Inclusive education driven by design

The case of a graduate seminar course

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This case study explores the use of design tools by educators with an aim to answer the question: How can a design-based approach contribute to the development of strategies for inclusive education? Thirty-five educators, who were students from the final year of a master's degree focusing on inclusive education taught at a Chilean university, participated in the study. The information collected included participant observation and the analysis of the work elaborated by the educators throughout the seminar. Subsequently, we selected the trajectories of three participants, which were analysed by open coding. The results suggest that adopting a design-based focus helped the educators understand pedagogical problems as systems of relationships, frame problems constructively, think visually about possible teaching strategies and develop didactic materials to respond to the special educational needs of their students. These findings are important in the light of inclusive education policies that seek to ensure the regular education system provides learning opportunities for all students, regardless of their physical or intellectual characteristics.

Keywords: inclusive education, design-based approach, teacher professional development, special educational needs

Introduction

Inclusive education is that which gives access to quality education to every child. Its three basic premises sustain that: i) every child count (UNESCO, 1994), ii) an educational system should be able to create opportunities for each one, and iii) the learning environment should welcome, protect and educate each child regardless of their gender and physical, intellectual, economic and linguistic characteristics, among others (Ainscow, 2014). In the Chilean context, Decree Nº83 (Ministerio de Educación, 2015) promotes the implementation of measures that give curricular flexibility and universal accessibility (Meyer, Rose & Gordon, 2014) to meet the need of students with special educational needs (SEN) in early years and primary education. However, 38% of educational establishment directors declare a lack of inclusive education teaching skills in Chile (Thomson & Hillman, 2019).

In search of a response to this need, a graduate programme focused on inclusive education at a Chilean university decided to incorporate design-based methods and tools. The programme assumes an anthropological perspective of otherness, which conceives differences as individual features of people. The programme defines itself as essentially interdisciplinary and professionalizing. Interdisciplinary training provides a comprehensive and integral vision of learning by considering the students' context, not just their learning condition or difficulty. The curriculum includes a set of disciplines that address diversity at all educational levels. Moreover, the teaching team is made up of professionals from early years, primary and special education, as well as others from psychology, speech therapy, occupational therapy, neuropsychiatry, public policy and design.

Design as a strategy for situated problem-solving in a school context

The decision to include design tools and methods seeks to develop higher professional competencies that enable the master's students to solve educational problems in context by designing and implementing

pedagogical strategies that support the inclusion of people with SEN into the regular school system. These strategies are understood as a set of teaching tools that allow interaction with the students that encourages their participation, motivation and interest, in order to achieve learning (Pérez & Salamanca, 2013).

Authors such as Simon (1996) and Schön (1998) have addressed the link between design and professional development. The former suggests that all professionals design when they carry out actions that seek to change existing situations into desirable, but as yet non-existent, situations. For his part, Schön suggests that design can serve as a model for professionals in other areas to develop skills in framing and solving complex problems. This would explain the growing use of design-based methods to address complex problems and encourage innovation in various contexts, including teacher training. At the early years education level Jordan (2016) observes that a design-based focus helps trainee teachers to be more flexible, more adaptable and more open to explore. While Henriksen, Richardson and Mehta (2017) have observed that approaches based on design, like so-called design thinking, provide an accessible structure that empowers teachers to creatively address the wide variety of problems they must solve daily.

Evidence is still limited and focused on small groups, but it is possible to foresee that adopting a design perspective could be of great value to Chilean educators in light of inclusion (Manghi et al., 2020) and professional development policies that demand large doses of flexibility and creativity on the part of teachers. Precisely, this case study analyses the contents, methodology, and results of the course "Seminar on innovation for diversity in school" offered as part of a master's degree course focused on inclusive education. This course incorporates a design perspective that seeks to answer the question; How can a design-based approach contribute to the development of strategies for inclusive education?

Seminar on innovation for diversity in school: objectives, contents and techniques

