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Bridging Design Prototypes & Autonomous Design

Gloria Gomez
University of Sydney

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pivot 2020
DESIGNING A WORLD OF MANY CENTERS

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Bridging Design Prototypes & Autonomous Design

Gloria GOMEZ

OceanBrowser Ltd. & University of Sydney
gloria@oceanbrowser.com
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The bridging design prototype (BDP) approach is a human-centred design method for individual designers and small organisations. BDPs are fully functional rapid prototypes that user communities accept to incorporate in real activities; while designers use them for learning about the community, the context, and the practice. Experimentation should not require the presence of designers. By functional, it means all features should operate. But, BDPs are not necessarily minimum viable products, as the digital or tangible materials with which they are built could have a limited lifespan. Informed by autonomous design, this reflection involved a meta-analysis of a project carried out in a Netherlands school. My BDP for preschool concept mapping was re-oriented to explore if it could be used as didactic tool to enhance interactive language learning in the education of children with speech impairments. The analysis illustrated BDPs enabled speech therapists, teachers, and counsellors to achieve goals of community design of itself. Three pilots, with escalating numbers in participation and duration, transformed this community's practices. Explorations with BDP adaptations and a new design (an app for the interactive whiteboard developed by a teacher) transformed speech therapists and teachers into designers. This approach might be useful in autonomous design projects seeking community design, decentring external designer participation, and enabling users to become designers.

bridging design prototypes; human-centred design; users as designers; autonomía and design

1. Introduction

The Pivot 2020 Conference encouraged "conversations about shifting centers, methods, epistemologies and ontologies" and opportunities for featuring "more diverse voices on the stages of the Center"… "as the movement to decolonize design gains strength…" (Noel et al., 2020). I am one of these voices bringing diversity to "the Center" represented by Western Europe and North American narratives of

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design. Back in 2003/2004 at the very start of my doctoral studies, unknowingly I became part of the movement to decolonise design. I am a cross-cultural, multi-ethnic woman of colour from the Global South, specifically from Colombia, but born in Guatemala from Colombian parents. I was educated in institutions and traditions of the Global North, within white Western European traditions through and through, from preschool to higher education. During the preparation of my Pivot short video and this paper, I have grown to understand that I am one of those "people who have been excluded from the main narrative of design" and that today "the Center is slowly starting to include" (Noel et al., 2020).

My interest in pluriversal design started in 2017, inspired by a collection of readings proposed for the Strategic Design Journal (SDJ) call on Autonomía and Design, and my participation as reviewer for this special issue (Botero, del Gaudio, & Gutiérrez Borrero, 2018). My overall interest in participatory design dates back to my doctoral studies, which has slowly become part of my research activity, as my application and others' application of the BDP approach started to show users without design education in the role of designers (Lee, 2008; Elizabeth B N Sanders & Williams, 2001)

This paper reports on a reflection on the possibility of BDPs to enable communities to achieve goals of design of itself, of autonomy. It draws knowledge from my doctoral research, and a case in a Netherlands school setting. This reflection has started a process of deconstructing a design approach within the field of human-centred design (bridging design, fully functional rapid prototypes) for the purpose of understanding its potential contribution to the field of autonomous design for the pluriversal world, in spite of its origins in heteronomous norms.

2. The Bridging Design Prototype approach

Definition

The BDP approach is a human-centred design method, if applied as intended, can produce BDPs. A BDP is a fully functional rapid prototype built with features familiar to a user community and with novel features a designer incorporates after careful analysis of relevant data. It capitalises on a user community's prior knowledge and recognises their context realities. These characteristics bring users into the development process early because they accept to incorporate it into their real activities. At the same time, individual designers or R&D teams use it for learning about the community, the context, and the practice (Gomez, 2009a; Gomez & Tamblyn, 2012b).

Origins

This approach was developed for gaining entry to real settings and working with difficult to access and technologically disinclined communities, as an individual designer wanting to undertake human-centred design (HCD) studies in preschools, on the use of a new learning tool (Gomez, 2007, 2009a). It evolved from exploring ways to address a number of challenges I encountered in the application of some HCD principles (Norman, 1999). The first challenge was that I had no way to "watch [prospective] users as they perform the activities the new product is intended to assist…" (p. 188). For the reason that the product idea was completely novel to this educational community. They did not perform product-related activities in their work setting (i.e. the preschool classroom). The second challenge was that I couldn't meet the HCD principle of "start[ing] with a multidisciplinary team that includes representatives from marketing, technology, and user experience" (p. 185). I was an individual designer (a small organisation of one person) researching this issue independently without a particular institutional or company affiliation. The third challenge was that I was an outsider to the preschool community I was designing for. Early childhood education experts in Australia and New Zealand in the year 2005 did not see the relevance and benefits of the novel product I was proposing to them (Gomez, 2009a, 2009b).

