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Three cases of hybridity in learning spaces: Towards a design for a Zone of Possibility

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Abstract

The paper contributes to design discourse by drawing on Educational Design Research (EDR) that has been conducted into what we call a Zone of Possibility (ZoP) over the past seven years. We define a ZoP as a place where individuals can overcome the constraints of expectations and power structures to effect desired change. Specifically, this paper presents details of how our initial research question (RQ1) has evolved to the one presented in the conclusions (RQ2); both RQs are summarised below in the section "Research Questions." To describe this evolution, the paper is presented as 3 cases (Confer, ZoP Stokes Croft and Google Lens in HE) that have provided insights to explore the concept of the ZoP and its implications for EDR. Specifically, one of the main conclusions is the importance of bridging positioning practices as "successful communication" and an understanding of social context in hybrid contexts (ie, the ZoP).

Introduction

Educational design research (EDR), or design-based research, emerged over a decade ago as an alternative paradigm for education science (Brown, 1992). Indeed, design-based research has gained traction over the last decade appearing as a core topic n special issues of academic journals, in multiple book publications and in academic practice related to educational media environments (eg, Anderson & Shattuck, 2012; Kelly, Lesh, & Baek, 2008; McKenney & Reeves, 2012; Mor & Winters, 2007). EDR is a change oriented paradigm: its emphasis goes beyond understanding the world as it is, to ask "how do we make it better?" This entails a dual commitment to advance theory and practice simultaneously. It dictates a highly interventionist, inherently multi-disciplinary, iterative and situated methodology, which holds the promise of producing theory relevant to practice and practical innovations informed by theory. It is interventionist in the sense that researchers introduce innovations into the environment they study to observe their effects, iterative because these innovations evolve in tandem with their theoretical underpinnings, situated meaning that interventions are introduced into real-life settings, rather than laboratory conditions. The relation to theory is opportunistically eclectic: rather than maintaining a zealous allegiance to a monolithic theoretical tradition, researchers will draw on multiple sources as

Practitioner Notes

What is already known about this topic

- Real world contexts are complex, ill-structured and unpredictable. Designing for learning in such conditions is challenging. Specifically, hybrid learning spaces are open design opportunities but they pose challenges to designers of learning experiences.
- The notions of "bridging" in terms of how we best position ourselves in groups (with reference to power and control) is ill-defined from a design perspective.

What this paper adds

- One of the main conclusions is the importance of bridging positioning practices as "successful communication" and an understanding of social context in hybrid contexts (ie, the Zone of Possibility or ZoP).
- Cases that for an inquiry over several years into how to facilitate the realisation of a learner's potential in the ZoP.

Implications for practice and/or policy

- Bridging an understanding of social context will include an undertaking to develop "low flying" or "low overhead" mediational tools that address ethical and privacy concerns of citizens but that also sit easily in users' learning cultural and work practices.

befits the challenges at hand. Research questions are unashamedly value-driven: when asking "how do we make the world better?" researchers are compelled to take a stance on what is "better." This complexity introduces methodological and design challenges, as we illustrate below in the articulation and evolution of our research question based on three interventions (ie, the 3 cases).

In Cook *et al.* (2015), we identify two dimensions of hybridity in learning spaces: the interweaving of formal and informal social structures in an activity system, and the combination of physical and digital tools mediating an individual's interaction with the world and society. We go on to argue that "people connect and interact through a hybrid network of physical and technology-mediated encounters to co-construct knowledge and effectively engage in positioning practices necessary for their work... We suggest: [people] learn from each other in groups (a Zone) that calls for orchestrating social supports (navigation and bridging aids) so that learners can benefit from the ideas of others (Possibility)... [this can be] seen as a framework for enabling a 'Zone of Possibility'" (ibid., pp. 125). Hybrid learning spaces are thus open design opportunities but, as we will see, they pose challenges to designers of learning experiences.

This paper draws on EDR that has been conducted over the past seven years to contribute to the themes of the Special Issue "Hybrid Learning Spaces—Design, Data, Didactics." Following a related literature review and then a section outlining how our evolving research question guided our work, three cases are presented. The paper ends with preliminary conclusions and areas for future work.