The master is taught face-to-face at a Chilean university. It lasts three semesters and is targeted at education professionals who work in public or private institutions. The final degree project is carried out in the context of the "Seminar on innovation for diversity in school", which consists of 130 teaching hours. In this project, the master's students –henceforth "educators" to distinguish them from the recipients of their projects– integrate and put into practice the knowledge and skills acquired in the programme through the design and testing of an inclusive education strategy aimed at an individual or group of students. The seminar is divided into three stages. The first two are oriented at developing an integral evaluation of the student(s) and the third at developing the strategy.
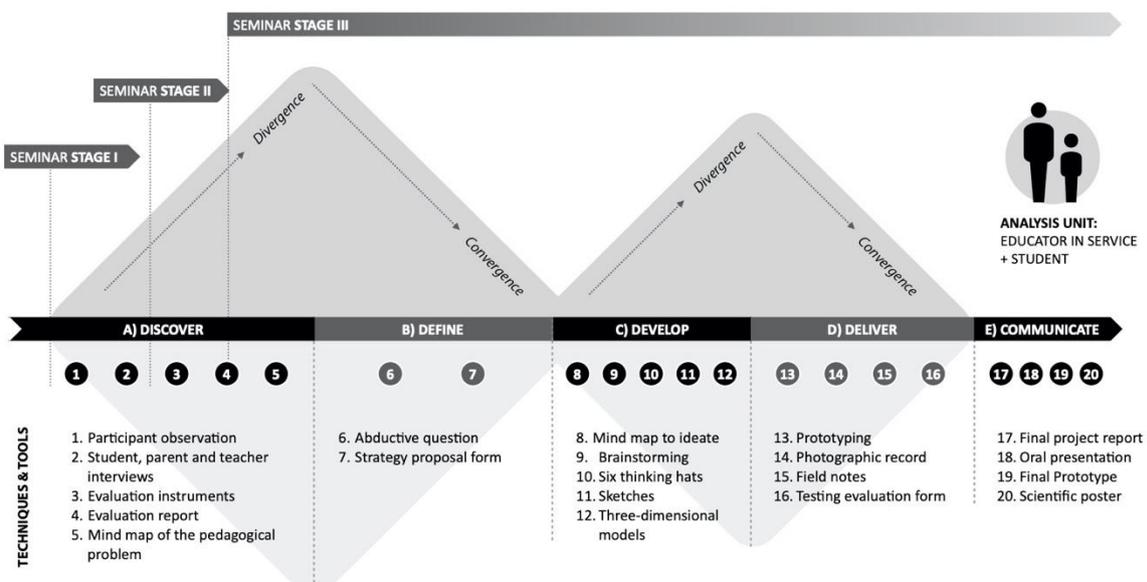

Figure 1: The Double Diamond integrated into the seminar's three stages

The seminar adopts the Double Diamond design model proposed by the United Kingdom's Design Council (Design Council, 2021). This model aims to guide designers and other professionals to address complex social problems through cycles of divergence and convergence oriented at a) discovering or identifying a problem, b)

defining the problem as a design challenge, c) developing ideas that respond to the challenge and d) delivering or testing different solutions on a small scale to evaluate and improve the proposal. In addition, the seminar incorporates: e) communicating the final solution. The following sections will describe the three stages of the seminar and their articulation with the Double Diamond, as summarised in figure 1.

a) Discover

The first two stages of the seminar focus on *Discover*. In the first stage, the educators start by observing their students in the educational establishment where they work to identify SEN and choose the recipient of their pedagogical strategy. This is followed by (1) *participant observation* and (2) *interviews with the student's teachers and parents* to identify barriers or facilitators in the learning process both at school and home. In the second stage, the educator evaluates the student's performance, both in the cognitive and the psychomotor and socio-affective areas, to determine more precisely what the student's SENs are. To do so, the educator applies several formal and informal (3) *psycho-pedagogical evaluation instruments*. The second stage ends with a comprehensive socio-educational evaluation in the form of a (4) *report*. This input marks the beginning of stage III of the seminar, the objective of which is to design and test an inclusive educational strategy. Stage III begins with the educators drawing a (5) *mind map of the pedagogical problem* using the information from their report. Designers' ability to visualize the whole process has been widely recognized as a way of thinking and creating and communicating ideas (Cross, 2013; Kolko, 2011). That is why the seminar uses mind maps, diagrams, sketches and models in the different stages of elaboration of the pedagogical strategy. This first mind map aims to visualize the pedagogical problem as a complex system composed of different interacting elements: the student – his or her strengths, difficulties and interests – the school and the family. The student's name is placed at the centre of the sheet, with all the other elements branching out from it. In this way, it is possible to establish relationships between distinct elements that make up the system and need to be taken into account when designing the inclusive support strategy.

b) Define

Schön (1998) has suggested that problems are not presented to professionals as an a priori external reality. On the contrary, professionals interpret a situation that they judge to be incomprehensible, worrying or uncertain as problematic. They must "frame" the situation, clarifying the results they hope to achieve with an intervention, stating the means they will use to reach it and conjecturing a possible solution. This type of reasoning, known as abductive, is related to the capacity to speculate and make conjectures; that is to say, it suggests that something can or might come to be (Cross, 2013). Precisely, to facilitate the definition of the design challenge, educators use what we have called an (6) *"abductive question"*, which is a first-person interrogative conditional: "How might we… to…?" (IDEO, 2012). In addition, the educators use (7) *forms* that help them progressively define the objectives, activities, resources and evaluation indicators of their strategy. Both the question and the forms are repeatedly revised and adjusted as the proposal is finely tuned.