Principles

The BDP approach is comprised of six agile and flexible principles underpinned by concepts drawn from human-centred product development, user-centred design, inclusive design, and participatory design, and a learning theory (table 1).

- The principles "multidisciplinary thinking team approach to research the user community and the market", "similar mental models", and "make activities simpler" enable individual designers or small organisations with incomplete multidisciplinary teams and limited resources to undertake human-centred design studies. Approximate research methods are used to learn about the user community. Secondary data sources (Spinuzzi, 2002) are heavily relied upon when rapid ethnography (Norman, 1999) is not possible early in the project.
- The principles "prior knowledge and familiar interactions", "broaden participation", and "participate in design" guide designers in the process of learning meaningfully about a user community from diverse and multiple perspectives. These principles alert designers to gather data from each relevant perspective, while attending to the wants and needs of each user community member. This attention must be reflected in the development of principles, guidelines, requirements, that later inform feature design.

Table 1 Principles and underpinning concepts of the BDP Approach

THE SIX PRINCIPLES OF THE BRIDGING DESIGN PROTOTYPE APPROACH	UNDERPINNING CONCEPTS DRAWN FROM FOUR DESIGN METHODS AND A LEARNING THEORY
Principle "Develop a human-centred design study that brings a **multidisciplinary thinking team approach to research the user community and the market**"	The human-centered product development process (Norman, 1999)
Principle "Becoming more empathic through the designer, R&D team and the user community achieving **similar mental models**"	The user-centred design method: Ideally the user's model and the designer's model of a system image should be equivalent (Norman, 2002)
Principle "Deep understanding of the **prior knowledge and familiar** technological, behavioural, and social **interactions** of the user community.	The conditions for meaningful learning: the learner must have prior knowledge and the learning must be prepared with familiar languages so the learner is motivated to learn (Ausubel, Novak, & Hanesian, 1978)
Principle "Development of features that **make activities simpler**"	The user-centred design: The seven principles for transforming difficult tasks into simple ones (Norman, 2002)
Principle "Development of features that **broaden participation**"	The inclusive design approach concepts of countering exclusion and accessibility (Keates & Clarkson, 2003)
Principle "Implementation of a prototype for early adoption enabling the user community to **participate**, contribute, improve features **in** the **design** process.	Participatory design: Users become participants and play a critical role in a design process (Spinuzzi, 2002; Suchman, 1993). Users' participation early in the front-end is needed to drive truly human-centred product development (Elizabeth B N Sanders & Williams, 2002)

What kind of rapid functional prototypes are BDPs?

BDPs are experience prototypes (Coughlan, Fulton Suri, & Canales, 2007) and provotypes (Mogensen, 1991). Experience prototypes emphasise experiential aspects while provotypes are used to provoke reaction and insights. The main difference with these also rapid prototypes is that BDPs must be fully functional rapid prototypes. Experimentation should not require the presence of designers. By functional, it means all features should operate, and users should be able to implement them in real activities. But, these are not necessarily minimum viable products, as the digital or tangible materials with which they are built could have a limited lifespan.

Studies and explorations in novel educational practice

The BDP approach was developed to carry out doctoral research in a project titled "Issues in Preschool Concept Mapping: An Interaction Design Perspective". It informed the development of a new learning tool for enabling educational experts to research the relevance of the practice of concept mapping in early childhood education. Before the emergence of the BDP for preschool concept mapping (also known as the Authoring Concept Mapping Kit or the Kit), teachers had no way to study and explore the relevance of Novak's concept maps (Novak, 1998) to the education of preschool age children. The implication of this was that I had no way to observe teachers educating children on the building of concept maps. Back in 2005, the belief was that concept maps should only be introduced in primary education as soon as children could write (Gomez, 2010).

BDPs enable researchers and professionals to engage with educational user communities in their own terms and to explore learning situations not possible before due to curricula or environmental factors (Contreras, Gómez, & Navarro-Newball, 2019; Gomez, 2010; Gomez & Crombie, 2016; Gomez & Tamblyn, 2012a, 2012b). Applications outside my own practice can be found in projects by graduate students in interaction design, primary education and mathematics (Marín Ortiz, 2017), and in product development and innovation (Gomez et al., 2020).