Background

Cremers, Wals, Wesselink, and Mulder (2017, p. 290) cite their own earlier work to define a hybrid learning configuration (HLC) as "a social practice around ill-defined, authentic tasks or issues whose resolution requires transboundary learning by transcending disciplines, traditional structures and sectors, and forms of learning. In HLCs working and learning are integrated as

students work on assignments from clients or other stakeholders in the community." In work that has many parallels to our own, Cremers *et al.* (2017) examine how a set of design principles that was utilised by the design teams in their study underpins the design of HLC configurations that are situated at the interface between school and workplace. The concept of boundary crossing was used as a theoretical framework for their work. The work described in this paper similarly deploys design principles in design teams at interface between workplace, community action and Higher Education. Specifically, Cremers *et al.* (2017, p. 292) successfully use a set of abstract, meta-design principles which "can be perceived as a boundary object, as the principles cross the boundary from the research context in which they were generated to new design contexts in which they are utilized." We extend the notion of HLCs to that of a Zone of Possibility where issues of power and control are in the foreground in networks that literally create "bridges" (see below for background literature and a definition). Further, in related work to our first case below, Lax, Scardamalia, Watt-Watson, Hunter, and Bereiter (2010) have for some years examined Knowledge Building in the health sector in Canada and as such their work complements the work described in the first case. They conclude that: "Three important contributions that a Knowledge Building technology can make over and above those of courseware are (a) support of sustained Knowledge Building discourse that involves multiple idea linkages and movement of discourse towards higher level organisations of ideas, (b) integration of various sociocognitive functions so that they have combined strength rather than representing different activity spaces and (c) possibilities for continual formative assessment driven by Knowledge Building goals" (Lax *et al.*, 2010, p. 22).

In the Introduction, we noted that in the ZoP bridging aids are important. This interest stems from the work of Putnam (2001) for whom, and along seemingly similar lines to Bourdieu (1986), social capital is the creation of social networks between socially heterogeneous groups; face-to-face examples are choirs and bowling clubs, online examples include the social network sites (Boyd & Ellison, 2008). Putnam maintains that social capital is built in social networks and their associated norms of reciprocity. He distinguishes between **bridging** and bonding social capital. A useful overview of social capital has been provided by Tomai *et al.* (2010):

"**Bridging social capital** arises when people from various backgrounds make connections entering social networks that are "inclusive," and therefore, favour participation of individuals who differ on many crucial variables such as income, political orientation, ethnic origin, religious affiliation, etc. **These kinds of networks literally create "bridges," which is they allow people**, who might not have had the possibility to encounter one another in their daily lives, the opportunity to become acquainted. The relationships that develop may lack in-depth, but they offer breadth: they provide the chance to get to know people of manifold backgrounds. Alternatively, bonding social capital can be exclusive. It is built between individuals engaged in tightly knit, emotionally close relationships, such as family and close friends. The individuals with bonding social capital have little diversity in their backgrounds but have stronger personal connections. The continued reciprocity found in bonding social capital provides strong emotional and substantive support and enables mobilisation. According to Putnam... these two types of social capital are related but not equivalent. And moreover, they are not mutually exclusive." (Tomai *et al.*, 2010, p 265, **our bold**).

Furthermore, we can assert that, "social capital is an elastic construct used to describe the benefits one receives from one's relationships with other people" (Steinfield, Ellison, & Lampe, 2008, p. 434). In summary, bridging social capital is a term that emphasises the informational benefits of a heterogeneous network of weak ties whereas bonding social capital emphasises emotional benefits from strong ties to close friends and family (Steinfield *et al.*, 2008, p. 435). This notion

of weak ties provides a slight variation on the definition of social capital provided by Bourdieu (1986) in that if we allow weak ties, "mutual acquaintance" in a network is not (necessarily) required. Furthermore, a key problem is one of creating and sustaining a spiral of social capital; such an endeavour may require scaffolding as a bridging activity (particularly for NEETs, ie, those not in education, employment or training, as well as for at-risk learners). A key issue is, therefore, how we can enable formal and informal learning activities of individuals and groups to become linked together through the scaffolding as a bridging activity mediated by new media and technology. This issue articulates the challenges of achieving "successful communication" and led to the (ZoP) research question(s) described below.