c) Develop

To create ideas that respond to the design challenge, the educators use techniques to stimulate creativity, such as the (8) *mind map to ideate* and (9) brainstorming. Following this, they evaluate and select the best ideas using the (10) *six thinking hats technique* (De Bono, 2017). The mind map to ideate is organized around the abductive question. It includes information about the student, his or her context and ideas for developing the pedagogical strategy and the learning results that need to be reached through its implementation. In addition, the educators use (11) *sketches* and (12) *three-dimensional models* to communicate their ideas to their instructors and peers. This is done progressively and iteratively, contrasting ideas with the socio-educational evaluation report, the mind map of the problem, the abductive question and the forms. If necessary, they adjust the question and update the form.

d) Deliver

The selected ideas materialize in (13) *prototypes* that are tested out on the student or target person in their school or family context. This allows the formal and pedagogical aspects to be checked, and if necessary, changes that improve the proposal can be applied. The educators observe the students interacting with the prototypes and take (14) *photographs* and (15) *field notes* for support. The conclusions are summarized in a (16) *test evaluation form.*

e) Communicate

The seminar finishes with a (17) *final report* and an (18) *oral presentation* showing the (19) *final prototype*, and a (20) *scientific poster* with a summary of the objectives and characteristics of the inclusive education strategy.

Methodology

This case study explores in-service educators' use of design methods and tools during the final seminar of a graduate course that aimed to answer the question: *How can a design-based focus contribute to the development of inclusive education strategies?*

The study involved 35 students from the 2016 and 2017 cohorts who attended the "Seminar on innovation for diversity in school" of a master's degree focusing on inclusive education taught at a Chilean university. All the participants were working educators, the majority being teachers, although there were also psychologists and speech therapists.

The information collected included participant observation by the researchers, who at the same time are teachers of the seminar, and the analysis of the work elaborated by the educators throughout the seminar, such as reports, forms, graphic and photographic material. Subsequently, we put together thick descriptions of the trajectory of three of the participants, which were analysed by coding with emerging categories. The selection criteria for these three participants included that they had carried out a detailed register of their trajectories' different stages and that a wide range of cases were covered between the three of them, including different education levels and pedagogical problems.

Results

The results of the study have been organized into two sections. The first summarises the pedagogical problems and the proposals of the three selected participants, while the second presents the study's principal findings.

Pedagogical problems addressed by the participants

SEN associated with a global development disorder in a girl in early years education

> *"How might we enhance the sensory and perceptual skills of a 3-year-old girl with Down syndrome in order to improve her communication skills?"*

Juanita is an early years teacher who works in a public nursery school. One of her pupils is a three-year-old girl with Down syndrome. The evaluation shows decreased sensory and perceptual skills, language expression and comprehension difficulties, poor stimulation from her family and a lack of pedagogical strategies targeted at the girl's needs at school. Juanita hypothesizes that a pedagogical strategy focused on strengthening sensory and perceptual skills that develop communicative competencies through play will contribute significantly to the girl's development. With this aim in mind, Juanita designs a box of sensory material that has two stages. The first targets the exploration of material stuck to the outside of the box, while the second seeks to encourage semantic and phonological skills through images of everyday objects and short stories.

SEN associated with a language disorder in a boy in primary school

> *"How might we enhance the development of Ale's meta-phonological skills in order to improve his initial literacy?"*

Carolina is a speech therapist who works in a Special Language School. One of her pupils is a six-year-old boy who shows great interest in the military world. The evaluation here shows that a language disorder is hindering the boy's initial literacy. The family has few tools to help his process, while the school's contribution has been hampered by his poor class attendance. Carolina designs a strategy to strengthen the development of his meta-phonological skills and improve his initial literacy. With this goal in mind, she designs a board game called "Soldier Ale" made up of a board with six military missions based on literacy skills. During the game, the boy uses soldier figures to go through each stage, and on reaching the goals, he is awarded medals. The game comes with instructions for his parents so they can support him.

SEN associated with reading comprehension difficulties in a woman deprived of liberty

> *"How might we strengthen reading comprehension and writing skills to improve education opportunities oriented at the world of work?"*

Hernán is a primary teacher who works in a prison. His student is a 57-year-old woman who never completed her primary education and is now deprived of liberty for drug trafficking. The evaluation shows learning difficulties in the language area, especially in reading comprehension. Hernán's strategy proposes a School Progress Log. This log provides a hard copy of support that makes the student's progress visible by recording the activities carried out, the student's self-assessment and the teacher's feedback. This strategy seeks to favour the student's metacognition to keep her motivated during her learning process and avoid her dropping out.