Users as designers

An unforeseen outcome of the impact of my doctoral research was learning about educational experts implementing their own BDPs for preschool concept mapping using documentation publicly available (Gomez, 2005, 2006, 2007, 2009). The implementations involved replications, re-designs, or inspiration to programme a software application (A. Cassata-Widera, 2008; A. E. Cassata-Widera, 2009; Kicken, Ernes, Hoogenberg, & Gomez, 2016). Users incorporated BDPs into their activities in the manner of "design at use" as in metadesign (Fischer & Giaccardi, 2006; Fischer & Scharff, 2000) and "user-driven design" as in design participation (Lee, 2008). According to Ehn (2008) in the meta-design approach "…both professional designers and potential users are seen as designers, much as in participatory design, but they are not participating in synchronous entangled design-games, but in design-games separated in time and space" (p. 96). In the results and discussion sections, I expand on users seen as designers - how teachers in the Netherlands (Hoogenberg-Engbers, 2013; Kicken et al., 2016; van Veen, 2014) implemented BDPs for undertaking their own studies and explorations on concept mapping. Their implementations show characteristics of autonomy, community design of itself, and suggest a way for "mantaining collaborative design process that are opened in an explicit manner" (Botero, 2013 in Escobar, 2016, p. 219).

3. What makes the BDP approach suitable to autonomous design

Esteva (2015 in Escobar, 2017, p. p. 172) "distinguishes three situations in terms of the norms that regulate the social life of a collectivity:" ontonomy, heteronomy and autonomy. Paraphrasing, Escobar

explains these situations. Ontonomy occurs when norms are established through traditional cultural practices. Heteronomy occurs when norms are established by others via expert knowledge or institutions. Autonomy occurs when the conditions exists for changing the norms from within, or the ability to change traditions traditionally. It seems that communities exclusively changing the norms through autonomy and ontonomy is aspirational in practice. In reality, there appears to be "negotiation" between heteronomy, and autonomy and ontonomy norms. According to Escobar (2017, p. 173) "… There is no absolute autonomy in practice; rather, autonomía functions as a theoretical and political horizon guiding political practice."

In such negotiation, there seems to be an interplay between autonomous and heteronomous norms where new forms of design could be useful. Escobar (2017) suggests co-design, transition design, autonomous design, and activist design. In the call for papers for SDJ, Botero and colleagues (2018) have suggested others, to name a few, design for democracy, convivial tools, and design in communal endevours. The Pivot 2020 conference brought together another set of projects exploring similar and related topics from the perspectives of decolonising design, horizontal design, indigenous design, bridging design prototypes, among many others (see contributions page in Noel et al., 2020). At its core, these emerging collection of approaches in pluriversal design seek to lesser the power and influence of the expert knowledge (external designers included) and institutions, and increase the power and influence of the people in a particular indigenous, rural or urban community (located in the Global North or the Global South), who deeply want to have more control, more say over the way a design process and its outcomes impact the way they live, learn, work and play.

BDPs are suitable in design projects in which external designers (representing heteronomous establishments), community experts and communities with expertise in their own wants and needs require a way to negotiate, dialogue as part of a meaningful design process. BDP characteristics have already been mentioned, which also make them suitable for autonomy projects in which there will indeed be a negotiation and interplay between external knowledge experts and communities wanting to practice the design of itself. Some of these characteristics are:

- "the user community accepts to incorporate it into real activities"
- "experimentations do not require the presence of the designer"
- the possibility of using them in activities of "design before use", "design participation" and "design at use"
- "for difficult to access and technologically dis-inclined communities"

The praxis of autonomous design presupposes five "elements for thinking about the relations among autonomy, design, and the realization of the communal…" (Escobar, 2017, pp. 184-185). My reading about these elements in the imagined scenario that Escobar uses to illustrates their application in the transition design of a region in Colombia inspires me to think that the BDP approach could be used to advance this kind of social innovation projects, not only in the Global South, but also in the Global North, not only in community living projects, but also formal education projects.

Design projects involving people in formal institutions (e.g. schools, organisations or companies) aiming to improve the lives of people might benefit by the application of autonomous design with BDPs. If communities are involved from the start, BDPs could be produced in a co-design manner. If intended communities are involved later, the external designer(s) must develop a first BDP for gaining entry to the community setting, so a co-design process could be started. I foresee useful applications in situations where external designers would like to help communities to undertake design processes for "changing the norms from within or the ability to change traditions traditionally" (Esteva 2015 in Escobar, 2017, p. 172), naturally in agreement with their own ontologies and traditions. Designers and

community members might arrive at concerted agreements through situations and methods for "deeply understand[ing] the prior knowledge and familiar technological, behavioural, and social interactions of the user community" (BDP principle, see table 1).