In a wide ranging critical review of Post-Vygotskian perspectives on learning and research (Cook, 2015) the first author drew heavily on the work of Daniels (2008) to frame his perspective on designing for the Zone of Possibility (ZoP), which is in the title of this paper. Daniels overcomes some of the power imbalances implicit in Vygotsky's (1930/1978) Zone of Proximal Development (ZPD); briefly the issue is that a learner works with a "more capable peer," which has an implicit power imbalance. Categories are constituted by social divisions of labour. Positioning can be viewed as being in a systematic relation to the distribution of power and principles of control. Thus, social positioning underlies practices of communication and gives rise to the shaping of identity. The implication is that a "subject" like a learner inhabits a space of possibility, thus, a subject would be represented "by a socially structured **ZoP** rather than a singular point" (Daniels, 2008, p. 164, **our bold**). Indeed, we find this notion of the ZoP within the context of the situation and the context of the culture as relevant to notions of hybridity. Daniel's is resistant to the notion of a network as a connected system, within which component parts share some function, instead focusing on "the existence of multiple activity systems that may supplant each other and may be mutually transformed" [3, p. 166]. As will be pointed out below, other theoretical stances are welcomed in our work. However, the ZoP is something that the first author keeps coming back to and as such provides the conceptual cornerstone of Cook's work.

Methodology

This paper does not introduce novel empirical results. Our objective is to review and reflect on work done over several years and draw over-arching insights. The work considered here is presented through three case studies. Before briefly summarising our 3 cases at the end of this section, below we link them together as we articulate our original and revised research question that guided each case. In line with our EDR approach, described in the Introduction, our research questions are unashamedly value-driven in that we inquire into and build hybrid spaces as networks that literally create "bridges." In the literature review provided above, we summarised bridging social capital as a term that emphasises the informational benefits of a heterogeneous network of weak ties (Steinfield *et al.*, 2008, p. 435) and pointed out that a learner inhabits a space of possibility and is thus represented by a socially structured ZoP rather than a singular point (Daniels, 2008, p. 164). Consequently, we define a Zone of Possibility or ZoP is a place where individuals can overcome the constraints of expectations and power structures to make things happen. Further, we extend the notion of HLCs (Cremers *et al.*, 2017) to that of a ZoP where bridging issues of power and control are in the foreground.

In order to explore how a ZoP intervention could enhance perceived usefulness of design principles by design teams, we used an EDR approach. Specifically, we extended the Participatory Pattern Workshop approach by including design principles as boundary objects translating theory into practice, and agile user stories as boundary objects bridging the EDR language with that of software engineering. As Cremers *et al.* (2017, p. 290) point out, design principles "as

a research outcome which is used in practice, connect the worlds of design research and educational practice by crossing the boundary between those two worlds (eg, Klerkx *et al.*, 2012)." Furthermore, this paper presents how our initial research question (RQ1) has evolved to the one presented in the conclusions (also provided below as RQ2).

Research questions

RQ1 "In the context of socio-technical environments, how can the design process and design thinking advance or bridge our social capital?"
RQ2 "In the context of hybrid learning spaces, how can the design process and design thinking advance or bridge 'successful communication' and an understanding of social context in a ZoP?"

A key issue is that we move to notions of "bridging," which from a design perspective is ill-defined, in RQ1 towards a ZoP which is central to RQ2 which includes bridging issues of power and control. A related key issue is how we enable formal and informal learning activities of individuals and groups to become linked together through the scaffolding as a bridging activity mediated by new media and technology. This issue articulates the challenges for "successful communication" mentioned in RQ2. Further, an important part of the design process and design thinking is the design principle. Design principles are the projection of kernel theories into the problem domain (in our case above Knowledge Building and post-Vygotskian theory projected into the three cases). In case 1 for example, our approach allowed us to synchronise with other streams of the Confer project (eg, Social Semantic Server: the technological framework in the project providing tools and associated users with a growing set of services (eg, recommenders) of different granularity that generate and utilise social and artefact network data needed in a hybrid learning environment). We proposed various design principles and in Year 4 of Confer (2016) and continued with the process of systematically connecting these to follow up case studies; if successful this would provide external validation of our conceptual approach. Design principles emanate from and connect to theories of learning and instruction, they can be at several levels of specificity and those presented below articulate the ZoP concept. The meta-design principles capture abstract theoretical ideas and project them into the problem domain. Each has meta-design principles follows this template: Description, Theoretical background, Tips (Challenges, Limitations, Tradeoffs, Pitfalls) and Links to other principles and patterns. The meta-design principles provide links to online public descriptions plus a brief overview how they link to theory.