Principal findings

Understanding the problem as a system of interrelationships in which the student is at the centre.
The use of mind maps throughout the different stages of the seminar proved to be an effective way for educators to understand the pedagogical problem better and identify opportunities.
In the first mind map, the spatial organization of the information allowed all the intervening factors to be represented simultaneously and with the same level of importance. In this way, barriers and facilitators at the school and family level were juxtaposed with the student's characteristics, interests and educational needs. This broke the lineal logic of educational assessment, which tends to focus on the deficits without considering the student's interests or skills, elements that can provide important opportunities for the design of the pedagogical strategy.

Figure 2: Carolina's mind map for the pedagogical problem

For example, in Carolina's mind map for the pedagogical problem (figure 2), the boy's interest in the military imaginary is represented by the thick blue line, which in visual terms is almost as important as the information about his SEN (the red line). The drawing of the light bulb indicates that this topic emerges as an opportunity to be used as a motivational resource, which was transferred onto the mind map to ideate that included words like "game", "tin soldier", and "medals" (figure 3). Subsequently, the military theme transformed into a crucial element of the pedagogical strategy.

Figure 3: Carolina's mind map to ideate

Thinking visually about the strategy

In addition to mind maps, drawings and sketches helped the in-service educators explore, refine and communicate their ideas. Hernán's diagram allowed him to specify the stages of his pedagogical strategy, as well as the contents, activities and sections, such as "reading texts on values", "writing short stories", and "preparing recipe books". In addition, the diagram –which brings to mind a board game– helped convey the idea of progress, showing not only the learning trajectory but also the finish (figure 4). Visualizing the teaching-learning process in this way also helped make the metacognitive processes Hernán sought to create in the student more visible.

Figure 4: The stages of Hernán's pedagogical strategy

Framing the problems constructively and in first-person

Formulating the pedagogical problem in terms of a design challenge and using a first-person interrogative conditional positioned the educators as active agents and not mere observers of "somebody else's" problem. In addition, it allowed them to map out a pedagogical goal without losing sight of the wider purpose, namely contributing to the student's educational inclusion. With her challenge question – How can we enhance the sensory and perceptual skills of a 3-year-old girl with Down syndrome in order to improve her communication skills? Juanita hypothesized that strengthening the girl's sensory and perceptual skills would improve her communication with her environment, which in turn would produce better quality interactions that would contribute to her development.

Ideating, materialising and testing ideas through drawings and models

Making models or prototypes and having the target people –the students, their teachers, family members– manipulate them was a key activity. It allowed the educators to evaluate their proposals and make necessary adjustments to achieve a strategy in accordance with the conditions of use of the material. For example, Juanita's final proposal was a box of sensory material made up of two stages. The first stage aimed at the student exploring and manipulating the material stuck to the four exterior sides of the box. The second sought to improve the girl's semantic and phonological skills. To achieve this result, Juanita made different prototypes that she tested with the girl in the nursery school. In the first test, she observed the size, colour and materiality of the box, the manipulation of elements such as buttons and zips and how the material motivated the girl. Testing out the box allowed her to see problems related to an excess of visual stimulation and difficulties in manipulating some objects due to their size or position. Juanita corrected these aspects in her second prototype by adjusting the material and the sequence of activities (figures 5 and 6).

Figure 5: Developing different prototypes

Figure 6: Photographic record of Juanita's testing

Discussion

Our research addressed the question: How can a design-based approach contribute to the development of strategies for inclusive education? In this regard, we can affirm that design provided tools for in-service educators to frame an educational problem in a contextualized manner and design a pedagogical strategy focused on the SEN and interests of a student, as well as the conditions and context of the family and the school. In this way, the educators complied with the fundamental premise of inclusive education, namely that the regular education system must welcome all students and create learning opportunities for each one, regardless of their condition (Ainscow, 2014).

In the same line of inclusive education (UNESCO, 1994), design provided a global and integrating vision through visual thinking. This allowed the educators to redefine a specific pedagogical problem and find new relationships between the elements involved, which were interpreted as opportunities to create situated pedagogical responses. In this way, they managed to ideate a pedagogical strategy and design a didactic resource relevant to the user because they took into account his or her learning potential, preferences and interests and individual and collective needs. This allows us to affirm that design thinking provided support that enabled the in-service educators to creatively face a wide variety of pedagogical problems (Henriksen et al., 2017).

What initially were considered barriers to learning in the evaluation were understood as design requirements after using a design approach. This was evidenced by the transformation of impediments into access to learning through the pedagogical strategy and the didactic material. In this sense, design allowed educators to transfer what they had learned in the approach and resolution of complex problems so fostering innovation and contributing to their professional development (Schön, 1998).

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