User communities accepting to incorporate BDPs into their real activities (or co-designing them with external BDP designers) might generate situations exhibiting the five elements for autonomous design (Escobar, 2016, pp. 210-211). Next, I explain how this could be. Escobar's elements are between quotes and in italic.

- With a BDP *"every person or community practices the design of itself."* They can implement practices that advance the community's aims in a meaningful manner.
- With a BDP *"every person or community is a practitioner of its own knowledge"*. Every member of the community is able to show what they know or how to improve what they know, and in that process, incorporate new knowledge in the form of concepts and materials, etc.
- The long-term open-ended manner in which a BDP is incorporated into a community context enables *"In first place [that] a community designs a system of investigation or learning about itself."* The incorporation process require the community to investigate ways in which this BDP could be used by every member in a manner that it is meaningful to their individual roles and practices with the system. Strategic collaboration with knowledge experts is encouraged.
- A BDP can kickstart studies and explorations around changing practice. But in the longer term what they are doing is providing a community with an opportunity to experience such change and realise that *"each design process involves a statement of problems and possibilities".* The practice can be deeply transform by having everyone on board and together generating the objectives and actions for making the practice permanent.
- Long-term, multi-year use of a BDP and its multiple re-designs, adaptations, and new designs can lead to *"the construction of the model of a system that generates the problem of community concern".* Once the community has evaluated the relevance of this new practice inspired by the BDPs, they proceed to implement a model for sustainably continuing and evolving the practice.

4. Method and project informing my reflection

My reflection is informed by a project illustrating the unexpected application of autonomous design in the formal education of children with severe impairments. How a BDP helped an educational community to decentre mainstream design practices according to Escobar's (2016) autonomous design elements. The community implemented a project and carried out design activities without consulting with the external/ BDP designer (i.e. me). These activities occurred seven years after my doctoral studies were completed.

The project

As briefly introduced earlier, a method to advance my doctoral studies was the implementation of a BDP for preschool concept mapping for undertaking research in real settings, and for enabling teachers to study the relevance of this novel approach to preschool education (Gomez, 2006, 2007, 2009b, 2010). Outside of my own research, three situations of design at use (Fischer & Giaccardi, 2006; Fischer & Scharff, 2000) or user-driven design (Lee, 2008) took place in the United States and the Netherlands.

The types of studies and explorations undertaken with the BDP transformed these users into designers (i.e. child educational psychologist, teachers, speech therapists)**.** I did not participate in the implementation of the BDPs in the first and third situation. At the request of Hoogenberg-Engbers, I was

a consultant in the second situation, and provided a video-recorded seminar on concept mapping who she run during the workshop.

In the first situation, Cassata-Widera (2008; 2009) incorporated the BDP in her doctoral research on child-developmental psychologist with focus on metacognitive skills and concept maps. In the second situation, Hoogenberg-Engbers (2013) designed a workshop to introduce primary school teachers to concept mapping with the BDP at a conference on gifted and talented education. These two situations provided evidence of the BDP for preschool concept mapping to enable early childhood experts to undertake studies and explorations on this topic (see section "contribution" in Gomez, 2009b, p. 20).

In the third situation, Kicken and Ernes reoriented my BDP to teach interactive language learning in a Netherlands school setting between 2012 and 2015. A meta-analysis on a co-authored paper (Kicken et al., 2016) aims to illustrate the emergence of autonomous design behaviours during the implementation of a new educational practice. The fragments chosen display the five elements of autonomous design (Escobar, 2016, pp. 210-211).