The real world is a complicated place and both RQs and the related cases attempt to reflect this. For example, the second case (Stokes-Croft project), had it worked, was clearly integrating both the questions of the complex political positioning of self *and* the use of a tool. As we point out above, positioning practices are necessary for group interactions with other humans in contexts like the workplace or higher education. What are the rules of engagement? What is the underlying game? Do I want to play? As a learner, how do I realise my potential? Positioning can be viewed as coping strategies for dealing with real world. Specifically, we view positioning as being in a systematic relation to the distribution of power and principles of control. Thus, social positioning underlies practices of communication and gives rise to the shaping of identity. The implication is that a "subject" inhabits a space of possibility, thus, a subject would be represented "by a socially structured ZoP rather than a singular point" (Daniels, 2008, p. 164). How we design for positioning in a ZoP is and under-explored area. As we have pointed out, the real world is a complex place and both RQs and the related cases attempt to reflect this. See Meta Design Principle 1 (MDP1) below in case 1 for more detail.

In the rest of the paper, we present 3 case studies (Confer, ZoP in Stokes Croft and Google Lens in HE) that have provided insights to explore further the concept of the ZoP and its implications for EDR. Specifically, one of the main conclusions is the importance of bridging "successful communication" in terms of positioning practices and an understanding of social context in Hybrid contexts (ZoP). The first two cases (with a section each below) look at Meta Design Principles (MDPs) for the ZoP. Specifically, the next section outlines detailed work on the groupware tool Confer which was developed for work-based learning using the guidance of MDP1&2. In the section that follows (case 2), we go on to present an extension of MDP1 and clarify some aspects by using the case of the ZoP-Stokes Croft community enterprise. A further sections (case 3) explores the ZoP MDP1 in a Higher Education context. Preliminary conclusions are then drawn.

CASE STUDY 1: USING THE PARTICIPATORY PATTERNS DESIGN (PPD) METHODOLOGY TO CO-DESIGN GROUPWARE: CONFER A TOOL

Confer is a groupware tool (Cook, Mor, *et al.*, 2016) that provides support to bridge face2face and online discussions in professional work groups, which was designed and developed in the context of the Learning Layers project. The Learning Layers Project (http://learning-layers.eu/) was funded by the EU FP7 programme and developed technologies to support informal learning in the workplace, specifically in the healthcare and construction sectors. The Learning Layers project has won the VET Research Excellence Award 2018 (https://tinyurl.com/yynlykrc), and ran from 2012–16. Confer (http://results.learning-layers.eu/tools/confer/) was co-designed with users (professional in the UK's National Health Service). In true design research spirit, the co-design methodology evolved alongside the product development. The resulting methodology (Figure 1), is called the Participatory Patterns Design (PPD) methodology. PPD (Cook, Mor, *et al.*, 2016) provides a framework for engaging multidisciplinary communities in collaborative reflection on educational innovation in a given domain. It leads practitioners and researchers through design and development cycles in which they:
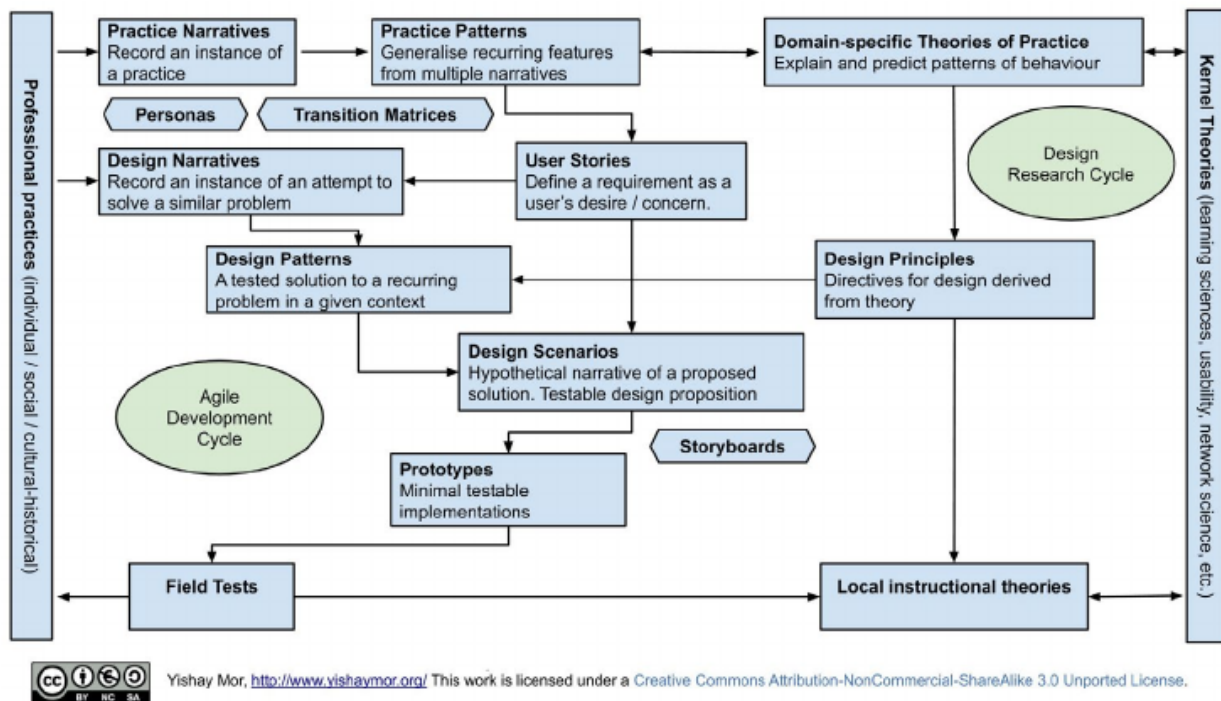
Figure 1: Schematic diagram of the Participatory Patterns Design (PPD) methodology (see https://goo.gl/ ZUMTVz for glossary)

