order to get their designs right for the DELS, exceeding our advised and expected schedule for iterations. We see that with each iteration, educators learned more about their students and became more confident in how they could engage and design for them.

3. Finding partners. In design thinking, we try to collaborate as much as possible. Teachers worked with grade level or same subject teachers at their districts. They worked with our design and research team in small-group and whole-group meetings. Having partners who were also building design literacy allowed for multiple feedback opportunities, collective brainstorming, and support with revisions and iterations.

As a group, we noticed our teachers across sites and grade bands grow in their design literacy and knowledge of and commitments to DELS. Teachers remarked on the rewards of deliberately building empathy with one student. “All DELS deserve our attention,” reflected a seventh grade English teacher. “We need to make them an intentional focus at our school sites in order for anything to change.” Another teacher felt that she “gained greater insights into the social and emotional needs of my focal student. Having observations outside the classroom allowed me to build on her strengths.” Deliberately engaging in an empathy process through a collaborative process helped teachers see their students in a new light. The insights they developed from this propelled their commitment toward the next phases of the design process.

Conclusion

Our research team has been working to better understand how practicing teachers’ design literacy can be nurtured, developed, and applied. We see teachers as professionals who engage design as an integral part of their responsibilities but who receive little training in design. In this project, we partnered with teachers from primary schools to address a critical problem of practice: how to best support their multilingual students designated as English learners (DELS) to achieve academically. Our team provided design thinking training and coaching to encourage the teachers to develop positive mindsets about their DELS and professional development on approaches to language development in schools. We used a design-based research approach to answer the question, how might teachers learn and use design thinking to develop effective supports for their multilingual students?

The results point to the power of building skills and mindsets related to empathy and prototyping for developing effective support for multilingual learners, which we illustrate above in two examples of teachers who grew their design literacy. One teacher started a podcast where she empowered her student to be the language expert; another teacher used art to coordinate with the student’s English teacher to provide tailored lessons. Both teachers learned to make both subtle and bold shifts through the design process. One teacher remarked that she was moved by the empathy process because it brought “head

and heart together as one.” Both teachers’ views of possible interventions shifted from purely grammatical language learning lessons to hand-fashioned plans that facilitated language-abundant interactions for students that also built their capabilities and confidence. The teachers’ developing design literacies played significant roles in what they were able to design for their students.

This is the design thinking literacy we hoped was possible. The teachers gained new background knowledge through the workshops concerning DELs. They engaged in deep empathy and brought that to their design solutions, developing positive design mindsets. While there was variation in the depth of teachers’ design literacies, the two examples we shared here were representative of the general trends we saw across the cohort. Our goal was not for the teachers to develop the capacities of professional designers but rather to support them to use design thinking processes and mindsets to improve their professional practice. We believe the design fluency developed could last and become more widespread among teachers.

Our research took place with primary schools, but we believe that the principles outlined in our design thinking research-practice partnership model extend beyond grade level and content areas. Once one has empathy-based insights about a student—he is deeply artistic, or she is socially isolated, or they are proud of their cultural traditions—one can try for an “innovation” that will positively respond to the student’s needs. Engaging an iterative design thinking process and having support for putting it into practice with students who have “wicked” learning situations is fundamental to realizing design literacy for teachers.

Author Note

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