5. Results

Principle: every community practices the design of itself

> *Every community practices the design of itself: its organizations, its social relations, its practices, its relation to the environment. If for most of history communities practiced a sort of "natural design" independent of expert knowledge (ontonomy, spontaneous coping), contemporary situations involve design based on both detached and embodied forms of reflection (Escobar, 2017, p. 184).*

Fragments chosen to illustrate the principle:

> *[Kicken and Ernes] are speech therapists contractors of the external services of the Institute Vitus Zuid Mgr. Hanssen in the Netherlands. As part of the training to become a specialist in guiding gifted and talented children, they attended the concept mapping workshop run by … Hoogenberg-Engbers (2013) and… learned to encourage children to make their own connections between concepts using the voice-recorders. So they decided to explore uses of the BDP with children with speech impairments. They thought that concept mapping could also work for teaching interactive language learning…(see Kicken et al., 2016, pp. 113-114).*

This fragment illustrates an example of design-based on an embodied form of reflection. The knowledge expert (Hoogenberg-Engbers) and the activities undertaken at the workshop motivated these speech therapists to explore new learning possibilities with what they call "a new didactic tool." Its potential of "encouraging children to make their own connections between concepts using the voice-recorders" motivated the decision to try it. Here a process of "changing norms from within" was started and independent from the knowledge experts (myself and Hoogenberg-Engbers).

Principle: people are practitioners of their own knowledge

> *Every design activity must start with the strong presupposition that people are practitioners of their own knowledge and from there must examine how people themselves understand their reality. This epistemological, ethical, and political principle is at the basis of both autonomy and autonomous design. (Conventional development planning is intended to get people to practice somebody else's knowledge, namely, the experts'!) (Escobar, 2017, p. 184)*

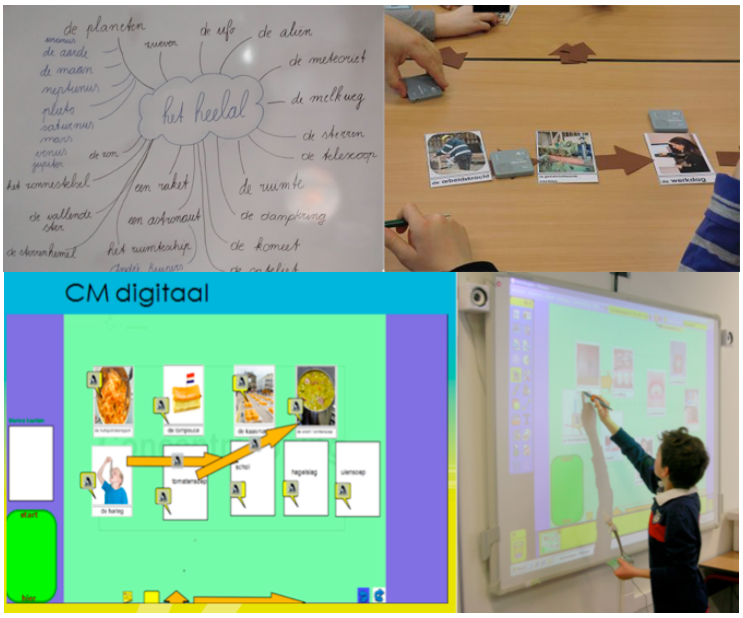

Figure 1 Top photos show a topic web and concept map with the BDP. Bottom photos show screens from the app created by a teacher participating in the pilot

Fragments chosen to illustrate the principle:

> *Concept mapping [with the BDP] fits the Institute's [didactic] approach to language teaching [developed by van den Nulft and Verhallen]. The Authoring Kit [i.e. the BDP for concept mapping] integrated as a good didactic tool with the current interactive language learning approach. There was no additional work for the teachers, just another way of teaching a theme. It transferred to the whole team, and co-teaching was possible. (see Kicken et al., 2016, p. 118).*

The community could easily incorporate the new "didactic tool" into teaching practices, were able to change their practice, without additional work, through workshops and collaborative teaching. This could be an approach for "changing tradition traditionally" (Escobar, 2017, p. 173). The BDP features made sense and accommodated well to their teaching practices, teaching and learning traditions and routines.

Another fragment chosen to illustrate the principle:

> *Using The Authoring Kit as an inspiration, the teachers developed their own kits used in the three pilots. Due to frequent use, the photo cards became worn out and the voice-recorders' sound quality diminished and worsened. Therefore, the voice recorders have been replaced with alternative ones…*
>
> *One teacher, Ger Wensink, developed a concept mapping application for the Interactive Whiteboard [figure 1]. This application has allowed teachers to save the results and reuse the concept map in another learning activity. The teachers are extremely happy with the development of this digital application because it has multiple possibilities.*
>
> *(Kicken et al., 2016, pp. 124-125)*

The new tool was flexible to their needs, allowed for adaptation, modification, redesign, and enabled the teachers to have practice experience at their own pace, combining prior knowledge (tradition) with new knowledge (creating kits for finding their own way of teaching). The BDP enabled the teaching team

to create conditions that permitted teachers to “changes norms from within”, for autonomy (Esteva, 2015 in Escobar, 2017).