- Understand existing epistemic practices (ie, public reasoning and adjudication of competing claims for knowledge): Identify gaps in those practices
- Consider relevant theories as well as existing/ previous attempts to address these gaps
- Conceptualise a novel solution
- Define the evaluation protocols for this solution

Using the PPD methodology, the co-design activities surrounding Confer have used design constructs from an early stage in the design cycle to mediate between theory and practice when designing tools for supporting the under-explored area of workplace informal learning. A boundary object is information, such as specimens, field notes, and maps, used in different ways by different communities. Including design principles as boundary objects assists in translating theory into practice, and agile user stories as taken as boundary objects bridge the EDR language into that of software engineering. Design principles are the projection of kernel theories into the problem domain (in our case the post-Vygotskian theory of the ZoP and Knowledge Building was projected into the Confer tool). Our approach allowed us to synchronise with other streams of the Learning Layers project.

PPD draws on a long line of research, and utilises several key constructs, including agile user stories, design narratives, design patterns, design principles and design scenarios. A full account of these is beyond the scope of this paper and can be found in Cook, Mor, *et al.* (2016). Suffice to say here that both design patterns and design principles are mediating forms (boundary objects), bridging the gap between theory and practice. Design patterns identify a recurring problem and a common method of solution from phenomenological accounts of practice, and then, seek theoretical support to explain the observed practice. Design principles, on the other hand, project theoretical postulates into practical directives. The meta-level (theory driven) design principles are linked to various design patterns (practice driven). Our approach, therefore, allows for meaningful connections between different theoretical viewpoints to emerge (Cook *et al.*, 2015). Furthermore, it was found that one of the strengths of such a design approach is that we do not commit to a single theoretical tradition. Rather, in true design science spirit, it draws on multiple theories: in this particular case, post-Vygotskian concept of hybridity in professional learning networks (described above), plus knowledge building communities and the related concept of progressive inquiry (Cook *et al.*, 2015). This does not come without a price and additional challenges since single theory systems are "cleaner," and therefore, easier to explain and justify. Single theory systems tend to shoe-horn thinking into nice boxes which cut out a lot of the essential complexity. Our approach provides a systematic and rigorous internal approach and potentially provides a way of warranting claims and a powerful explanatory and step-by-step guidance of the functioning and scope for learning in professional networks; it has also allowed for an in-depth look at our research and design question (Cook, Mor, *et al.*, 2016). The 2 meta-design principles (MDPs) with links to online public descriptions, plus a brief overview of how they link to theory, are as follows. The full top-level descriptions are included here as outcomes of applying the PPD in the design and development of Confer:

MDP1: Respect learners' ZoP, http://ilde.upf.edu/layers/v/brn
Professionals engaged in social learning want to present themselves in the best possible professional light, ie, people will position themselves in different ways depending what they deem as the best way from the perspective of their professional role in circumstances of a particular situation. In other words, people will position themselves differently according to particular circumstances and how they see their professional role. They do not want to expose themselves professionally. Also, professionals are being positioned by actors in their activity systems. Consequently, we are designing for a ZoP. This means that we as designers need to be aware of potential multiple layers of power relationships when learners ask for or give social support or receive recommendations.

First, encouraging professional learners to observe peer group interactions to build up a picture of the cultural norms of the group they are entering; assist construction of an online persona by building on the profiles of key peers who seem closely related. Second, when professional learners interact, they connect to the cultural aspect of learning by bringing to light the alternative views held by other learners and the criteria used to interpret ideas. Third, enable professional learners to identify when authorities (actors) are positioning them within the group. In this way our tools mediate professional identity building through participation in a ZoP.

MDP2: Support knowledge building discourse, http://ilde.upf.edu/layers/v/btz
This is a principle which embeds discussion around educational design of the need for that design to further the goal of creating a culture which is conducive to learning. This principle sees educational design as a way to enhance a culture supportive to learning. In this way, paedagogic design transcends the limited application of the connectionist framework by prodding the learners to better understand their own volition and develop an internal locus of control. To embed knowledge building discourse:

- Provide opportunities for discussion between designers around the user experience when engaging with the product of a learning design process. That user experience should facilitate the learning process rather than standing in its way with unfamiliar systems or extraneous features.
- Provide the mechanism for the learner to reflect on their degree of autonomy and agency in the learning process. When they think this through, they can begin to build a set of metacognitive skills which will benefit their development in the long term as they become aware of how they best learn.
- Where possible, scaffold a user awareness of knowledge building-based design into the tool. This can be born from the first point above and facilitate the second. It draws the user and designer into a shared cognition around the topic which has the potential to be a transformative experience for the users, who then find themselves the architect of their own learning design efforts in the future.

Case study 2: Urban regeneration within the ZoP in citizen led "hybrid cities" (stokes croft)
In this section, we present an extension of MDP1 described above and clarify some aspects of the ZoP in a new context of community enterprise. In Cook, Lander and Santos (2016) we applied MDP1 to "hybrid cities," hence allowing us to explore the generality of our approach. The ZoP Stokes Croft is a Digital Public Space that uses the concept of the ZoP to allow the people of the inner city neighbourhood of Stokes Croft in Bristol (UK) to share their experiences of self-driven economic, social and cultural regeneration (Cook, Lander, *et al.*, 2016). The ZoP app developed for this case allows a user to set up a Digital Public Space using Android devices. Users could potentially record video clips, annotate points of interest at a specific time and location in a video frame, share and discuss. The ZoP app is an extended version of an existing app called "Ach So!" (Aalto University, https://github.com/learning-layers/AchSo) new features have been integrated in order to support the social aspects of the ZoP such as a forum associated to each video, and an enriched user profile section. ZoP-SC is available in Github: https://github.com/zopspace/zop-sc.

It is essentially a peer-to-peer tool that could have potentially been used to engage with a wide range of challenges from social regeneration, to workplace problem solving, heritage and culture, smart cities and urban data. In parallel, a responsive web site mock-up was envisaged which could collect the video stories and extract insights in order to inform and influence people and

organisations locally and globally. The prototype app was trialed with undergraduate students from a local university. For an example story see: https://vimeo.com/161160245.

The ZoP-SC project described above not only progress partly because funding could not be found to develop the app (in fact only an initial attempt was made); but also because although users who trialed the ZoP-SC did shoot video clips and annotated them, we found they did not go on to use the discourse tools, which may have been regarded as an unnecessary overhead. However, the discourse tools were seen as a key mediational tool for learning and positioning by the project team. This was disappointing, so another way to facilitate the realisation of a learner's potential in the ZoP needed to be found; preferably one that was already available and had low overheads in terms of scaffolding learning discourse in a ZoP.

The lessons learnt from the ZoP-SC derived to the next case. Google Lens used in a more formal tutorial discourse contexts seemed to present a useful opportunity to overcome some of the aforementioned limitations, as the next sections will explore.