As it is supposed to occur in autonomous projects, the activities with the BDP implied the defence of some practices such as “the didactic approach of van den Nulft and Verhallen”. Others were transformed others such as learning to make concept maps with tangible materials (figure 1, top photos). Finally, there was opportunity for the true invention of new practices such as the development of an app for the interactive whiteboard by a teacher (figure 1, bottom photos).

Principle: an inquiring or learning system about itself

> *What the community designs, in the first instance, is an inquiring or learning system about itself. As designers, we may become co-researchers with the community, but it is the latter that investigates its own reality in the codesign process. (Escobar, 2017, p. 184)*

Figure 2 Three examples of the kind of bridging design prototypes teachers created to teach students concept mapping

Concept mapping with the BDP enabled teachers to see that:

- It added value in vocabulary learning
- It took teachers and children some effort to increase word networks, and let go of old strategies
- Teachers learned to use open questions and listen to what the children meant by asking more questions
- It facilitated children to show more of their own thinking
- Conversation exchange was more child-initiated and interactive
- Children themselves established relationships between concepts, and completed each other’s sentences

(see transcript in Kicken et al., 2016, p. 118)

Teachers and children’s new behaviours and reactions showed opportunities for reflection and inquiring about the implications of this new tool in their educational practices, particularly in the learning process of vocabulary expansion. Teachers experienced a new way to meet individual educational needs of children with severe-speech language difficulties. Also, they reported novel improvements in their teaching practice, for example, becoming a coach or facilitator in the learning process. Each teacher freely adapted the BDP to own teaching styles.

The co-design team was comprised by the school community itself: two speech therapists leading the project, two internal counsellors who would continue lead the project longer term, teachers who participated in each pilot and their children. One school director supported and advocated for the initiative with the other directors (who were five in total). Finally, two external knowledge experts (myself and Hoogenberg-Engbers) acted as observers, advisors, joining the project at particular events (site visits), assisting with particular situations (e.g. liaison with management for project resourcing and dissemination among the relevant expert community), and collaboration in publication writing. An education magazine did an article of the project before the last pilot (van Veen, 2014). This co-design team illustrates what Escobar (2017, p. 186) calls "the ideal situation for autonomous design [is] obtain[ed] when the client, the designer, the decision maker, and the guarantor of the system are the same entity (Churchman 1971), namely, the community and its organizations."

Principle: statement of problems and possibilities

> *Every design process involves a statement of problems and possibilities that enables the designer and the group to generate agreements about objectives and to decide among alternative courses of action… The result should be a series of scenarios and possible paths for the transformation of practices or the creation of new ones.*[20] *(Escobar, 2017, p. 185)*

The design process for an adoption model involved three pilots that were carried out between 2012 and 2015, with escalating numbers in participation and duration at the Institute.

- An afternoon pilot: Kicken and Ernes tried the BDP with three children ages 4-5-6. They observed behaviours uncommon in children of such age. These results motivated them to undertake more practice, leading the Institute's management to authorising an initial pilot. The knowledge expert, Hoogenberg-Engbers, was invited as a passive observer and did not know the participants.
- A five-month pilot: five teachers volunteered their time to learn concept mapping. Coached by Kicken and Ernes, then proceeded to incorporate it in their teaching with their students. The knowledge experts, Gomez and Hoogenberg-Engbers, visited the site, met pilot teachers and their students. At request of co-teaching team, Gomez wrote a report for the five school directors, which was also disseminated among key experts of the concept mapping community. The report purpose was to persuade the management to resource a one-year pilot.
- A one-year pilot: 18 groups with teachers of the middle and upper grades and their children age 6 to 12. Internal counsellors now are involved to create opportunity for more shared responsibility. A good practice video was also circulated. Kicken and Ernes co-taught in collaboration with all participants. The coaching activity will be taken over by the counsellors in the future.

The BDP provoked insights and inspired a design process involving co-teaching activities in which teachers were coached to implement their own applications of the design, according to their classrooms and children's needs. Together they generated agreements on objectives and decided alternatives for action. For example, one objective was "children should be active in their own language development and vocabulary expansion should take a prominent role…] (Kicken et al., 2016, p. 114). A questionnaire design to survey teacher opinion showed the importance the Institute placed in the teachers being free to develop their own practice. The questionnaire was designed to assess if three pillars of education (autonomy, competence and responsibility) were present in the activities. A result summary on autonomy said "… most teachers felt that concept mapping was not a forced didactic structure or method they had to use in their groups. They felt that they had the space to apply it in a different way, if they had wished to (Kicken et al., 2016, p. 121). The co-teaching approach with workshops and videos

was at the core of implementation to make sure that the knowledge was transferable longer term, and achieved according to their didactic approach for interactive language learning.