Case study 3: Hybrid paedagogy in HE: research-based learning in the ZoP mediated by Google Lens

From the perspective of a hybrid interleaving of the physical-digital & formal-informal in the ZoP, Google Lens (see https://lens.google.com/) provides very interesting affordances for co-creating with learners. Also, as was mentioned above, it seemed to present a useful opportunity to overcome some of the limitations uncovered in the ZoP-SC case. It also raises opportunities for discussion about future hybrid space design, particularly in terms of ethical and privacy issues. *Note that the work in this section was conducted by the first author hence "I" and "my" are used rather than the "we" and "our" used in proceeding sections.*

Lens is a mobile app designed to bring up relevant information related to objects it identifies. When directing the phone's camera at an object, Google Lens will attempt to identify the object or read bar codes, QR codes, labels and text, and show relevant search results and information.

In a research-based learning session with my (ie, the first author's) undergrads at Goethe University Frankfurt, we explored the affordances of Google Lens. As such this section briefly reports on a teaching and learning innovation. Specifically, in a face to face session in June 2019, I asked a group of 11 of my undergraduate Education students to use Google Lens in a self-directed walkabout on the campus, and then, to prepare a 10-15 presentation on the following five questions:

1. What was your experience as a learner of using Google Lens?
2. Could it be used for hands on (hands-on) low costs Augmented Reality exercise with learners? If yes list 3 scenarios
3. How would Google Lens need to be developed, or what other apps would be needed, to make the learning/ educational experience better?
4. Is Google building probably the biggest AI in world?
5. What are the ethical and privacy issue involved with Google Lens for students and the public generally?

Three groups formed, undertook the activity and fed back in class; they were invited to email me their presentation if they were happy for me to present their work in workshops and research into paedagogy. What follow is an anonymised summary of a few of the interesting points raised by the groups, all of whom engaged enthusiastically with the co-research task. All groups made extensive use of the app in various contexts, identifying plants, birds, cars, drink brands, sweets,

clothing, and much more. A campus street sign in German was translated to English. The app did not work too well in the library looking at book shelves, leading Group 2 to suggest that a filter was required so that if it were an academic context, then, the app would "know" that the titles and content of the books were important. Group 1 managed to generate a humorous failure of the app, with a tree stump being mistaken for a turtle.

Group 2 made the following responses to Q1. "Impressive… But also intimidating… Worried about data issues… Who are the real beneficiaries? We or Google?… Not sure if we should keep the app." For group 2 another issue was that it gathered data even when you did not realise it, for example of the type of shoe a student was wearing and its price, where to buy it, etc… All groups came up with multiple scenarios for Q2, eg, group 2: "(1) foster care studies, (2) medical field, (3) zoo simulation." Group 3 suggested that when construction workers are drilling/boring into the road the app could show where the pipes and other utilities were to avoid accidents. Group 3 came up with several creative responses to Q3, including "add a button to items so you know how to recycle them" and a hybridity scenario: "if statues became holograms they could tell you stories about who they are." Another group felt there should be an edit button and this would enable student collaboration around objects. One student responded to Q4 "we are afraid they are."

I did prompt students in the briefing that I felt Q5 was important. That said, responses were extensive and are now summarised. Group 2 felt there was scope for relevancy in the future, in that although facial recognition did not currently work in the app, there was the suspicion that (maybe because of knowledge that the Google Glass privacy concerns leading led to the product being taken off the market) this was waiting to be turned on; indeed, students would like to have this as a preference to keep it turned off. Also, Group 1 commented "Normally people have to know your name to stalk!"; Group 3 commented "who decides what is shown?". Further, Group 3 felt it was important for you as the learner to critically reflect on the accuracy of sources and were concerned we would lose the skill to interact with the physical world. All groups were worried the app would remember the history of what you had been looking at. Group 3 thought the app could lead to addiction and lack of attention when learning issues.

The description of this third case is brief because it was exploratory. However, in the conclusions you will see that the project will continue with Google Lens. Indeed, we feel it of interest that there were concerns about the ethical and privacy dimensions; it was interesting that one participant immediately uninstalled the app.

Preliminary conclusions and areas for future work

We define a ZoP as a place where individuals can overcome the constraints of expectations and power structures to make things happen. We extend the notion of Hybrid Learning Configurations (Cremers *et al.*, 2017) to that of a ZoP where bridging issues of power and control are in the foreground. What now follows are some preliminary conclusions are areas for future work.