Principle: a model of the system that generates the problem of communal concern

> *This exercise may take the form of building a model of the system that generates the problem of communal concern. Given this model, the question that every autonomous design project must face is: what can we do about it? The answer will depend on how complex the model of reality is. The concrete result is the design of a series of tasks, organizational practices, and criteria by which to assess the performance of the inquiry and design task.[21] (Escobar, 2018, p. 185)*

As the number of pilot participants grew, organisational practices evolved. For example:

- In the 5-month pilot, concept mapping was done on themes, practice was bi-weekly. Teachers were regularly observed and filmed
- Internal counsellors are to take the responsibility of coaching teachers in the future
- Adoption via a pilots model of concrete direct experience created consensus with teachers and school management
- The evaluation criteria on the pillars of education informed arguments for wide implementation
- In 2016, the management decided to incorporate this tool at every level, but preschool

For details see (Kicken et al., 2016)

The pilot format with activities over three years showed that this educational community was able to change one didactic tool for another one through bottom-up, escalated, and concerted decisions between members of the co-design team. The improvement in children's learning and their motivation inspired the team to continue on and argue for more scope and resourcing. This process slowly convinced the school directors of the tool's benefits. As pilot participation increased more coordination and resourcing was needed. Co-teaching required the production of a video and carrying out an assessment criteria towards the one-year pilot complexion. The survey provided the data for taking the decision to implement this new didactic tool school-wide. The model below sketches some aspects of how the BDP adoption process occurred.

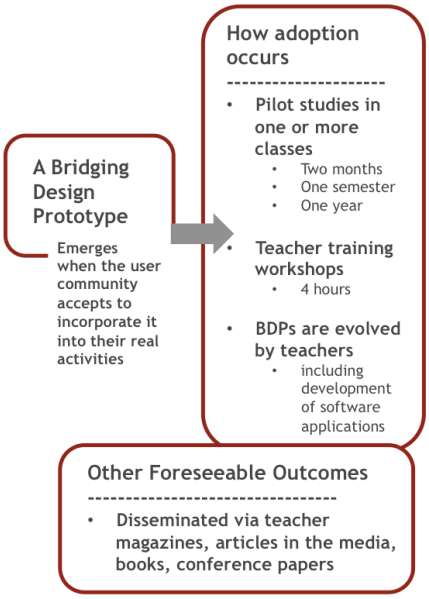

Figure 3: Model of adoption of a BDP for preschool concept mapping by an educational community

6. Discussion: potential contributions to autonomous design

The bridging design prototype approach is a new form of design practice, with some traction, that could work within an autonomous design framework, and could contribute to the reimagining of collective futures of sustainable innovation projects in social and educational settings. In the case just reported, the "conditions exist[ed] for changing the norms from within" at the Institute. The BDP provided a way for the community to show "the ability change [educational] traditions traditionally]. They established a co-design team comprised only by school members. External knowledge experts and other parties (e.g. educational magazine) were engaged at specific points in time for strategic reasons.

From heteronomy to autonomy

Esteva (2015) defines "'heteronomy' is regulation imposed from outside, by others, by the market or the state, like legal systems and business practices imposed to citizens or clients." (2015, p. 143). Originally, BDPs have been designed under this definition of heteronomy norms. The intention was to implement them to gain access to real contexts to learn about the community, the context, the practice, for a research-driven purpose. Its six principles have been put together drawing from three design methods and a theory of learning, mainly informed by theoretical concepts from the Global North scholarly design knowledge. It is also ruled by my design norms "the system I established" for implementing prototypes for gaining entry to natural settings and enable activities of "design before use" (Ehn, 2008; Redström, 2008). The formal educational contexts (i.e. schools) in which the BDP for preschool concept mapping has been adopted are also located in the Global North not only geographically, but also in childhood educational thought (Gomez, 2009). So far it has been applied to investigate situations in formal education, within mainstream educational systems and methods.

However, when BDPs are used as intended, there seems to be transition from heteronomy norms - the designer dictates how it is used, to autonomía norms - the user community dictates how best it should be adapted or transformed. The BDP for preschool concept mapping was a suggestion, a provocation for gaining insight and helping the community to experience first hand how this might be useful to the performance, further development of their educational practices.

Community members becoming designers

The BDP enabled the community to sustainably adopt a new tool and construct a new teaching reality (i.e. incorporating concept mapping in interactive language learning) to replace an existing method (topic webs) or complement others (e.g. conversation exchange). The co-design team achieved a change in didactic tools from a bottom up approach and one by one teachers were convinced through personal experience (they saw the children behaving differently). The bottom-up design approach evident here can be characterised as the one expected in design participation as described by Lee (2008): "the realm of collaboration extends to other spaces", the initiators are users, the expected outcome is "design-oriented (design innovation)", and the role of the professional designer is of a strategist "aiming to develop innovative…or better design to improve people's lives" (2008, p. 35). Within the heteronomous norms in which this school operates, this community has been able to undertake some autonomous activities that have lived up to the Zapatista dictum"changing the world does not come from above or from outside" (Tramas y mingas para el buen vivir, 2013 cited in Escobar, 2017, p. 167). The co-design team negotiated the terms of implementation and wide adoption with the school direction, which illustrates Escobar's point "there is no absolute autonomy in practice" (2017, p. 13).

Decentring participation of the external designer

The BDP designer influence was lesser/decentred and my non-involvement in project implementations favoured the emergence of autonomous design practices. It was possible to maintain processes of

collaborative and open design that were more explicit (Botero, 2013 cited in Escobar, 2016, p. 219), in which I had a strategic role assigned by the community. The community's re-designs, adaptations, and new design show that the BDPs can potentially promote "…the articulation of design-in-use practices in the context of temporally extended collective design activities …" (Botero, 2013, p. 13 in Escobar, 2018, p.194). They can also, inspired in Marttila & Botero's (2016) words, provoke ideation on what types of worlds [i.e. educational worlds] we should be concerned with and care about and how we can contribute to their remaking.

Pluriversal design studies

Autonomous design projects with BDPs might pivot a "discussion of decolonization from an academic critical perspective to a creative and generative one" (Noel et al., 2020). Decolonising frameworks draw knowledge from multiple theories and methodologies, involve diverse participants/actors, with diverse interest and backgrounds, where negotiation is needed, and encouraged(Diaz Soto & Blue Swadener, 2002; James Tarditi, 2016). In parallel, ecologists, transition activities, and designers relatively easy propose scenarios to trigger the design imagination (Escobar, 2017, p. 194). Pluriversal design studies with the BDP approach in real settings might produce interesting decolonial investigations of imagined scenarios of sustainable practice, not only in educational settings, but also in rural and urban settings, and with vulnerable communities.

The new design of an app for the interactive whiteboard by one teacher (figure 2) invites explorations of IT autonomous design in formal education. Re-thinking the role of the teacher in educational technology is a current interest (Johnson et al., 2014). There exist reports of inspiring projects on decolonising IT in informal educational settings (Cavallo, 2000; James Tarditi, 2016). So there is an opportunity for BDP-supported research on the democratisation and decolonisation of formal education in the Global South not only in early childhood education in poor locales in Colombia (Franco Franco, 2016) and primary school in southern Kenya (Dinkwater, 2014), but also in researching inequality and inclusion inclusive educational technologies in the Global North (Contreras et al., 2019; Kicken et al., 2016).

7. Conclusions and future work

In this paper, I reflected on the use of BDPs in autonomous design projects in which the community undertakes the design of itself. The reflection was based on a meta-analysis of a prior research project. An educational community adopted a BDP for carrying out improvements in teaching practice with children with impairments, in a manner in which elements of autonomy were unexpectedly present. For example, the BDP/external designer was not involved in the pilots. The co-design team (speech therapists, teachers, and internal counsellors) was the community itself who implemented pilots escalating in numbers of teacher and children participation. Collaborative activities (e.g. co-teaching and workshops) were at the core of adoption model leading to a new design by a teacher (e.g. an app for the interactive whiteboard). The model of the system is sustainable to the school and transferable to other schools. The BDP approach might be useful, advance autonomous design projects seeking for communal forms of autonomía, decentring participation of external knowledge experts and designers, in their exploration of sustainable innovation models and practices for living, learning, working, among others.

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About the Author:

Gloria Gomez undertakes applied design research in novel educational practice with Bridging Design Prototypes. She is co-founder at OceanBrowser Ltd, honorary senior lecturer at the University of Sydney, and scientific committee member in the postgraduate programmes in Diseño y Creación at La Universidad de Caldas.