Project software developers must not be allowed to lead us into an overblown system; in the end Confer, described above, became overly complex and the users who had helped co-design it could not find the time to help evaluate it. Furthermore, we must also heed the lessons from the ZoP-SC project described above. The ZoP-SC project found that users who trailed the ZoP-SC did shoot video clips and annotated them. However, they did not go on to use the discourse tools, which may have been regarded as an unnecessary overhead. An alternative approach to bridging learners into a ZoP needed to be found and hence the Google Lens in HE case emerged. As we saw in the final section, Google Lens has the potential to mediate hybrid learning in the ZoP.

However, there are many ethical and privacy concerns related to the growing dominance of Google, Facebook and other organisations and the spread of related products and surveillance approaches. There is also an attendant apprehension felt about the Artificial Intelligence that underpins tools like Google Lens. This was surfaced by the Goethe HE case above, one student group commented that Lens is both "awesome yet scary" with another member reporting that after the activity they uninstalled Lens. This has implications for data analytics and the use of recommender systems.

Future work will look for partners and funding for a new project with the working title: Designing for the ZoP using Lens+. Specifically, we will use the PPD methodology in a variety of settings, eg, Higher Education (HE) and work-based learning, to feed into a rethinking of how the use of Google Lens, plus other apps, can further learning in a ZoP.

Given the above considerations, the research question posed in the introduction is modified as follows, on the basis of the previous experience, to guide this future work:

RQ2: In the context of hybrid learning spaces, how can the design process and design thinking advance or bridge "successful communication" and an understanding of social context in a ZoP?

What we mean by this, following on from Daniels (2008), is that where power and control may be unevenly distributed to individuals or groups or categories of professionals, this translates into principles of successful or unsuccessful communication and understanding of social context. Bridging an understanding of social context will include an undertaking to develop "low flying" or "low overhead" mediational tools that address ethical and privacy concerns of citizens but that also sit easily in users' learning cultural and work practices.

We offer this paper as an invitation to engage in a debate on these issues. In particular, we are interested in conversations around the following area for future work:

- Boundary objects mentioned in the first case (Confer) are quite interesting because they forefront both the task at hand and the internal group dynamics in the ZoP.
- For Confer, "progressive inquiry" is the only available template. We would be interested in considering different structures for other kinds of tasks, for example "collaborative policy making" (Innes & Booher, 2010); which is an approach that can be said to have some elements of "progressive inquiry"; however we note that it also extends this with certain differences. Further, in this context, we would like to explore if AI-powered tools for "collaborative intelligence" like the ones developed by Anna DeLiddo (for example see Ullmann, De Liddo, & Bachler, 2019) could be integrated in the long run.
- The second case (Stokes-Croft project), had it worked, was clearly integrating both the questions of the complex political positioning of self *and* the use of a tool. Could this be an area to follow up?
- In the third case (Google Lens) nothing was said about the Zones of Possibility within the student groups, or about any reflection the students may or may not have been asked to do on their own learning, volitions, successful communications or co-creations. Essentially, are we missing the political positioning of self *and* the use of a tool in the student exercise? Could future work explore these issues?
- The second two case studies described above utilised personal mobile technology (apps). How would the balance change if we introduced autonomous location-based agents? Holograms or embedded displays in public spaces, supported by sensors, could initiate conversations with humans. How do we scaffold or bridge positioning practices as "successful communication" and obtain an understanding of social context in hybrid contexts (ie, the ZoP) where agency is explicitly shared between humans and machines?

Statements on open data, ethics and conflict of interest
This is not empirical research and as such no data sets were developed to make available. Confer was developed with a software company (CEO Raymond Elferinkin) in Learning Layers and is subject to the Consortium Agreement. Learning Layers was a 7th Framework Large-scale integrating project co-funded by the European Commission; Grant Agreement Number 318209. ZoP-Stokes croft was developed from existing Open Source (OS) software called Ach So! App (Aalto University, https://github.com/learning-layers/AchSo). The ZoP app is OS and is also available at https://github.com/zopspace/zop-home.

The UK's NHS (a project partner in Learning Layers) granted ethical clearance for the work on Confer following a full review; the data stored and protected under the terms of this ethical proposal. For ZoP Stokes Croft app, we took care to make sure participants provided informed consent and remained anonymous. For the Goethe HE work Cook checked with his Faculty and was informed that as the session was in a regular class, and because students provided informed consent and remained anonymous nothing else was required.

There are no conflicts of interest in the work we are reporting here.

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